Demographic and Characteristics of Included Studies

Effects of elastic band exercise on the frailty states in pre-frail elderly people. Chen et al.	
Study (Year Published)	2019
Country	China
Objective/purpose	Evaluated whether elastic band exercise could prevent frailty states, and improve grip strength (female/male), walking speed, and physical activity in prefrail elderly people.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Participants were recruited from the community center through giving out leaflets, posting leaflets on the bulletin board or word of mouth. Seventy pre-frail community-dwelling elderly people in Wenzhou city participated in this study from October 2017 to March 2018. One site.
Inclusion Criteria/Exclusion Criteria	Inclusion: Pre-frail elderly people (who met one or two criteria based on the Fried frailty phenotype: unintentional weight loss, self-reported exhaustion, low physical activity, slow walking speed, weak grip strength), age between 65 and 85 years old, having no understanding/ hearing/visual impairment and vestibular/cerebellar dysfunction, could follow general commands and communicate normally, could walk independently without assistance, having no other organized exercise training except elastic band exercise during intervention and voluntary participation in the study. There were five criteria presenting in the frailty phenotype (Fried et al. 2001): unintentional weight loss, weight loss (not due to dieting or exercise) more than 4.5 kg in last 12 months; self-reported exhaustion, "you felt that everything you did was an effort or you could not get going," either of these two feelings appeared more than three days in the last seven days; low physical activity, answering "yes" to either of the following two questions was considered as a positive result: "Having limits to some activities in daily life due to physical reasons, including moving the table, sweeping the floor, playing tai-chi, and simple gymnastics, climbing a few flights of stairs and so on" and "in the last month, the things (work or daily activities) you wanted to do only could be done in half due to physical reasons, or the type of work or daily activities was limited"; slow walking speed, walk 4.5m, men (≤ 173 cm) or women (≤ 159 cm) need more than seven seconds, men (> 173 cm) or women (> 159 cm) need more than six seconds; and weak grip strength, measured dominant hand three times and recorded mean value, then stratified by gender and BMI (i.e. men: BMI ≤ 24, grip strength ≤ 29 kg; BMI 24.1–28, grip strength ≤ 30 kg; BMI > 28, grip strength ≤ 32 kg and women: BMI ≤ 23, grip strength ≤ 17 kg; BMI 23.1–26, grip strength ≤ 17.3 kg; BMI 26.1–29, grip strength ≤ 18 kg; BMI> 29, grip strength ≤ 21 kg). Score: One criterion represented one point; the total score was five points. The higher the score, the

	more severe the frailty states, those with three or more points were considered frailty, with zero points were considered non-frailty and those with one or two points were hypothesized to be pre-frail. Exclusion: Participants were excluded if they had severe skeletal muscle diseases and serious diseases (e.g. heart, lung, liver, and kidney), with a previous history of mental illness or antipsychotic medication, unwilling to participate in the study or planning to be hospitalized in the next half year or participate in other organized exercise training, having regular exercise (more than three days/week) or good exercise levels, and having low attendance rate (<85%). Participants who died, appeared serious diseases or injury, dropped out in the process of study and could not continue due to adverse events such as cardiovascular and motor system during the study.
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype.
Total sample n (number invited)	70
Intervention n (number invited)	35
Control n (number invited)	35
Loss to follow-up: I n (%); C n (%)	I: 2 (6); C: 2 (6)
Age	Mean age intervention (SD): 76.97 (5.19) Mean age control (SD): 75.27 (5.98)
Gender: I n (%); C n (%)	Female: I: 21 (64); C: 22 (67) Male: I: 12 (36); C: 11(33)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	Intervention Mean (SD): 22.79 (2.85) kg/m^2 Control Mean (SD): 22.64 (3.11) kg/m^2
Description of Intervention	Eight-week duration. The elastic band group was treated with elastic band exercises and the intervention was conducted for eight weeks, three days per week, 45–60 minutes per session, including warm-up activities before exercise and relaxed activities after exercise. The yellow elastic band (JOINFIT natural latex elastic band) was selected for exercise. All participants in the elastic band group were divided into three exercise groups, 11–12 participants in each group. Three exercise groups were led by the same intervener who was familiar with each exercise movement. The intervener received two elastic band training sessions and pass the assessment. The intervener could also be a physiotherapist or a trained community center worker. The intervention was delivered at the community room.

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

	Participants were asked about their physical condition. Their heart rate and blood pressure were measured before each exercise session. There were eight exercise movements. Each movement was performed for two sets, 10–15 repetitions per set; no elastic band for two exercises; both left and right were performed alternately; one to two minutes rest between each set; allowed to seize the chair or desk to maintain balance for safety.
Type of intervention	Physical Activity Intervention Category: Muscle-Strengthening Type of Intervention: Resistance/strength training
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	3x/week; 45-60 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Physiotherapist or a trained community center worker.
Description of Control	The control group maintained normal daily activity and did not receive any special intervention, irregular exercise (less than two days per week) or sedentary.
Length of Follow-Up	Post-intervention (eight weeks).
Adherence to intervention (# or % of sessions attended/completed)	33/35 participants completed the intervention.
Serious adverse events	There were no adverse events reported during the study.
Funding Source	NR

Effect of a short multicomponent exercise intervention focused on muscle power in frail and pre frail elderly: A pilot trial. Losa-Reyna et al.	
Study (Year Published)	2019
Country	Spain
Objective/purpose	Established whether a short-supervised facility-based exercise program improved frailty, physical function and performance in comparison with usual care treatment.
Study Design	Quasi-experimental, non-randomized, single-blinded controlled study.
Recruitment setting and/or recruitment methods	Subjects were recruited at the Frailty Unit in the Hospital Virgen del Valle that belongs to the Complejo Hospitalario of Toledo, Spain. One site.
Inclusion Criteria/Exclusion Criteria	Inclusion: men and women aged 75 years or more; diagnosed as pre-frail or frail according to the frailty phenotype; a score between two and ten points in the Short Physical Performance Battery; able to walk independently or assisted. Exclusion: severe cognitive impairment (based on subjective evaluation of the geriatrician), severe disability (score < 15 points on the Barthel Scale, major surgery in the previous six months before the beginning of the study, history of stroke within the previous six months or any other disorder that precluded participation in an exercise program.
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype.
Total sample n (number invited)	30
Intervention n (number invited)	16
Control n (number invited)	14
Loss to follow-up: I n (%); C n (%)	I: 6 (37.5%), C: 5 (35.7%)
Age	Mean age overall (SD): 84.2 (4.5) Mean age intervention (SD): 84.0 (4.7) Mean age control (SD): 84.4 (4.6)
Gender: I n (%); C n (%)	Female: I: 9 (81.8), C: 6 (66.7) Male: 2 (18.2); C: 3 (33.3)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Even though all the subjects were considered frail, the subjects enrolled in the trial were relatively healthy with few comorbidities 3.5 (2.2).
Smoking Status	NR
BMI	Intervention Mean (SD): 26.5 (3.3) kg/m^2 Control Mean (SD): 27.8 (5.9) kg/m^2

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Description of Intervention	The training program was applied for six weeks, with a total of 12 training sessions distributed in two weekly sessions. Each session had an approximate duration of 45 minutes, and a resting period of at least 48 hours was allowed between training sessions. Then, the participants performed the following resistance exercises to improve lower-limb muscle power: leg press and plantar flexion followed by a high-intensity interval training -type cardiovascular exercise consisting in walking on a treadmill.
Type of intervention	Physical Activity Intervention Category: Mixed Type of Intervention: Resistance/strength training, walking/marching, jogging, running, other (high-intensity interval training)
Physical Activity Intervention Intensity	High/strenuous intensity.
Frequency and Duration of Physical Activity Intervention	2x/week; 45 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	NR
Description of Control	Usual care. The control group was advised not to change their eating habits or physical activity during the course of the present study.
Length of Follow-Up	Post-intervention (six weeks).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	Biomedical Research Networking Centear on Frailty and Healthy Aging (CIBERFES) and Ministerio de Educación, Cultura y Deporte of the Government of Spain.

Effect of 24-month physical activity on cognitive frailty and the role of inflammation: the LIFE randomized clinical trial. Liu et al.	
Study (Year Published)	2018
Country	USA
Objective/purpose	Evaluated the effect of physical activity on cognitive frailty and determined whether inflammatory biomarkers at baseline, particularly interleukin-6, modified the effect of physical activity on cognitive frailty.
Study Design	Multicenter, single-blinded randomized clinical trial.
Recruitment setting and/or recruitment methods	Eight US field centers between February 2010 and December 2013.
Inclusion Criteria/Exclusion Criteria	Inclusion: Men and women aged 70–89; sedentary (reported <20 minutes/week in past month performing structured physical activity (i.e., exercise), and < 125 minutes/week of moderate physical activity); had functional limitations, as evidenced by a short physical performance battery score nine or less out of 12 (the short physical performance battery score is an integrative measure of balance, gait, and lower extremity strength); could walk 400 m in 15 minutes or less without the help of someone or a walker; and could safely participate in the intervention as determined by medical history, physical exam, and electrocardiography. Eligible participants had no diagnosis of dementia or significant cognitive impairment based on the Modified Mini-Mental State Examination after accounting for education and race.
Frailty index used *Include if modified (y/n) and how*	Study of osteoporotic fractures frailty index.
Total sample n (number invited)	1635
Intervention n (number invited)	818
Control n (number invited)	817
Loss to follow-up: I n (%); C n (%)	I: 244 (29.8); C: 227 (27.8)
Age	Mean age intervention (SD): 78.6 (5.2) Mean age control (SD): 79.1 (5.3)
Gender: I n (%); C n (%)	Female: I: 420 (65.2); C: 436 (66.7) Male: I: 224 (34.8); C: 218 (33.3)
Race/Ethnicity	n (%): White: I: 487 (75.6); C: 516 (78.9) African American: I: 120 (18.6); C: 93 (14.2) Other: I: 37 (5.7); C: 45 (6.9)
SES status *(reported by income or education level ONLY)*	Education, n (%): ≤ High school: I: 246 (38.2); C: 224 (34.4) College: I: 257 (40.0); C: 265 (40.6) Post-graduate: I: 140 (21.8); C: 163 (25.0)
Co-morbidities/chronic conditions	n (%)

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	History of hypertension: I: 458 (71.1); C: 468 (71.6) History of diabetes: I: 163 (25.3); C: 169 (25.8) History of cardiovascular disease: I: 44 (6.8); C: 51 (7.8) History of stroke: I: 50 (7.8); C: 42 (6.4)
Smoking Status	NR
BMI	Intervention Mean (SD): 30.2 (5.7) kg/m^2 Control Mean (SD): 30.3 (6.1) kg/m^2
Description of Intervention	The physical activity intervention included a goal of 150 minutes/week of walking, in addition to strength, flexibility, and balance training. This intervention required attendance at two center-based visits a week and home-based activity three to four times a week. The physical activity sessions were individualized and progressed towards a goal of 30 minutes of walking daily at moderate intensity, 10 minutes of primarily lower extremity strength training by means of body weight (e.g., chair rises) and ankle weights (two sets of 10 repetitions), three to five minutes of large muscle group flexibility exercises, and 10 minutes of balance training. The participants began with lighter intensity and gradually increased intensity over the first two to three weeks of the intervention. The Borg's scale of self-perceived exertion, with scores ranging from six to twenty, was used to measure intensity of activity. Participants were asked to walk at an intensity of 13 (activity perception of "somewhat hard"), and perform lower extremity strengthening exercises at an intensity of 15-16 (activity perception of "hard"). Intervention duration was 24 months.
Type of intervention	Physical Activity Intervention Category: Mixed Type of Intervention: Resistance/strength training, Walking/marching, jogging, running, Balance and flexibility
Physical Activity Intervention Intensity	Moderate intensity.
Frequency and Duration of Physical Activity Intervention	3-4x/week; 50 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	NR
Description of Control	The health education group attended weekly workshops of health education during the first 26 weeks, and monthly sessions thereafter. Workshops consisted of topics that were relevant to older persons, other than physical activity, such as negotiating the healthcare system, traveling safely, preventive services, and other relevant topics. The program also included a five to ten minutes instructor-led program of gentle upper extremity stretching or flexibility exercises.
Length of Follow-Up	Post-intervention (24 months).

Adherence to intervention (# or % of sessions attended/completed)	63% of intervention sessions; 73% of control sessions.
Serious adverse events	NR
Funding Source	National Institutes of Health/National Institute on Aging Cooperative Agreement, the National Heart, Lung and Blood Institute, the Intramural Research Program, National Institute on Aging, NIH, and the Claude D. Pepper Older Americans Independence Centers.

The Home-based Older People's Exercise (HOPE) trial: a pilot randomised controlled trial of a home-based exercise intervention for older people with frailty. Clegg et al.	
Study (Year Published)	2014
Country	UK
Objective/purpose	The Home-based Older People's Exercise programme was designed to improve mobility and function for older people with frailty.
Study Design	Two arm, assessor blind pilot randomized controlled trial.
Recruitment setting and/or recruitment methods	The approach involved using eligibility criteria to exclude the robust and then measure frailty in those who were recruited. Between July 2010 and November 2011, 474 potential participants were contacted to assess for eligibility and 84 (18%) were recruited.
Inclusion Criteria/Exclusion Criteria	Inclusion: people living at home and under the care of a case manager or community matron; the housebound (identified through Read code searching of general practitioner registers of National Institute for Health Research 'Research Ready' general practitioner practices); attending a day centre or respite care; residence in assisted living sites; at discharge from intermediate care hospitals and following attendance at elderly medicine outpatient clinics in Bradford, UK. Exclusion: unable to stand and walk independently; currently participating in an alternative exercise programme; registered blind. Those who had poorly controlled angina; had another household member already in the trial; had severe dementia or were receiving palliative care.
Frailty index used *Include if modified (y/n) and how*	Edmonton Frail Scale.
Total sample n (number invited)	84
Intervention n (number invited)	45
Control n (number invited)	39
Loss to follow-up: I n (%); C n (%)	I: 5 (11), C: 9 (23)
Age	Mean age overall (SD): 79 (9.2) Mean age intervention (SD): 79.4 (7.9) Mean age control (SD): 78.0 (10.5)
Gender: I n (%); C n (%)	I: 33 (73), C: 27 (69) I: 12 (27), C: 12 (31)
Race/Ethnicity	n (%) Caucasian: I: 38 (84), C: 33 (85) Asian: I: 7 (16), C: 6 (15)
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Charlson comorbidity index, mean (SD): I: 2.4 (1.9), C: 2.8 (2.1)
Smoking Status	NR
BMI	NR

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Description of Intervention	The Home-based Older People's Exercise programme was a 12-week-progressive exercise intervention that was presented to participants in an exercise manual and delivered by community-based physiotherapists. For this trial, the intervention was delivered by Bradford Teaching Hospitals NHS Foundation Trust community physiotherapists. The manual contains five sections; information, safety tips, good posture, exercises and staying on track. The core constituents of the Home-based Older People's Exercise programme were strengthening exercises for the muscle groups required for basic mobility skills like getting out of bed, standing up from a chair, walking a short distance and getting off the toilet. Physiotherapists received intervention training in a two-hour workshop. At the beginning of the intervention, participants were requested to perform five repetitions of each exercise in the routine. This progressed to 10 and then 15 repetitions as performance improved. The exercise routine took <15 minutes to complete, and participants were requested to complete the routine three times a day on five days of the week. Participants received weekly support from physiotherapists through five face-to-face home visits and seven telephone calls. If participants were coping well with the exercises, they were encouraged to progress within the programme. Progression involved an increase in repetitions, introducing new exercises or advancing to the next level of the Home-based Older People's Exercise programme.
Type of intervention	Physical Activity Intervention Category: Muscle-Strengthening Type of Intervention: Resistance/strength training
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	5x/week; <15 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Community-based physiotherapists.
Description of Control	The control group continued to receive usual care from the primary healthcare team and, other than baseline and follow-up assessments, had no contact with the research team.
Length of Follow-Up	12 weeks.
Adherence to intervention (# or % of sessions attended/completed)	Adherence diaries were returned by 27 of the 28 participants (96%) who completed the 12-week intervention. Of the adherence diaries returned, the mean diary completion was 64%, the mean total adherence was 46% and the mean partial or total adherence was 67%.

Serious adverse events	Seven participants in the intervention arm and eight in the control arm fell at least once (risk ratio: 0.66, 95% confidence interval: 0.27, 1.61). Two participants in the intervention arm and four in the control arm were admitted to hospital on at least one occasion (risk ratio: 0.38, 95% confidence interval: 0.07, 1.91). One participant in the control group was admitted to a care home.
Funding Source	Dunhill Medical Trust and Royal College of Physicians Joint Research Fellowship.

Self-Management Group Exercise Extends Healthy Life Expectancy in Frail Community-Dwelling Older Adults. Yamada et al.	
Study (Year Published)	2017
Country	Japan
Objective/purpose	Evaluated the effects of the self-management group intervention on disability in community-dwelling older adults.
Study Design	Prospective cohort study.
Recruitment setting and/or recruitment methods	Community dwelling adults aged 65 years and older who were living independently in a city in Kyoto prefecture in 2012 were recruited.
Inclusion Criteria/Exclusion Criteria	Exclusion: older adults who had already been designated as being activities of daily living-dependent and who were already eligible to receive the benefits of the long-term care insurance services. Individuals who moved out of the city during the four-year follow-up period.
Frailty index used *Include if modified (y/n) and how*	Kihon Checklist. A score of eight or more was classified as frail, four to seven as pre-frail, and zero to three as robust, according to Satake's criteria.
Total sample n (number invited)	3240
Intervention n (number invited)	1620
Control n (number invited)	1620
Loss to follow-up: I n (%); C n (%)	I: 0 (0); C: (0)
Age	Mean age intervention (SD): 77.1 (6.4) Mean age control (SD): 77.2 (6.9)
Gender: I n (%); C n (%)	Female: I: 1330 (82); C: 1336 (82.5) Male: I: 290 (18); C: 284 (17.5)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	Intervention Mean (SD): 22.4 (3.5) kg/m^2 Control Mean (SD): 22.3 (3.9) kg/m^2
Description of Intervention	In December 2016, 106 groups were established in the city, and 1620 older adults participated in self-management group activities. The activities were composed of 60 minutes of group training sessions once or twice every two weeks from December 2012 to December 2016. The exercise classes were facilitated by well-trained volunteer staff. The exercise sessions were completed according to a standardized format consisting of 10 minutes of light-intensity aerobic exercise, 20 minutes of mild strength training, 20 minutes of flexibility and balance exercises, and 10 minutes of cool-down activities. The aerobic exercise comprised global movement of the legs, trunk, and arms involving all joints and major muscle

	groups. Strength training consisted of progressive resistive exercises using a person's own body weight.
Type of intervention	Physical Activity Intervention Category: Mixed Type of Intervention: Resistance/strength training, Aerobic activities, Balance and flexibility
Physical Activity Intervention Intensity	Light intensity.
Frequency and Duration of Physical Activity Intervention	1x/week; 60 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Volunteer
Description of Control	Matched controls.
Length of Follow-Up	Two years and four years.
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	In the participation group, no severe health problems, such as cardiovascular or musculoskeletal complications, occurred during the exercise sessions. Minor problems reported included muscle ache and fatigue. All problems were managed easily by the adjustment of the participation program and were improved during the intervention.
Funding Source	Grants-in-Aid for Comprehensive Research on Aging and Health, from the Ministry of Health, Labor, and Welfare, Japan and The Research Fund for Longevity Sciences from the National Center for Geriatrics and Gerontology.

An individualized exercise programme with and without behavioural change enhancement strategies for managing fatigue among frail older people: a quasi-experimental pilot study. Liu et al.	
Study (Year Published)	2017
Country	Hong Kong
Objective/purpose	Evaluated the feasibility and preliminary effects of an individualized exercise programme with and without behavioural change enhancement strategies for frail older people with fatigue.
Study Design	Three-arm, single-blinded, quasi-experimental pilot study.
Recruitment setting and/or recruitment methods	A convenience method was used to recruit participants from eight district community health centres for older people. Potential participants were identified by the centre-in-charges. A leaflet was then mailed inviting them to take part in this study. Eight sites.
Inclusion Criteria/Exclusion Criteria	Inclusion: community-dwelling older people aged ≥65years; able to communicate in Cantonese; able to walk with or without an assistive device and able to complete the Timed-up-and-Go test to ensure that their mobility was good enough to join the exercise training; and in a frail state with exhaustion using the Fried frailty index. The items in the index included: unintentional weight loss, exhaustion, slowness, weakness, and low activity. The presence of ≥ three items was an indication of frailty. The participants had to meet the criteria for frailty, and one criterion indicating that they suffer from exhaustion. Exclusion: suffered from any disease in which fatigue was a dominant symptom (such as neurodegenerative diseases, cancer, and end-stage renal failure cachexia cases); had been admitted to hospital in the past three months, which may lead to muscle wasting owing to recent long-term bed rest; had undergone major surgery during the last six months; were confined to bed or restricted by the permanent use of a wheelchair; had been regularly performing moderately intense exercise (such as hiking and Tai Chi) for more than three hours per week; exhibited depressive symptoms, as assessed by the Chinese-Geriatric Depression Scale with a score of ≥ eight; or were terminally ill.
Frailty index used *Include if modified (y/n) and how*	Fried frailty index.
Total sample n (number invited)	85
Intervention n (number invited)	64 (Combined n: 34, Exercise n: 30)
Control n (number invited)	21
Loss to follow-up: I n (%); C n (%)	I: 5 (14.7), 1 (3.3); C: 0 (0).
Age	Mean age overall (SD): 79.32 (7.72) Mean age intervention (SD): I: 79.72 (7.95), 77.03 (7.07) Mean age control (SD): 81.90 (7.69)
Gender: I n (%); C n (%)	Female: I: 26 (89.7), 26 (89.7); C: 21 (100.0) Male: I: 3 (10.3), 3 (10.3); C: 0 (0.0)

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Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	Education Level, n (%): No formal education: I: 10 (34.5), 9 (31.0); C: 12 (57.1) Primary level: I: 11 (37.9), 10 (34.5); C: 5 (23.8) Secondary level: I: 4 (13.8), 8 (27.6); C: 2 (9.5) Degree level: I: 0 (0.0), 2 (6.9); C: 0 (0.0) Other: I: 4 (13.8), 0 (0.0); C: 2 (9.5)
Co-morbidities/chronic conditions	Charlson Comorbidity Index (CCI), Mean (SD): I: 4.03 (1.27), 3.93 (1.33); C: 4.24 (1.04) Number of Diseases, Mean (SD): I: 2.28 (1.79), 2.69 (1.14); C: 2.67 (1.77)
Smoking Status	NR
BMI	NR
Description of Intervention	Combined: behavioural change enhancement programme + exercise Exercise: exercise and centre-based health talks on the management of different health issues with the exception of fatigue. Control: centre-based health talks on the management of different health issues with the exception of fatigue. The aim of the behavioural change enhancement programme was to strengthen the participants' motivation to develop the intention to actively manage their fatigue; and to encourage them to adhere to their exercise regimen. This programme was designed based on the Health Action Process Approach model and consisted of three phases (i.e. phase one: goal initiation; phase two: planning; and phase three: action execution) with six face-to-face one-hour sessions. The first three weekly sessions were arranged during phases one and two. The remaining three sessions were offered once per month in weeks 4, 8, and 12 during phase three. The participants were guided in transforming their goals into a detailed action plan. In addition, a plan for coping was formed with reference to anticipated barriers, and alternative plans were generated to overcome those barriers. Both plans and goals would be modified based on the individual's progress throughout the programme. Four strategies were adopted in the programme to continually strengthen the self-efficacy of the participants. The four strategies were: obtaining performance accomplishments through experiences of success in achieving goals; generating social persuasion through regular sensible feedback and encouragement; gaining vicarious experiences through peer sharing and perceiving the positive physiological and emotional responses of engaging in regular exercise. All of the sessions in this programme were ran by a well-trained research assistant with a bachelor's degree in psychology. A weekly 45–60minute centre-based exercise programme was arranged from weeks 4 to 16 during the action execution phase for the combined and exercise groups. This multidimensional programme consisted of balance training, resistance exercises, and aerobics training, with warming-up and cooling-down exercises at

	the beginning and at the end. All participants received circuit training with set exercises, but the dosage of the different components was tailor-made for each participant based on his/her physical conditions. A compact disc and a pamphlet describing the different types of exercises used in this programme were disseminated to all participants to encourage them to continue to practise their exercises at home for 30 to 45 minutes at least three times per week. Centre-based supervision by a physiotherapist was arranged monthly after the physical assessments. Other sessions were supervised by an exercise instructor. Participants in the control and the exercise groups attended the centre-based health talks on the management of different health issues with the exception of fatigue. The number and timing of the talks were similar to those in the face-to-face sessions in the behavioural change enhancement programme for the combined group. The intervention duration was 16 weeks.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, aerobic activities, balance and flexibility
Physical Activity Intervention Intensity	Can't tell.
Frequency and Duration of Physical Activity Intervention	1x/week; 45-60 minutes at the centre and at least 3x/week 30-45 minutes at home.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Physiotherapist and exercise instructor.
Description of Control	Participants in the control and the exercise groups attended the centre-based health talks on the management of different health issues with the exception of fatigue. The number and timing of the talks were similar to those in the face-to-face sessions in the behavioural change enhancement programme for the combined group.
Length of Follow-Up	Post-intervention (16 weeks).
Adherence to intervention (# or % of sessions attended/completed)	Attendance rate (percentage of all classes): I: 0.69 (0.23), 0.86 (0.15); Control: 0.71 (0.26).
Serious adverse events	No serious adverse events occurred or were reported by the participants.
Funding Source	Internal General Research Fund and The Centre for Gerontological Nursing, School of Nursing, The Hong Kong Polytechnic University.

Effects of Resistance Exercise Training on Cognitive Function and Physical Performance in Cognitive Frailty: A Randomized Controlled Trial. Yoon et al.	
Study (Year Published)	2018
Country	South Korea
Objective/purpose	Elucidated the effects of high-speed resistance exercise training on cognitive function and physical performance in older adults with cognitive frailty.
Study Design	Parallel-group, randomized controlled trial.
Recruitment setting and/or recruitment methods	NR
Inclusion Criteria/Exclusion Criteria	Inclusion: participants who were ≥65 years; lived in Seoul, Korea; had no history of depression; chronic disease; degenerative neurologic disease; hospital admission in the past 12 months for any reason; not illiterate; had no stroke or other cardiopulmonary disease; or dementia. Additional inclusion criteria included the ability to walk 10 m without a walking aid, a clinical dementia rating score of 0.5, and pre-frail and frail older adults, as of August 2016. Prefrail and frail older adults were identified based on five Cardiovascular health study criteria defining physical frailty: unintentional weight loss, slowness, weakness, exhaustion, and low activity, which were scored one if present and zero if absent. The total cumulative scores ranging from zero to five were used to classify a participant as robust (score = zero), prefrail (score = one to two), or frail (score = three to five). Cognitive frailty was defined as the simultaneous presence of physical frailty, as described above, with cognitive impairment, defined as a clinical dementia rating score of 0.5, and absence of concurrent dementia.
Frailty index used *Include if modified (y/n) and how*	Cardiovascular health study criteria.
Total sample n (number invited)	65
Intervention n (number invited)	32
Control n (number invited)	33
Loss to follow-up: I n (%); C n (%)	I: 10 (31), C: 10 (30)
Age	Mean age overall (SD): 73.94 (4.27) Mean age intervention (SD): 73.82 (4.37) Mean age control (SD): 74.03 (4.27)
Gender: I n (%); C n (%)	Female: I: 14 (70.0). C: 16 (69.6) Male: I: 6 (30.0); C: 7 (30.4)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	Education (years), Mean (SD): Total: 9.08 (4.13); I: 8.09 (3.50); C: 9.77 (4.44)
Co-morbidities/chronic conditions	NR
Smoking Status	NR

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

BMI	Overall Mean (SD): 24.57 (3.06) kg/m^2 Intervention Mean (SD): 24.86 (2.73) kg/m^2 Control Mean (SD): 24.38 (3.30) kg/m^2
Description of Intervention	Independent exercise lasting one hour was conducted three times each week for 16 weeks. High-speed resistance exercise regimens were based on the use of elastic exercise bands, based on previous intervention. Each session included a 10-minute warm-up, 40-minute high-speed resistance training (seated row, one leg press, applied pec deck flus, seated leg raise, lateral raise, semi squats, wide squats, bridging), and 10 minutes of cooling down. The sessions were separated by a minimum of 48 hours and were performed under the direct supervision of an exercise instructor to ensure safety and adherence with the exercise protocol. Exercise intensities were set by the color of the elastic exercise band. In the high-speed resistance training group, blue elastic bands (tension: low, 20 Nm) were used and the participants were instructed to perform exercise training at a perceived exertion rate of 12-13 ("Somewhat hard"). The high-speed resistance exercise consisted of two to three sets of 12-15 repetitions. The exercise program in this study followed the guidelines for older adults recommended by the American College of Sports Medicine.
Type of intervention	Physical Intervention Category: Muscle-Strengthening Type of Intervention: Resistance/strength training
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	3x/week; 60 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Under the direct supervision of an exercise instructor.
Description of Control	Participants in the control group were asked to continue their routine daily activities and performed static and dynamic stretching (using elastic exercise band) twice weekly for one hour, over 16 weeks.
Length of Follow-Up	Post-intervention (16 weeks).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	Institute of Health and Environment, Seoul National University and Fellowship for fundamental academic fields, Seoul National University.

Benefits of a novel concept of home-based exercise with the aim of preventing aspiration pneumonia and falls in frail older women: a pragmatic controlled trial. Takatori et al.	
Study (Year Published)	2016
Country	Japan
Objective/purpose	Investigated whether home-based exercise with the aim of preventing aspiration pneumonia and accidental falls improves swallowing-related and physical functions in community-dwelling frail older women.
Study Design	Single-blinded, pragmatic controlled clinical trial.
Recruitment setting and/or recruitment methods	Participants were recruited from seven long-term care prevention classes among seven towns and cities in the Nara prefecture in Japan from the 1st to 30th of September, 2014. Seven sites.
Inclusion Criteria/Exclusion Criteria	Excluded: presence of a chronic exhausting disease such as malignancy or infection; involvement in another home exercise programme; regular participation in an exercise class; they could not perform the exercise programme due to severe joint pain and being diagnosed with dementia.
Frailty index used *Include if modified (y/n) and how*	Kihon checklist.
Total sample n (number invited)	266
Intervention n (number invited)	148
Control n (number invited)	118
Loss to follow-up: I n (%); C n (%)	I: 10 (7); C: 46 (39)
Age	Mean age overall (SD): 75 (5) Mean age intervention (SD): 74.6 (5.1) Mean age control (SD): 75.9 (6.0)
Gender: I n (%); C n (%)	Female: I: 148 (100); C: 118 (100)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	NR
Description of Intervention	The intervention group first received guidance from research physical therapists in the home-based exercise programme. Then, the brochures and original DVD showing the exercise programme were distributed to all participants for practice. Participants were instructed to perform the exercise programme at home at least three times/week and to record each session on a calendar. The home-based exercise programme had 12 elements that combined stretching, breathing exercises, balance training, muscle strengthening and dual-task training (i.e., simultaneous processing of cognitive tasks and motor tasks). The time required

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	per session was about five minutes. Horizontal movement (i.e. protraction) of the head was aimed to expand the mesopharynx space (Item number three); strong exhalation and body axis rotation in a single-leg standing position aimed to strengthen the oblique abdominal muscle and peak cough force (Item number seven); and the combination of a forward lunge for lower limb muscle strengthening and the Pushing exercise for improvement of the glottal closure function (Item number eight)—were the distinctive movements in this programme. The intervention duration was six months.
Type of intervention	Physical Intervention Category: Muscle-strengthening Type of Intervention: Resistance/strength training, balance and flexibility, other (stretching, breathing exercises, dual-task training)
Physical Activity Intervention Intensity	Can't tell.
Frequency and Duration of Physical Activity Intervention	3x/week; five-minute session.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Research physical therapists initially provided guidance.
Description of Control	Participants in the control group were advised to maintain or improve their activity in daily life and attend lectures on health.
Length of Follow-Up	Post-intervention (six months).
Adherence to intervention (# or % of sessions attended/completed)	Among the 148 participants in the intervention group, 138 participants (93.2%) completed the programme three times per week (median: three times, interquartile range, 3–3).
Serious adverse events	No adverse events were reported for any participant after the intervention.
Funding Source	NR

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

A Multicomponent Exercise Intervention that Reverses Frailty and Improves Cognition, Emotion, and Social Networking in the Community-Dwelling Frail Elderly: A Randomized Clinical Trial. Tarazona-Santabalbina et al.	
Study (Year Published)	2016
Country	Spain
Objective/purpose	Ascertained if a supervised-facility multicomponent exercise program when performed by frail older persons could reverse frailty and improve functionality; cognitive, emotional, and social networking; as well as biological biomarkers of frailty, when compared with a controlled population that received no training.
Study Design	Randomized clinical trial.
Recruitment setting and/or recruitment methods	Two primary care centers of the same health department in La Ribera (Valencia, Spain) were involved: Carcaixent and Sollana. The number of citizens in each center in 2014 were 20,613 (10.3% of the population ≥ 70 years) and 5041 (11.1% of the population ≥ 70 years), respectively. The listing of individuals was obtained from the Valencian Community health database (Abucasis). Targeted mass mailing was the primary recruitment strategy. All the volunteers received the study information in their health and sociocultural centers. Those interested in the study were contacted by phone and were invited for an interview to provide more details and to check the eligibility criteria. Two sites.
Inclusion Criteria/Exclusion Criteria	Inclusion: men and women aged 70 years or older who were: sedentary (less than three hours of weekly physical activity); frail according to the frailty phenotype; with a gait speed slower than 0.8 m/s; and were community dwellers. Exclusion: life expectancy less than six months by any cause, a value of 7c-7d in the Global Disability Score in cognitive impaired patients (score <24 in the Mini-Mental State Examination [MMSE]); severe disability (score <15 points on the Barthel Scale or an E score or higher in the Katz scale); ejection fraction left ventricle 20% or less; hospital admission in the past three months for any reason, oncologic patient with active treatment with chemotherapy or radiotherapy, major non-ambulatory surgery in the past six months before the beginning of the study; family member centenarian in the previous two generations; patient with a coronary event in the past 12 months; institutionalized patients, or impossibility of going to the primary care center when using their own means of transport.
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype.
Total sample n (number invited)	100
Intervention n (number invited)	51
Control n (number invited)	49
Loss to follow-up: I n (%); C n (%)	I: 11 (22); C: 9 (18)

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

Age	Mean age intervention (SD): 79.7 (3.6) Mean age control (SD): 80.3 (3.7)
Gender: I n (%); C n (%)	Female: I: 29 (56.9); C: 25 (51.0) Male: I: 22 (43.1); C: 24 (49.0)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Condition, n (%) Hypertension: I: 44 (86.3); C: 33 (67.3) Hyperlipidemia: I: 28 (56.9); C: 18 (36.7) Diabetes mellitus: I: 19 (37.3); C: 15 (30.6) Chronic obstructive pulmonary disease: I: 7 (13.7); C: 1 (2) Fall syndrome: I: 8 (15.7); C: 4 (8.2) Hearing impairment: I: 28 (57.1); C: 25 (54.3) Parkinson disease: I: 2 (4.1); C: 2 (4.1) Previous stroke: I: 4 (7.8); C: 4 (8.2) Arthritis: I: 35 (68.6); C: 23 (46.9) Heart failure: I: 12 (23.5); C: 7 (14.3) Ischaemic heart disease: I: 4 (7.8); C: 4 (8.2) Renal failure: I: 7(13.7); C: 2 (4.1) Anxiety depressive disorder: I: 21 (41.2); C: 14 (28.6) Cancer previous: I: 7 (13.7); C: 5 (10.2) Charlson Index: I: 2.4 (2.2); C: 1.9 (1.5)
Smoking Status	No: I: n (%); C: n (%): 39 (76.5); 28 (57.1) Yes: I: n (%); C: n (%): 2 (4.1); 2 (4.1) Ex-smoker: I: n (%); C: n (%): 10 (19.6); 19 (38.8)
BMI	Intervention Mean (SD): 29.9 (5.6) kg/m^2 Control Mean (SD): 30.0 (4.2) kg/m^2
Description of Intervention	This study took place between December 1, 2013, and September 30, 2014. Those in the intervention group performed 65 minutes of daily activities, five days per week for 24 weeks at the "Hogar del Jubilado," Valencia. The sessions were delivered in a group, were supervised, and involved a combination of the following activities: proprioception and balance exercises (10-15 minutes), aerobic training (initially at 40% of maximum heart rate increasing progressively to 65%), strength training (initially at 25% of one repetition maximum to 75%) and stretching. The ratio of trainers to participants was 15. Patient exercise compliance was 47.3% (95% confidence interval: 38.7%-55.7%). Proprioception exercises included postural sway and dynamic balance, coordination, and flexibility of the lumbo-pelvic area. The aerobic training included walking around a circuit and climbing stairs. Strength training was performed with resistance bands and included isometric, concentric, and eccentric exercises with arms, hands, and legs. The stretching exercises included arms, legs, and neck. Duration of intervention was 24 weeks.

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, aerobic activities, balance and flexibility, other (stretching, proprioception (postural sway and dynamic balance, coordination, and flexibility of the lumbo-pelvic area))
Physical Activity Intervention Intensity	Moderate intensity.
Frequency and Duration of Physical Activity Intervention	5x/week; 65-70 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Four physiotherapists and four nurses.
Description of Control	The control group received no training and they attended the regular primary care program established by their center.
Length of Follow-Up	Post-intervention (24 weeks).
Adherence to intervention (# or % of sessions attended/completed)	77.5% of the intervention group performed three to six hours per week of exercise, whereas in the control group, 90% of the individuals performed three hours or less per week of exercise.
Serious adverse events	NR
Funding Source	the Spanish Ministry of Education and Science (MEC) from the “Red Temática de investigación cooperativa en envejecimiento y fragilidad” (RETICEF); from “Conselleria d’Educació, Cultura i Esport de la Generalitat Valenciana”; Intramural Grant from INCLIVA and EU Funded CM1001; Integrated Project of Excellence (ISCIII. FEDER); and FRAILOMICHEALTH.2012.2.1.1-2; and by FEDER funds from the European Union.

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

Nutritional, Physical, Cognitive, and Combination Interventions and Frailty Reversal Among Older Adults: A Randomized Controlled Trial. Ng et al.	
Study (Year Published)	2015
Country	Singapore
Objective/purpose	Compared the effects of six-month-duration interventions with nutritional supplementation, physical training, cognitive training, and combination treatment vs control in reducing frailty among community-dwelling prefrail and frail older persons.
Study Design	Parallel group, randomized controlled trial.
Recruitment setting and/or recruitment methods	Potential participants were identified from among community residents in the southwest region of Singapore through door-to-door open invitation from October 2009 to August 2012.
Inclusion Criteria/Exclusion Criteria	Inclusion: Prefrail or frail older adults aged 65 years and above; able to ambulate without personal assistance; and living at home. Exclusion: significant cognitive impairment (Mini Mental State Examination score 23); major depression; severe audiovisual impairment; any progressive, degenerative neurologic disease; terminal illness with life expectancy <12 months; were participating in other interventional studies; or were unavailable to participate for the full duration of the study.
Frailty index used *Include if modified (y/n) and how*	Cardiovascular health study (Fried's frailty phenotype).
Total sample n (number invited)	246
Intervention n (number invited)	I: Nutritional: n = 49, Cognitive Training: n = 50, Physical Training: n = 48. Combination: n = 49.
Control n (number invited)	C: n = 50
Loss to follow-up: I n (%); C n (%)	I: 4 (8), 5 (10), 2 (4), 3 (6); C: 4 (8)
Age	Mean age overall (SD): 70.0 (4.7) Mean age intervention (SD): I: 69.7 (4.23), 69.7 (4.31), 70.3 (5.25), 70.4 (4.74) Mean age control (SD): 70.1 (5.02)
Gender: I n (%); C n (%)	Female: I: 32 (65.3), 38 (76), 27 (56.2), 26 (53.1); C: 28 (56.0) Male: I: 17 (34.7), 12 (24.0), 21 (43.8), 23 (46.9); C: 22 (44.0)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	Education, n (%) No formal schooling: I: 13 (26.5), 9 (18.0), 13 (27.1), 6 (12.2); C: 10 (20.0) Primary school: I: 20 (40.8), 27 (54.0), 22 (45.8), 22 (44.9); C: 29 (58.0) Secondary of Higher: I: 16 (32.7), 14 (28.0), 13 (27.1), 21 (42.9); C: 11 (22.0)
Co-morbidities/chronic conditions	≥ five medical comorbidities, n (%): I: 0 (0.0), 2 (4.0), 5 (10.4), 3 (6.1); C: 2 (4.0)
Smoking Status	NR

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BMI	Intervention Mean (SD): 24.0 (4.31) kg/m^2, 23.1 (2.70) kg/m^2, 23.5 (3.03) kg/m^2, 24.4 (3.79) kg/m^2 Control Mean (SD): 23.6 (3.35) kg/m^2
Description of Intervention	Physical exercise was of moderate, gradually increasing intensity, tailored to participants' individual abilities, of 90 minutes duration, on two days per week for 12 weeks in classes conducted by a qualified trainer, followed by 12 weeks of home-based exercises. Participants performed the exercises in groups of eight to ten, and were encouraged to continue daily individualized exercise assignments at home. The exercise program was designed to improve strength and balance for older adults, according to American College of Sports Medicine guidelines for older adults, based on a single set of eight to fifteen repetition maximum (RM), or 60% to 80% of 10 RM, starting with <50% one repetition maximum involving eight to ten major muscle groups. They included resistance exercises integrated with functional tasks; and balance training exercises involving functional strength, sensory input, and added attentional demands were carried out at three levels of increasing demand. The intervention duration was 24 weeks.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, Balance and flexibility
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	2x/week; 90 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Qualified trainer.
Description of Control	Participants had access to one standard care from health and aged care services that were normally available to older people, including primary and secondary level care from government or private clinics and hospitals, and community-based social, recreational, and daycare rehabilitation services. They were given an equal volume of artificially sweetened, vanilla-flavored liquid (ingredients: non-dairy creamer, liquid caramel, sugar, and water), two capsules and one tablet (ingredients: cornstarch, lactose, magnesium stearate) that were identical in appearance to the active nutritional supplements, with instructions not to replace their meals with the supplements. Both the active supplement and the control were administered by interventional nurses who had no knowledge of the participant's assignment status.
Length of Follow-Up	12 months.

Adherence to intervention (# or % of sessions attended/completed)	The mean compliance levels were 88% for combination group, 91% for nutrition supplement, 94% for control, 85% for physical training, and 79% for cognitive training. Two hundred twenty-eight participants (93%) completed one-year follow-up assessment.
Serious adverse events	Two subjects who participated in exercise training had joint pain (hip and knee) initially that was relieved after adjusting training regimen. No other adverse events occurred during the study.
Funding Source	National Medical Research Council.

Effects of a combined physical training and nutrition intervention on physical performance and health-related quality of life in prefrail older women living in the community: a randomized controlled trial. Kwon et al.	
Study (Year Published)	2015
Country	Japan
Objective/purpose	Examined the effects of a combined exercise training and nutritional program intervention, compared with exercise training alone and control group (neither exercise nor nutrition program) on physical performance and health-related quality of life in prefrail older women living in the community.
Study Design	Three-arm randomized controlled trial.
Recruitment setting and/or recruitment methods	The participants were recruited from a "mass health checkup" of older residents in Itabashi Ward, Tokyo, Japan. The health checkup was conducted from November 5th to 12th, 2006 by the Tokyo Metropolitan Institute of Gerontology.
Inclusion Criteria/Exclusion Criteria	Inclusion: defined frailty as the lowest 20th percentile on handgrip strength and walking ability among the total participants (n = 666). In particular, prefrail participants were selected using a modification of the criteria for the frailty syndrome proposed by Fried and colleagues. The inclusion criteria were muscle weakness (handgrip strength in the lowest quartile at baseline, 23 kg) and slow gait speed (lowest quartile of timed usual walking speed at baseline, 1.52 m/seconds). Exclusion: Serum albumin ≥4.5 mg/dL, serious musculoskeletal conditions, and taking calcium or vitamin D supplements. A previous study (by the same authors) demonstrated people with high serum albumin to have high physical performance. Because the participants needed to walk or use public transportations to commute from their house to the research center, where the intervention was carried out, those with serious musculoskeletal diseases were excluded. Those who took nutritional supplements containing calcium or vitamin D have been reported to show an increased muscle strength.
Frailty index used *Include if modified (y/n) and how*	Modified Fried's frailty phenotype (Y). Defined frailty as the lowest 20th percentile on handgrip strength and walking ability among the total participants.
Total sample n (number invited)	89
Intervention n (number invited)	28
Control n (number invited)	31
Loss to follow-up: I n (%); C n (%)	I: 3 (10.7); C: 3 (9.7)
Age	Mean age overall (SD): 76.8 Mean age intervention (SD): 77.0 (4.2) Mean age control (SD): 76.9 (3.9)
Gender: I n (%); C n (%)	Female: I: 28 (100); C: 31 (100)

Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Chronic disease condition, (%) Hypertension: I: 44.0; C: 42.9 Stroke: I: 4.0; C: 10.7 Diabetes mellitus: I: 8.0; C: 7.1 Heart disease: I: 16.0; C: 17.9 Hyperlipidemia: I: 52.0; C: 57.1
Smoking Status	NR
BMI	NR
Description of Intervention	Physical training was conducted once a week for a duration of one hour per session. The program consisted of warm-up and stretching exercise (10-15 minutes), special exercise aiming to increase muscle strength and balance capability (20-45 minutes), and cool-down (five to ten minutes), in that order. Four classes were held, with 15 persons in each class. The program was conducted by a certified health fitness trainer, with the participation of one physician and two assistants. In each class, the participants were given diagrams and explanations of the exercise movements so that they would be able to do them at home, and also a checklist to record whether they managed to do the exercises during the week. The program consisted of strength-training bodyweight exercises as well as exercises using Therabands, dumbbells, and balls. Strength-training bodyweight exercise started with one set of five-time repetition of the same motion, progressing to one set of 10-time repetition. The exercises involved holding the edge of a Thera band with open arms standing with feet shoulder-width apart and raising dumbbells above the head, alternating between each hand, standing with feet shoulder-width apart. To enhance enjoyment, participants were engaged in game-like activities using different sized balls. Other activities were also performed, such as walking, kneeling, and chair stands. Each exercise was performed in three or four variations to provide individually tailored, different levels of complexity. The intervention duration was 12 weeks.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, walking/marching, jogging, running, balance and flexibility
Physical Activity Intervention Intensity	Can't tell.
Frequency and Duration of Physical Activity Intervention	1x per week; 60 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor,	Certified health fitness trainer.

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volunteer, researcher, physiotherapist)	
Description of Control	Participants in the control group participated in a general health education session conducted once a month for a total of three sessions during the 12-week intervention period. The project physician, certified health fitness trainer, and dietitian provided the participants with information on physical training for preventing falls and urinary incontinence as well as a dietary guideline for healthy aging. After the trial was completed, this group was offered a 12-week exercise and nutritional program as in the same manner for the exercise training and nutrition (EN) and exercise training (E groups).
Length of Follow-Up	Nine months.
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	Grant in Aid for Scientific Research from the Ministry of Education, Science and Culture of Japan, the Basic Science Research Program through the National Research Foundation of Korea (NRF), and by the Ministry of Education, Science and Technology.

Handgrip strength does not represent an appropriate measure to evaluate changes in muscle strength during an exercise intervention program in frail older people. Tieland et al.	
Study (Year Published)	2015
Country	Netherlands
Objective/purpose	Assessed whether measuring handgrip strength provided proper insight in the efficacy of resistance-type exercise training to increase muscle mass, strength, and physical performance in frail older people.
Study Design	Quasi-experimental.
Recruitment setting and/or recruitment methods	Between December 2009 and October 2010, 1420 older people were approached, 398 were screened, and 127 participants were included into the studies. A total of 127 prefrail and frail older subjects (≥65 years) were included in the current study. Number of sites was unknown.
Inclusion Criteria/Exclusion Criteria	Inclusion: none of the subjects had participated in a resistance-type exercise-training program over the past two years. The inclusion of the older people and the design of the original studies are described in detail elsewhere as the current study is part of a larger project. Exclusion: Diagnosed with any form of cancer, chronic obstructive pulmonary disease (COPD), diabetes (basal plasma glucose ≥ 7 mmol/L), renal insufficiency (eGFR <60 ml/min/1.73 m2).
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype.
Total sample n (number invited)	127
Intervention n (number invited)	62
Control n (number invited)	65
Loss to follow-up: I n (%); C n (%)	I: 11 (18); C: 8(12)
Age	Mean age overall (SD): 79.0 (0.7) Mean age intervention (SD): 78.4 (1.0) Mean age control (SD): 79.5 (1.0)
Gender: I n (%); C n (%)	Female: I: (66%); C: (55%) Male: I: (34%); C: (45%)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	NR
Description of Intervention	Whole body resistance-type exercise training was performed two times per week under personal supervision for 24 weeks. The sessions were performed in the morning and afternoon with at least 72 hours between sessions.

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	The training consisted of a five-minute warm-up on a cycle ergometer, followed by four sets on the leg press and leg extension machines and three sets on chest press, lat pulldown, pec-dec, and vertical row machines (Technogym, Rotterdam, Netherlands). The workload started at 50% of one repetition maximum (10–15 repetitions per set) and increased to 75% of one repetition maximum (eight to ten repetitions per set) to stimulate muscle hypertrophy. Resting periods of one minute were allowed between sets and two minutes between exercises. To evaluate changes in muscle strength, one repetition maximum was repeated after 4, 8, 12, 16, and 20 weeks of training. Workload intensity was adjusted based on the one repetition maximum outcomes.
Type of intervention	Physical Intervention Category: Muscle-Strengthening Type of Intervention: Resistance/strength training
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	2x per week; NR.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Under personal supervision.
Description of Control	65 subjects did not receive any exercise training.
Length of Follow-Up	Post-intervention (24 weeks).
Adherence to intervention (# or % of sessions attended/completed)	The average adherence to the exercise protocol was 83 ± 2%.
Serious adverse events	NR
Funding Source	This study did not receive funding.

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The effect of functional circuit training on self-reported fear of falling and health status in a group of physically frail older individuals: a randomized controlled trial. Gine-Garriga et al.	
Study (Year Published)	2013
Country	Spain
Objective/purpose	Evaluated whether a 12-week functional circuit training program could reduce self-reported fear of falling and improve health status in a group of physically frail community-dwelling older individuals.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Participants were recruited from one randomly selected primary health care center in the Barcelona area. The recruitment process was presented elsewhere. One site.
Inclusion Criteria/Exclusion Criteria	Inclusion: Individuals who were 80 to 90 years of age. Physical frailty was defined according to the results of two tests of physical abilities, and according to two questions from the center for epidemiological studies depression scale. Individuals, who were identified as being physically frail based on the following criteria, were invited to participate in the study: if they either required more than 10 s to perform a rapid-gait test (i.e., to walk along a three metre course and back at a quick comfortable pace); if they could not stand up five times from a seated position in a hardback chair with their arms folded, or if they were categorized as frail by the exhaustion criterion.
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype.
Total sample n (number invited)	51
Intervention n (number invited)	26
Control n (number invited)	25
Loss to follow-up: I n (%); C n (%)	I: 4 (26); C: 6 (24)
Age	Mean age intervention (SD): 83.9 (2.8) Mean age control (SD): 84.1 (3)
Gender: I n (%); C n (%)	Female: I: 13 (59.1); C: 12 (63.2) Male: I: 9 (40.9); C: 7 (36.8)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Medical conditions, n (%) Stroke: I: 6 (27.3); C: 5 (26.3) High blood pressure: I: 13 (59.1); C: 14 (73.7) Arthritis: I: 4 (18.2); C: 5 (26.3) Diabetes mellitus: I: 7 (31.8); C: 6 (31.6) Use of walking aid: I: 6 (27.3); C: 5 (26.3) Number of falls previous 12 months, median (IR): I: 1 (5); C: 2 (4)

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

	Falls that required medical care, median (IR): I: 1 (5); C: 1 (3) Falls that required hospitalization, median (IR): I: 0 (1); C: 0 (2)
Smoking Status	NR
BMI	Intervention Mean (SD): 27.9 (3.6) kg/m^2 Control Mean (SD): 28.6 (5.3) kg/m^2
Description of Intervention	The intervention group underwent a functional circuit training program that focused on functional balance and lower-body strength-based exercises in an indoor primary care facility. Functional circuit training participants reported to the training facility twice a week for 12 weeks. All training sessions began with a warm-up, walking at their usual pace for 10 minutes, and ended with cool-down, stretching for five minutes. During the functional circuit training, participants performed one day of balance-based activities and one day of lower-body strength-based exercises, both were combined with function-focused activities. Balance activities were designed to challenge the visual (e.g., eyes open/closed), vestibular (e.g., move head), and somatosensory (e.g., stand on foam) systems. Static balance consisted of two-leg and one-leg balance with toes or heels raised, and tandem standing with eyes open/closed using different surfaces. When training dynamic balance, activities such as walking on different surfaces, with varied elevations, and performing a dual task (cognitive and functional task such as catching, throwing, and reaching); incorporating different gait patterns (e.g., narrow walking, longer strides, zig-zag walking); and with variations in gait speed were performed. Four sets of exercises of increasing complexity were designed, when the easiest step was achieved; without help, the individual could perform the more complex set of exercises. Lower-body exercises included functional tasks such as rising from a chair, stair climbing, knee bends, floor transfer, lunges, leg squat, leg extension, leg flexion, calf raise, and abdominal curl using ankle weights. An eight-repetition maximum without weight was established at the first training session and repeated at the second training session. Participants were instructed to perform strength training at a perceived exertion intensity of 12–14 (somewhat hard), without holding their breath during exercises to minimize exercise-induced blood pressure elevations. Initially, the participants performed one to two sets of six to eight repetitions of each exercise; the number of repetitions was increased when a participant was able to complete eight repetitions at a lower perceived exertion intensity; the maximum number of repetitions was 15. The load was increased 0.5 kg when a subject could perform 15 repetitions at a lower perceived exertion intensity up to a maximum of two kg.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, balance and flexibility

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	2x per week; NR.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	NR
Description of Control	Participants in the control group were asked to continue their routine daily activities and received their usual care from their primary care practice whenever it was needed. The control subjects met once a week in the training facility (12 times) for social meetings with the researchers.
Length of Follow-Up	Post-intervention was 12 weeks. Follow-up was 36 weeks.
Adherence to intervention (# or % of sessions attended/completed)	Moreover, all participants in the functional circuit training program were highly compliant with the exercise prescription except for one woman who required rest (sitting on a chair) after each exercise during the first three weeks. Participants in the control group were required to complete 12 sessions, and their compliance was 76%.
Serious adverse events	There were no adverse events during the study period.
Funding Source	IDIAP Jordi Gol, Primary Healthcare Research Institution, Barcelona, Spain.

Wii-hab for pre-frail older adults. Daniel.	
Study (Year Published)	2012
Country	USA
Objective/purpose	Compared the effectiveness of a novel rehabilitation program using a popular exercise gaming system with added weight vest as an intervention aimed at decreasing frailty-related outcomes when compared with community-based seated group exercise classes for senior adults.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Recruited from local senior centers and residential living centers through flyers and announcements that adverted the opportunity to participate in a study.
Inclusion Criteria/Exclusion Criteria	Inclusion: Age ≥65 years were given an appointment for screening. One or two of the characteristics of frailty as defined by Fried and colleagues were invited to participate. These characteristics of frailty were unintentional weight loss, slow gait speed, weakness, exhaustion, and low energy expenditure.
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype.
Total sample n (number invited)	23
Intervention n (number invited)	8, 8
Control n (number invited)	7
Loss to follow-up: I n (%); C n (%)	I: 0 (0), 0 (0); C: 2 (28.6)
Age	Mean age overall (SD): 77 (5.3) Mean age intervention (SD): 78.13 (5.5); 80 (3.37) Mean age control (SD): 72.6 (4.6)
Gender: I n (%); C n (%)	Female: I: 5 (62.5), 5 (62.5); C: 4 (57.1) Male: I: 3 (37.5), 3 (37.5); C: 3 (42.9)
Race/Ethnicity	Seated exercise: 100% white Wii-fit: 6 white, 1 latino Control: 3 white, 2 latino
SES status *(reported by income or education level ONLY)*	Seated exercise: 1 some high school, 2 some college, 5 college degrees Wii-fit: 2 high school diplomas, 2 some college, 3 college degrees Control: 1 some college, 2 graduate degrees
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	Intervention Mean (SD): 24.9 (3.7) kg/m^2; 26.9 (4.0) kg/m^2 Control Mean (SD): 29.4 (1.4) kg/m^2
Description of Intervention	The seated exercise group participated in study staff-directed group exercise sessions for 45 minutes per day three times per week for 15

	weeks. The exercises were based on a traditional senior fitness program, and a rigorous seated aerobics program. All exercises were led by a certified fitness professional, with participants either seated or utilizing chairs for support. The seated group exercise program was a progressively increasing intensity routine, with exercises aimed at increasing lower leg strength, upper body strength, and flexibility. Some lower leg strengthening exercises included chair stands and chair lunges, while some upper body exercises included triceps extensions and shoulder presses using a medium strength Theraband. Each session included three bouts of walking for five to ten minutes at a time and ended with 10–15 minutes of stretching. The Wii-fit group also participated in study staff-directed small group exercise sessions for 45 minutes three times per week for 15 weeks. This group used a Nintendo Wii, utilizing basic games such as bowling, tennis, and boxing. Wii-fit participants also wore a weight vest with 2% of their body weight added to the weight vest every two weeks, so that their core and quadriceps muscle groups were progressively overloaded throughout the 15-week study period.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, aerobic activities
Physical Activity Intervention Intensity	Can't tell
Frequency and Duration of Physical Activity Intervention	3x/week; 45 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Certified fitness professional.
Description of Control	The control group was instructed to continue whatever physical activity they participated in before becoming a participant in the study during the study period.
Length of Follow-Up	Post intervention (15 weeks).
Adherence to intervention (# or % of sessions attended/completed)	86% (both interventions).
Serious adverse events	NR
Funding Source	NR

Community-based exercise program is cost-effective by preventing care and disability in Japanese frail older adults. Yamada et al.	
Study (Year Published)	2012
Country	Japan
Objective/purpose	Evaluated the effect of an exercise intervention on care and disability classified by long term care insurance service requirement certification and health care cost in community-dwelling older adults.
Study Design	Prospective cohort study.
Recruitment setting and/or recruitment methods	The Japan Multi-center Aging Cohort for Care prevention. In this study, in 2009, community-dwelling older adults who were independent in activities of daily living in two cities were recruited (Maibara City in Shiga Prefecture and Maizuru City in Kyoto Prefecture). Subjects were screened in an initial interview and recruited frail older adults ≥65 years or older.
Inclusion Criteria/Exclusion Criteria	Inclusion: Independent in activities of daily living in two cities (Maibara City in Shiga Prefecture and Maizuru City in Kyoto Prefecture). Exclusion: Older adults who were already activities of daily living-dependent and were eligible to receive benefits from long term care insurance services.
Frailty index used *Include if modified (y/n) and how*	Frailty Checklist of Japan (25 questions: lifestyle (questions one to five), motor abilities (questions six to ten), nutrition (questions 11 to 12), oral functions (questions 13 to 15), seclusion (questions 16 to 17), forgetfulness (questions 18 to 20), and emotions (questions 21 to 25). Frailty was defined by scores of ten or more points on questions one to twenty).
Total sample n (number invited)	610
Intervention n (number invited)	305
Control n (number invited)	305
Loss to follow-up: I n (%); C n (%)	I: 0 (0); C: 0 (0)
Age	Mean age intervention (SD): 79.7 (6.3) Mean age control (SD): 80.3 (6.6)
Gender: I n (%); C n (%)	Female: 231 (75.7); 238 (78.0) Male: 74 (24.3); 67 (22.0)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	Intervention Mean (SD): 23.0 (3.4) kg/m^2 Control Mean (SD): 22.6 (3.5) kg/m^2

Description of Intervention	Twenty minutes of moderate intensity aerobic exercise, 30 minutes of progressive strength training, 20 minutes of flexibility and balance exercises, and 20 minutes of cool-down activities. The aerobic exercise was composed of global movement of the legs, trunk, and arms involving all joints and major muscle groups in activities such as dance. Strength training consisted of progressive resistive exercises using an elastic band. A sequence of progressively difficult exercises was also performed to improve static and dynamic balance. The control group received screening evaluation only. The intervention duration was 16 weeks.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, aerobic activities, balance and flexibility
Physical Activity Intervention Intensity	Moderate intensity.
Frequency and Duration of Physical Activity Intervention	1x/week; 90 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Physiotherapist
Description of Control	The control group only received screening evaluation.
Length of Follow-Up	Post-intervention (one year).
Adherence to intervention (# or % of sessions attended/completed)	100%
Serious adverse events	No fall incidents or health problems, such as cardiovascular or musculoskeletal complications, occurred during training sessions or testing. Minor problems were muscle ache and fatigue.
Funding Source	NR

The effect of functional circuit training on physical frailty in frail older adults: a randomized controlled trial. Gine-Garriga et al.	
Study (Year Published)	2010
Country	Spain
Objective/purpose	Determined the effect of a 12-week structured intervention program on reducing physical-frailty measures in a group of community-dwelling physically frail elderly individuals. The secondary aim of the study was to evaluate whether these improvements were sustained six months after the end of the training program.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Participants were recruited from one randomly selected primary health care center in the Barcelona area.
Inclusion Criteria/Exclusion Criteria	Inclusion: Age 80–90 years The total number of 80- to 90-year-old individuals registered in the primary health care center was ~3,547, and during January to March 2009 (recruitment period), ~2,029 eighty- to ninety-year-old individuals attended the center. Exclusion: unable to walk, were undergoing an exercise program, had a diagnosis of severe dementia (not able to understand or follow verbal commands), or had had a stroke, hip fracture, myocardial infarction or hip- or knee- replacement surgery within the previous six months.
Frailty index used *Include if modified (y/n) and how*	Two tests of physical abilities (Gill and colleagues; Tinetti and colleagues) and according to two questions on the Center for Epidemiological Studies Depression Scale (Fried and colleagues). Participants were considered frail if they required more than 10 seconds to perform a rapid-gait test (i.e., to walk along a three-metre course and back at a quick comfortable pace), if they could not stand up five times from a seated position in a hardback chair with their arms folded or if they were categorized as frail by the exhaustion criterion. Participants were asked to self-report their exhaustion using the following two statements from the depression scale: “I felt that everything I did was an effort” and “I could not get going.” The question was asked as “How often in the last week did you feel this way?” and their answers graded as zero (<1/day), one (one-two days), two (three-four days), three (most of the time). Participants graded two or three were categorized as frail by the exhaustion criterion.
Total sample n (number invited)	51
Intervention n (number invited)	26
Control n (number invited)	25
Loss to follow-up: I n (%); C n (%)	I: 4 (15.4); C: 6 (24.0)
Age	Mean age intervention (SD): 83.9 (2.8) Mean age control (SD): 84.1 (3.0)
Gender: I n (%); C n (%)	Female: I: 13 (59.1); C: 12 (63.2)

	Male: I: 9 (40.9); C: 7 (36.8)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Medical conditions, n (%) Stroke: I: 6 (27.3); C: 5 (26.3) High blood pressure: I: 13 (59.1) C: 14 (73.7) Arthritis: I: 4 (18.2); C: 5 (26.3) Diabetes mellitus: I: 7 (31.8); C: 6 (31.6)
Smoking Status	NR
BMI	Intervention Mean (SD): 27.9 (3.6) kg/m^2 Control Mean (SD): 28.6 (5.3) kg/m^2
Description of Intervention	The intervention group underwent a functional circuit training program that focused on functional balance and lower body strength-based exercises for 12 weeks. All training sessions began with a warm-up, walking at usual pace for 10 minutes, and ended with cool-down, stretching for five minutes. During the functional circuit-training program, participants performed one day of balance-based activities and one day of lower body strength-based exercises; both were combined with function-focused activities. Balance activities were designed to challenge the visual (e.g., eyes open/closed), vestibular (e.g., move head), and somatosensory (e.g., stand on foam) systems. Static balance consisted of two-leg and one-leg balance with toes or heels raised and tandem standing with eyes open or closed on different surfaces. When training dynamic balance, activities such as walking on different surfaces, with varied elevations, and performing a dual task (cognitive and functional task such as catching, throwing, and reaching), incorporating different gait patterns (e.g., narrow walking, longer strides, zigzag walking) and variations in gait speed, were performed. Balance exercises included function-focused activities such as walking with obstacles, while wearing standard sunglasses (worn over corrective lenses as needed) to mimic a semi-dark environment, walking while carrying a package that obstructed the view of the feet, and walking while picking up objects from the floor. Four sets of exercises of increasing complexity were designed; when an easier step was achieved without assistance, the individual went on to perform the next more complex set of exercises. Lower body exercises included functional tasks such as rising from a chair, stair climbing, knee bends, floor transfer, lunges, leg squat, leg extension, leg flexion, calf raise, and abdominal curl using ankle weights. An eight-repetition maximum without weight was established at the first training session and repeated at the second training session. Participants were instructed to perform strength training at a perceived exertion intensity of 12–14 (somewhat hard), without holding their breath during exercises to minimize exercise-

	induced blood-pressure elevations. Initially, the participants performed one or two sets of six to eight repetitions of each exercise; the number of repetitions was increased when a participant was able to complete eight repetitions at a lower perceived exertion intensity; the maximum number of repetitions was 15. The load was increased 0.5 kg when a participant could perform 15 repetitions at a lower perceived exertion intensity, up to a maximum of two kg.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, balance and flexibility
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	2x/week; 45 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Researcher
Description of Control	Participants randomly assigned to the control group were asked to continue their routine daily activities and received their usual care from their primary-care practice whenever it was needed. To control for the fact that the intervention group may have improved their performance simply because of exposure to the researchers and the socialization effect of working in a group, the control participants met once a week in the training facility (12 times) for social meetings with the researchers. Four health education sessions of 60 minutes were conducted as part of the 12 visits. The classes included health topics that were relevant to older adults, such as nutrition, medication use, foot care, sleep hygiene, and other health-related areas.
Length of Follow-Up	Post-intervention was 12 weeks. Follow-up was 36 weeks.
Adherence to intervention (# or % of sessions attended/completed)	Compliance: I: 100%; C: 76%
Serious adverse events	There were no adverse events during the study period.
Funding Source	IDIAP Jordi Gol Primary Health Care Research Institution, Barcelona, Spain.

Effects of exercise programs on falls and mobility in frail and pre-frail older adults: A multicenter randomized controlled trial. Faber et al.	
Study (Year Published)	2006
Country	Netherlands
Objective/purpose	Investigated the effects of two exercise-based fall-preventive intervention programs on falls, physical function and disability in an elderly population.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Recruitment was performed at long-term care centers between March and July 2002. Three additional centers were included in August and September 2003 to increase the sample size. Residents were invited to a meeting where details about the project were given. 15 centres.
Inclusion Criteria/Exclusion Criteria	Exclusion: unable to walk six metres independently (the use of a walking aid was allowed), as this prevented participation in the exercise programs, or if their cognition, as judged by the nursing staff, was so impaired that the participants would not be able to process the information provided during the testing and exercising. In addition, the general practitioner of each participant judged whether there was a medical contraindication for participation. This recruitment strategy provided a group of participants with varying degrees of frailty. No stringent exclusion criteria were used to enable generalizability of the results.
Frailty index used *Include if modified (y/n) and how*	Fried's frailty phenotype (Y). Unintentional weight loss could not be calculated as body weight was only assessed at baseline. As an alternative, BMI of less than 18.5kg/m^2 was used as the criterion for this indicator. Weakness was determined with the 36-Item Short-Form Health Survey physical functioning score with a cut-off score of 75 points was used instead of operationalizing weakness by means of grip strength. Exhaustion was deemed present when the 36-Item Short-Form Health Survey vitality scale score was less than 55 points. Slowness was assessed by means of walking speed using sex- and height-corrected cut-off scores. Low physical activity was assessed with the Longitudinal Aging Study Amsterdam Physical Activity Questionnaire.
Total sample n (number invited)	278
Intervention n (number invited)	80, 94
Control n (number invited)	50, 54
Loss to follow-up: I n (%); C n (%)	I: 28 (35.0), 26 (27.7); C: 10 (20.0), 12 (22.2)
Age	Mean age intervention (SD): 85.4 (5.9), 84.4 (6.4) Mean age control (SD): 84.9 (5.9)
Gender: I n (%); C n (%)	Female: I: 53 (80.3), 61 (76.3); C: 74 (80.4) Male: 13 (19.7), 19 (24.8); C: 18 (19.6)
Race/Ethnicity	NR

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SES status *(reported by income or education level ONLY)*	Only primary school, n (%): I: 27 (40.9), 31 (38.8); C: 41 (45.1)
Co-morbidities/chronic conditions	History of stroke, n (%): I: 15 (27.3), 18 (24.7); C: 17 (19.3)
Smoking Status	NR
BMI	Intervention Mean (SD): 27.4 (5.1) kg/m^2, 29.0 (5.4) kg/m^2 Control Mean (SD): 27.4 (4.9) kg/m^2
Description of Intervention	Key components in both programs were balance and functional strength, because these are the most prominent domains that should be addressed in elderly facing functional limitations. Furthermore, it was taken into consideration that group-based training is recommended for elderly persons to increase motivation for participation. The exercises were tailored to the functional needs of the participants, maintaining a moderate intensity that focuses on long-term sustainability and enjoyment. The first program, referred to as functional walking, was derived from the tailored exercise program developed by Robertson and colleagues. The functional walking program consisted of 10 exercises forming the core program, which focus on balance, mobility, and transfer training. Each exercise was described in three or four variations to provide various levels of complexity, thus creating the possibility for individual tailoring. The exercises consisted of standing up from a chair, reaching and stepping forward and sideward, heel and toe stands, walking and turning, stepping on and over an obstacle, staircase walking, tandem foot standing, and single-limb standing. The second program, referred to as in balance, was derived from principles of Tai Chi. The in balance program included the seven therapeutic elements of Tai Chi that have been identified as most beneficial for elderly persons. In the beginning of the program, attention was paid to somatosensory feedback signals coming from ankle and hip motions that can be used as input for balance control. Combined with exercises increasing ankle range of motion, proprioception and sensation can be improved, and co-contractions that are often present to compensate for diminished sensory input may be removed. Later in the program, Tai Chi forms were introduced with the emphasis on slow and continuous motions, trunk rotation, and weight shifting. The frequency and duration of the sessions were the same for both programs. Each program started with one session per week for four weeks, followed by twice-weekly sessions for 16 weeks.
Type of intervention	Physical Intervention Category: Muscle-strengthening Type of Intervention: Resistance/strength training, walking/marching, jogging, running, balance and flexibility, standing
Physical Activity Intervention Intensity	Moderate intensity.

Frequency and Duration of Physical Activity Intervention	1x/week for four weeks then 2x per week for 16 weeks; 90 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Instructor led group sessions.
Description of Control	Participants in the control groups were asked not to change their usual pattern of activities. To check if the control group had not increased its physical activity level as a result of "contamination" by the experimental groups, all participants were required to report their amount of physical activity at the postintervention assessment in the same way as at the preintervention assessment. In all groups there appeared to be a reduction of about five minutes a day, and no significant differences between the groups were observed in this regard.
Length of Follow-Up	Post-intervention was 20 weeks. Follow-up was one year.
Adherence to intervention (# or % of sessions attended/completed)	On average, 32 (range, 25–36) intervention sessions were completed, of the 36 initially scheduled. The actual number of sessions varied between the homes due to organizational reasons. The median relative compliance was 88% (25th–75th percentile, 74%–94%) for functional walking and 84% (65%–92%) for in balance.
Serious adverse events	NR
Funding Source	NR

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Effects of exercise training on frailty in community-dwelling older adults: results of a randomized, controlled trial. Binder et al.	
Study (Year Published)	2002
Country	USA
Objective/purpose	Evaluated whether a multidimensional exercise-training program could significantly reduce frailty in community-dwelling older men and women.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Men and women aged 78 years and older were recruited from the community using mass media, direct mailings, and community efforts to participate in studies of exercise.
Inclusion Criteria/Exclusion Criteria	Inclusion: individuals had to meet at least two of the following three criteria: score between 18 and 32 on the modified physical performance test; report of difficulty or need for assistance with up to two instrumental activities of daily living or one activity of daily living; achievement of a peak oxygen uptake (VO_2 peak) between 10 and 18 mL/kg/min (range of age-predicted VO_2 peak for healthy sedentary adults aged 75–80 is 18–30 mL/kg/min). Exclusion: did not meet two of the three frailty criteria; medical conditions contraindicated vigorous exercise; neuromuscular disorders unlikely to improve with exercise; chronic use of corticosteroids, immunosuppressive drugs, or androgen-, estrogen-, or progestin-containing compounds; cigarette use within the previous year; diagnosis of cancer within the previous five years; sensory impairments that interfered with following instructions for testing or exercise training; or significant cognitive impairment.
Frailty index used *Include if modified (y/n) and how*	Modified Physical Performance Test (Y) and VO_2 peak. Substituted a chair-rise task and a balance task for the writing and eating tasks in the original physical performance test. This modified physical performance test includes seven standardized tasks that are timed (50-foot floor walk, putting on and removing a laboratory coat, picking up a penny from the floor, standing up five times from a 16-inch chair, lifting a seven-pound book to a shelf, climbing one flight of stairs, and standing with feet in side-by-side, semi tandem and full-tandem positions) and two additional tasks (climbing up and down four flights of stairs and performing a 360° turn). The score for each item ranges between zero and four, with 36 representing a perfect total score for the test. Participants were considered frail if they met two out of the following three criteria: A score of 18-32 on the modified physical performance test, peak oxygen consumption between 10-18 mL/kg/min or reported difficulty or need for assistance with up to two independent activities of daily living or one activity of daily living. Test-retest reliability for the total modified physical performance test score for this population was 0.96.
Total sample n (number invited)	119

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Intervention n (number invited)	69
Control n (number invited)	50
Loss to follow-up: I n (%); C n (%)	I: 23 (33); C: 9 (18)
Age	Mean age overall (SD): 83 (4) Mean age intervention (SD): 83 (4) Mean age control (SD): 83 (4)
Gender: I n (%); C n (%)	Female: I: 34 (52); C: 26 (53) Male: I: 32 (48); C: 23 (47)
Race/Ethnicity	Ethnic origin, % Caucasian: I: 77, C: 88
SES status *(reported by income or education level ONLY)*	Education, % Not high school graduate: I: 16; C: 20 High school graduate: I: 15; C: 16 Some college: I: 25; C: 27 College graduate: I: 77; C: 88
Co-morbidities/chronic conditions	History of, % Hypertension: I: 55; C: 49 Diabetes mellitus: I: 9; C: 12 Coronary artery disease: I: 23; C: 25 Heart failure: I: 2; C: 8 Arthritis: I: 74; C: 78 Atrial fibrillation: I: 12; C: 13 Joint replacement: I: 12; C: 23 Geriatric Depression Score, mean (SD): I: 2.4 (2.4); C: 2.0 (2.0)
Smoking Status	Cigarette smoking, %: I: 42; C: 53
BMI	Intervention Mean (SD): 26.9 (4.5) Control Mean (SD): 26.5 (3.8)
Description of Intervention	The exercise training program was conducted in an indoor exercise facility and supervised by exercise physiology technicians. It consisted of three approximately three-month-long phases of exercise training. Participants were required to attend exercise sessions three times per week and complete 36 sessions of each exercise phase before follow-up assessments and progression to the next phase of exercise training. The first exercise phase used a group format and included 22 exercises that focused on flexibility, balance, coordination, speed of reaction, and, to a modest extent, strength. The exercises were made progressively more difficult over time by increasing the number of repetitions and by performing them in more challenging ways. During the second phase, progressive resistance training was added. One repetition maximum voluntary strength measurements were performed at baseline for each of six different exercises (knee

	extension, knee flexion, seated bench press, seated row, leg press, and biceps curl), which were performed on a Hoist weightlifting machine. Initially, the participants performed one to two sets of six to eight repetitions of each exercise at 65% of the one repetition maximum. By the end of the first month of weight training, they progressed to three sets of eight to twelve repetitions performed at 85% to 100% of the initial one repetition maximum. The one repetition maximum measurements were repeated at monthly intervals to provide information for adjusting each individual's exercise prescription. Abdominal muscle exercises and some free-weight exercises were added after the first month. The participants also continued to perform a shortened version of the phase one exercises. In the third phase, endurance training was performed using treadmills, stationary bicycles, Aerodyne bicycles, or rowing machines. Initially, the intensity of the exercise was set at a level that elicited approximately 65% to 70% of VO_2 peak, and the participants exercised at this intensity for 15 minutes. The duration of exercise was increased progressively to 20 minutes. The training regimen was then supplemented with interval training, consisting of several three- to five-minute exercise bouts requiring 85% to 90% of the subject's VO_2 peak, interspersed with two to three minutes of rest. The exercise intensity was adjusted to the prescribed level using heart rate, measured with radiotelemetry, relative to the subjects' heart rate measured during VO_2 peak testing. The duration of endurance training was increased to a maximum of 30 minutes. Shortened programs of phase one and phase two exercises were continued during phase three. Study duration was approximately nine months long.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, aerobic activities, balance and flexibility, other (coordination and speed of reaction)
Physical Activity Intervention Intensity	Moderate intensity.
Frequency and Duration of Physical Activity Intervention	3x/week; 30 minutes (endurance training).
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Exercise physiology technicians.
Description of Control	The home exercise program included nine of the 22 core exercises included in phase one of the supervised exercise program and focused primarily on flexibility. Participants in the control group attended a one-hour training session in an exercise facility. They were asked to perform the exercises at home two to three times per week. To enhance adherence, control participants attended a

	monthly exercise class at our exercise facility. Participants in the control group performed the exercises for three consecutive three-month intervals. Follow-up testing was performed at the end of each three-month interval.
Length of Follow-Up	Post-intervention (nine months).
Adherence to intervention (# or % of sessions attended/completed)	Because participants in the exercise training group were required to complete 36 sessions of each exercise phase, their compliance was 100%. Control participants were instructed to record exercise sessions on a calendar, but their compliance was not monitored rigorously.
Serious adverse events	One individual in the exercise training group sustained a rotator cuff injury during resistance training, and a second individual experienced worsening of an existing shoulder problem during resistance training; both dropped out of the study. There were no other adverse events.
Funding Source	NIH Claude Pepper Older Americans Independence Center Award Grant and NIH General Clinical Research Center Grant.

A program to prevent functional decline in physically frail, elderly persons who live at home. Gill et al.	
Study (Year Published)	2002
Country	USA
Objective/purpose	Determined whether the intervention improved the ability of elderly persons, relative to those in a control group, to perform essential activities of daily living. The secondary aim was to identify the subgroups of this elderly population that benefited most from the intervention.
Study Design	Randomized clinical trial.
Recruitment setting and/or recruitment methods	Two strategies to were used to identify physically frail, elderly persons age ≥75 years from busy primary care practices in southern Connecticut. In the first, potential participants were screened for physical frailty during routine office visits; in the second, potential participants were identified from a roster of patients and were screened for physical frailty in their homes.
Inclusion Criteria/Exclusion Criteria	Exclusion: unable to walk, were undergoing physical therapy or participating in an exercise program, did not speak English, had a diagnosis of dementia or scored less than 20 on the Mini–Mental State Examination (on which possible scores range from zero to 30, with lower scores indicating worse cognitive status), had a life expectancy of less than 12 months, or had had a stroke, hip fracture, or myocardial infarction or had undergone hip- or knee-replacement surgery within the previous six months.
Frailty index used *Include if modified (y/n) and how*	Physical frailty was defined according to the results of two tests of physical abilities that are strongly associated with the development and progression of disability. Persons were considered physically frail if they required more than 10 seconds to perform a rapid-gait test (i.e., to walk along a 10-foot course and back as quickly as possible) or if they could not stand up from a seated position in a hardback chair with their arms folded. Persons meeting one of these criteria were considered moderately frail, and those meeting both criteria were considered severely frail.
Total sample n (number invited)	188
Intervention n (number invited)	94
Control n (number invited)	94
Loss to follow-up: I n (%); C n (%)	I: 33 (35); C: 16 (17)
Age	Mean age overall (SD): 83 Mean age intervention (SD): 82.8 (5.0) Mean age control (SD): 83.5 (5.2)
Gender: I n (%); C n (%)	Female: I: 80 (85); C: 70 (74) Male: I: 14 (15); C: 24 (26)
Race/Ethnicity	White, n (%): I: 85 (90); C: 86 (91)

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

SES status *(reported by income or education level ONLY)*	Years of Education, mean (SD): I: 11.3 (3.1); C: 11.3 (2.3)
Co-morbidities/chronic conditions	Number of Chronic Conditions, mean (SD): I: 2.1 (1.1); C: 2.0 (1.3) Chronic conditions included congestive heart failure, diabetes, and arthritis.
Smoking Status	NR
BMI	NR
Description of Intervention	A physical therapist assessed each participant for potential impairments in physical abilities and assessed the participant's home environment. Detailed algorithms and decision rules were developed to link the results of the assessment with the recommended interventions. The program was designed to include an average of 16 visits over a six-month period, although the actual number of visits was determined by the number and severity of the underlying impairments and by the participant's progress. To monitor adherence to the program, participants were asked to complete a daily exercise calendar, which was reviewed by the physical therapist during each visit. On completion of the visits, the physical therapist called the participants monthly for six additional months to answer questions and to provide encouragement. There were three assessments and each one had a subsequent recommended intervention: Impaired ability to move in bed or outdoors; impaired ability to transfer from one position to another; or impairment in indoor gait: instruction in safe, effective techniques to facilitate activity; training in proper use of assistive devices; removal of environmental hazards. Impairment in balance or range of motion: progressive, competency-based exercises. Presence of environmental hazards: removal of loose rugs, cords, and clutter in walking paths; placement of nonskid mats in bathroom and at kitchen sink; improvement in lighting; repair of walking surfaces, stairways, and railings; installation of adaptive equipment in bathroom. Unless such activity was medically contraindicated, all participants performed progressive, compentency-based conditioning exercises of the arms and legs with resistant elastic bands. The exercises were performed only under supervision until a physical therapist determined that the participant was able to perform them safely and effectively without supervision. Subsequently, the participant was instructed to perform the conditioning exercises three days per week. These exercises were performed once per day without supervision after the physical therapist determined that the participant was able to perform them safely and effectively without supervision. The intervention duration was six months.
Type of intervention	Physical Intervention Category: Mobility/rehab

	Type of Intervention: (Physical activity (not specified), other (instruction in safe, effective techniques to facilitate activity; training in proper use of assistive devices; removal of environmental hazards; removal of loose rugs, cords, and clutter in walking paths; placement of nonskid mats in bathroom and at kitchen sink; improvement in lighting; repair of walking surfaces, stairways, and railings installation of adaptive equipment in bathroom))
Physical Activity Intervention Intensity	Can't Tell
Frequency and Duration of Physical Activity Intervention	3x/week; duration NR.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Physical therapist.
Description of Control	An educational program designed to provide attention and health education was used in the control group. During six monthly home visits, a health educator and the participant reviewed general practices promoting good health, such as proper nutrition, management of medications, physical activity, sleep hygiene, and other health-related areas. Sessions were tailored to the participant's specific needs according to his or her responses on a brief health-related questionnaire. On completion of the visits, the health educator called the participants monthly for six additional months to answer questions and to provide encouragement.
Length of Follow-Up	Post-intervention (seven months) with 12-month follow-up.
Adherence to intervention (# or % of sessions attended/completed)	Adherence to the training program was high, with completion of 73.4%, 78.4% and 78.7% of the assigned exercises for balance, lower-extremity conditioning, and upper-extremity conditioning, respectively.
Serious adverse events	One or more falls n (%): I: 51 (55); C: 53 (58). Fall-related fracture: I: 1 (1); C: 5 (5), there were six fractures (four of the hip, one of the coccyx, and one of the shoulder) in the control group and one fracture (of the hand) in the intervention group. Chest Pain: I: 23 (25); C: 32 (35). Physician-diagnosed angina: I: 6 (7); C: 16 (17). Musculoskeletal problems leading to restriction in usual activities: I: 30 (33); C: 28 (30). Two participants in each group died before the first follow-up assessment, at three months.
Funding Source	National Institute on and the Gaylord Rehabilitation Research Institute

Appendix 4, as supplied by the authors. Appendix to: Racey M, Ali MU, Sherifali D, et al. Effectiveness of physical activity interventions in older adults with frailty or prefrailty: a systematic review and meta-analysis. *CMAJ Open* 2021. DOI:10.9778/cmajo.20200222.

Effect of dietary supplements and physical exercise on sensory perception, appetite, dietary intake and body weight in frail elderly subjects. de Jong et al.	
Study (Year Published)	2000
Country	Netherlands
Objective/purpose	Investigated the effect of the consumption of micronutrient-dense products, a physical exercise programme or a combination of both on the sensory perception (smell test and questionnaire), appetite (questionnaire), energy intake (three day food record) and body weight (on a weighing scale and with dual energy X-ray absorptiometry measurements)).
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	A total of 7080 letters were sent to elderly people living in the neighbourhood of Wageningen, The Netherlands, resulting in a study population of 217 free-living frail elderly, who were interested in the study and met the selection criteria.
Inclusion Criteria/Exclusion Criteria	Inclusion: To fulfil the criteria `frail', subjects must have required some kind of health care, such as home care or meals-on-wheels. The other main selection criteria that were applied were: age ≥ 70 years; inactivity (no regular participation in physical activities of moderate to high intensity); BMI < 25 kg/m^2 (based on self-reported weight and height) or recent involuntary weight loss; no use of multivitamin supplements; ability to understand the study procedures.
Frailty index used *Include if modified (y/n) and how*	Must have required some kind of health care, such as home care or meals-on-wheels.
Total sample n (number invited)	217
Intervention n (number invited)	55
Control n (number invited)	44
Loss to follow-up: I n (%); C n (%)	I: 15 (27); 6 (13.6)
Age	Mean age overall (SD): 78.7 (5.6) Mean age intervention (SD): 76.7 (4.4) Mean age control (SD): 79.3 (6.6)
Gender: I n (%); C n (%)	Female: I: 73%; C: 68% Male: I: 27%; C: 32%
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	Illness (%): I: 93; C: 87 Prescribed Medicines (%): I: 75; C: 75 Problems with swallowing (%): I: 17; C: 16 Problems with chewing (%): 25; C: 27 Dental state (%)

	Complete Dentures: I: 48; C: 68 Partial Dentures: 34; C: 27
Smoking Status	Current smokers (%): I: 10; C: 16
BMI	Overall Mean (SD): 24.5 kg/m^2 Intervention Mean (SD): 24.5 (3.0) kg/m^2 Control Mean (SD): 24.1 (3.2) kg/m^2
Description of Intervention	The main objective of the exercise programme was maintenance or improvement of mobility and performance of daily activities essential for independent functioning by maintenance of versatility in movement. Emphasis was placed on skill training; muscle strength, coordination, flexibility, speed and endurance were trained by exercises such as walking, stooping and chair stands, thereby improving performance of daily activities. Different equipment was used, for example, balls, ropes, weights and dynabands. Group sessions were organized twice per week for 45 minutes and were of moderate, gradually increasing intensity. The sessions were coordinated by skilled teachers and supervised by one of the project leaders (M.CAP). In order to guarantee uniformity all sessions were extensively rehearsed with all teachers together, and an instruction video and manual was made in advance. The intervention duration was 17 weeks.
Type of intervention	Physical Intervention Category: Mixed Type of Intervention: Resistance/strength training, walking/marching, jogging, running, balance and flexibility, other (coordination, speed and endurance).
Physical Activity Intervention Intensity	Moderate intensity.
Frequency and Duration of Physical Activity Intervention	2x/week; 45 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Teacher (researcher supervised).
Description of Control	A social programme was organized as a control for the exercise programme, in order to check for possible effects of attention. Sessions of 90-minutes were organized once every two weeks by a skilled creative therapist. This programme focused on creative activities, social activities and lectures about topics of interest for elderly people. Transport to and from all the sessions was arranged.
Length of Follow-Up	Post-intervention (17 weeks).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	Two subjects, both with rheumatoid arthritis, quit because of pain while exercising. No adverse events occurred during the sessions.

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Funding Source	Dutch Dairy Foundation on Nutrition and Health, Maarssen, The Netherlands and the Health Research Council, The Netherlands.

Low-intensity exercise as a modifier of physical frailty in older adults. Brown et al.	
Study (Year Published)	2000
Country	USA
Objective/purpose	Examined the effects of physical therapy exercises on many of the elements identified as factors associated with frailty. These included impairments in gait and decreases in flexibility, strength, balance, sensation, speed of response time, and coordination.
Study Design	Randomized clinical trial.
Recruitment setting and/or recruitment methods	Sedentary men and women over the age of 78 years who were living independently but with difficulty and were interested in participating in an exercise intervention study were invited for a pre-enrollment evaluation.
Inclusion Criteria/Exclusion Criteria	Inclusion: participants had to score less than 32 points on the physical performance test. Exclusion: volunteers whose physical performance test scores were 17 or less were considered too frail to participate in the program. Those with scores over 31 points had no observable frailty.
Frailty index used *Include if modified (y/n) and how*	Physical performance test (score of 18-31).
Total sample n (number invited)	87
Intervention n (number invited)	48
Control n (number invited)	39
Loss to follow-up: I n (%); C n (%)	I: 0 (0); C: 3 (8)
Age	Mean age intervention (SD): 83 (4) Mean age control (SD): 83 (4)
Gender: I n (%); C n (%)	Female: I: 28 (58.3): C: 22 (56.4) Male: I: 20 (41.7); C: 17 (43.6)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	NR
Description of Intervention	Exercises were designed to challenge all major muscle groups and to enhance flexibility, balance, body handling skills, speed of reaction, coordination, and, to a modest extent, strength. Twenty-two exercises formed the basis of the activity program. There were three levels of difficulty associated with each exercise, and exercises were changed monthly to provide new levels of challenge. For example, sit-to-stand was performed during the first month, with subjects using hands if need be. During the second month, sit-to-stand was performed without using the hands, and subjects held the partial standing position for several seconds before fully rising to the

	upright. During the third month, sit-to-stand was performed without hands, and subjects held the partial standing position for several seconds during the ascend, and very slowly descended back to the chair. More repetitions of each activity were required each month. Theraband was used to provide a small amount of resistance for the hip musculature and knee flexors and extensors, and occasionally, one to two-pound hand-held weights were used during upper extremity activities. Frequent position changes were required of exercise participants; these included moving from chair-sitting to floor-sitting, rolling from supine-lying to side-lying and prone, standing, and returning to sitting. As progress was made, more positional changes were added. Exercise classes were held three times per week, and once 36 sessions for the supervised exercise program were completed, retesting was done. The intervention duration was three months.
Type of intervention	Physical Intervention Category: Mobility/rehab Type of Intervention: Resistance/strength training, balance and flexibility, other (body handling skills, speed of reaction, coordination)
Physical Activity Intervention Intensity	Light intensity.
Frequency and Duration of Physical Activity Intervention	3x/week; duration NR.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	The exercise program was supervised although it was unclear who supervised the program.
Description of Control	Participants in the home exercise control group came in for retesting after three months of home activity. These participants performed nine of the same 22 core exercises as those in the supervised exercise program; they performed only those activities that challenge range of motion. Home exercise control group participants were invited to exercise on-site under supervision once a month. The nine exercises were: chin tucks (neck retraction); trunk twists as far as possible left and right; trunk side-bending as far as possible toward the floor; lateral arm raises (shoulder abduction), possibly with small hand-held weights; back to wall where the arms were abducted to 90° and both the arms and elbows were brought back to the wall; hands and knees, starting position on all fours then moved buttocks to heels; prone lying: raise head and shoulder up on elbows; supine hamstring stretch where the thigh was held to the chest while the knee was extended; supine with knees bent where one leg was allowed to fall out to the side to stretch adductors.

Length of Follow-Up	Post-intervention (three months).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	Washington University Claude D. Pepper

Resistance exercise training increases mixed muscle protein synthesis rate in frail women and men ≥76 yr old. Yarasheski et al.	
Study (Year Published)	1999
Country	USA
Objective/purpose	Examined whether weight-lifting increased muscle protein synthesis rate and maximum voluntary muscle strength in physically frail elderly women and men.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	One site. Seventeen sedentary 76- to 92-year-old adults were screened by the Recruitment Core of the Claude Pepper Older Americans Independence Center at Washington University Medical School and enrolled in this study.
Inclusion Criteria/Exclusion Criteria	Inclusion: Before enrollment, volunteers received a physical examination, including a medical history, cognitive function evaluation, physical performance/frailty evaluation, a blood chemistry profile, complete blood cell count, and urinalysis. Each volunteer's primary care physician authorized his or her participation in the exercise program. Exclusion: took prescription medications that could affect muscle amino acid metabolism (beta-adrenergic blockers, beta-agonists, calcium channel blockers, corticosteroids) or if they had a metabolic (e.g., diabetes), neuromuscular (Parkinson's disease, moderate to severe peripheral neuropathy, sciatica), or any disorder that might affect muscle amino acid metabolism, their ability to respond to resistance exercise, or where exercise would be contraindicated (e.g., hypertension or coronary artery disease).
Frailty index used *Include if modified (y/n) and how*	Physical performance test and self-reported activities of daily living.
Total sample n (number invited)	17
Intervention n (number invited)	12
Control n (number invited)	5
Loss to follow-up: I n (%); C n (%)	NR
Age	Mean age intervention (SD): Female: 82 (2), Male: 82 (1) Mean age control (SD): Female: 82 (2), Male: 82
Gender: I n (%); C n (%)	Female: I: 8 (66.7); C: 4 (80.0) Male: I: 4 (33.3); C: 1 (20)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	NR

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Description of Intervention	The supervised exercise participants attended controlled and prescribed exercise training sessions three days/week. For the first three months, all supervised exercise participants followed a stretching and flexibility physical therapy program similar to that of the home exercisers (control group). This supervised program was done three days/week and was designed to improve range of motion and familiarize each participant with increased activity. This program was followed by three months of supervised, closely monitored progressive resistance exercise training done three days/week. One repetition maximum voluntary muscle strength was determined in the supervised exercise participants (not controls) on each of eight different commercially available resistance exercise devices (Hoist Equipment) that included bench press, biceps curl, upright row, triceps extension, seated row, leg press, knee extension, and knee flexion. Abdominal muscle exercises and free-weight squats were incorporated into the later stages of the exercise program. An individualized resistance exercise program was designed for each participant based on a percentage of his or her one repetition maximum. The one repetition maximum measures were used to adjust the exercise intensity and to corroborate changes in muscle strength determined on a dynamometer. For safety, electrocardiogram and blood pressure were monitored during maximum voluntary strength testing and in some participants during the initial weeks of weight training. Initially, one to two sets of six to eight repetitions of each exercise were completed at 65–75% of one repetition maximum. This progressed to three sets of eight to twelve repetitions done at 85–100% of initial one repetition maximum. The intervention duration was six months.
Type of intervention	Physical Intervention Category: Muscle-Strengthening Type of Intervention: Resistance/strength training, balance and flexibility
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	3x/week; duration NR.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	NR
Description of Control	Control subjects participated in testing and educational sessions and were prescribed a home exercise program that consisted of light muscle stretching and exercises focused on improving joint range of motion. One day per month, the control subjects were transported to the exercise facility where the group participated in a one to one and a half hour supervised stretching and flexibility exercise session.

	This session was used to direct and assist the control participants with the performance of the home exercises and to provide purposeful interaction between the control participants and the exercise training staff.
Length of Follow-Up	Post-intervention (six months).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	National Institutes of Health awards

Is lower extremity strength gain associated with improvement in physical performance and disability in frail, community-dwelling elders? Chandler et al.	
Study (Year Published)	1998
Country	USA
Objective/purpose	Correlation between changes in lower extremity strength and changes in physical performance and disability in a frail community-dwelling population using progressive resistive strength training delivered in the home.
Study Design	Prospective controlled clinical trial.
Recruitment setting and/or recruitment methods	Fifty men and fifty women, community-dwelling volunteers older than 64 years of age, were recruited from areas within a 25-mile radius of the Durham Veterans Affairs Medical Center. Participants were recruited from outpatient Durham Veterans Affairs Medical Center clinics, Duke Aging Registry, elderly housing complexes, home health agencies, Meals on Wheels programs, and private clinics in the area.
Inclusion Criteria/Exclusion Criteria	Inclusion: All participants met a prespecified criterion for frailty, defined as the inability to descend stairs step over step without holding the railing. Exclusion: too fit (≥ three on Reuben's Advanced Activities of Daily Living) or diagnosed with: terminal illness (ie, the patient was not expected to survive six months); severe, unstable cardiac disease, including myocardial infarction in the past six months; severe fixed or progressive neurologic disease (ex, stroke with significant hemiplegia, Parkinson's disease); complete blindness; or lower extremity amputation. Persons scoring below an 18 on the Folstein Minimental Status Exam were excluded if unable to follow a three-step command.
Frailty index used *Include if modified (y/n) and how*	Inability to descend stairs step over step without holding the railing.
Total sample n (number invited)	100
Intervention n (number invited)	50
Control n (number invited)	50
Loss to follow-up: I n (%); C n (%)	I: 6 (12); C: 7 (14)
Age	Mean age overall (SD): 77.6 (7.6) Mean age intervention (SD): 77.5 (7.1) Mean age control (SD): 77.7 (7.8)
Gender: I n (%); C n (%)	Female: overall: 50% Male: overall: 50%
Race/Ethnicity	66% white; 34% black
SES status *(reported by income or education level ONLY)*	Overall years of education, Mean (SD): 10.3 (4.2) years
Co-morbidities/chronic conditions	NR

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Smoking Status	NR
BMI	NR
Description of Intervention	The exercise intervention was initiated within five days of baseline testing. Exercise subjects were supervised by a physical therapist in a 10-week, three-session-per-week, in-home program of resistive lower extremity exercises using Theraband and body weight for resistance. Using principles of progressive resistive exercise, Theraband resistance for each participant was systematically increased during the 10-week program. Exercises included resisted hip extension and abduction, knee flexion and extension, ankle dorsiflexion, toe raises, chair rises and stair stepping.
Type of intervention	Physical Intervention Category: Muscle-Strengthening Type of Intervention: Resistance/strength training
Physical Activity Intervention Intensity	Resistance/strength training
Frequency and Duration of Physical Activity Intervention	3x/week; duration NR.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Physical therapist.
Description of Control	The control subjects were asked not to initiate any new exercise program during the 10-week period.
Length of Follow-Up	Post-intervention (10 weeks).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	Department of Veterans Affairs, Rehabilitation Research and Development Service, and the Center for the Study of Aging and Human Development, Claude Pepper Center, Duke University, Durham, NC.

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A Randomized Controlled Trial of the Prescribed Stepper Walking Program in Preventing Frailty Among the Dwelling Elderly: Application of Comprehensive Geriatric Assessment. Kuo et al.	
Study (Year Published)	2018
Country	Taiwan
Objective/purpose	Determined whether there was a significant difference after the prescribed stepper walking program on changes in frailty indicators based on comprehensive geriatric assessment.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	Elderly individuals were recruited by the research nurse from an ambulatory setting of a teaching hospital in northern Taiwan. Subjects volunteered to participate in the study and were informed about the study protocol and signed an informed consent before participation.
Inclusion Criteria/Exclusion Criteria	Inclusion: ≥65 years; without acute myocardial infarction history or other acute medical and psychiatric disorders. Exclusion: those with regular exercise habits.
Frailty index used *Include if modified (y/n) and how*	Frailty indicators based on the comprehensive geriatric assessment.
Total sample n (number invited)	41
Intervention n (number invited)	19
Control n (number invited)	22
Loss to follow-up: I n (%); C n (%)	I: 4 (21.1); 1 (4.5)
Age	Mean age overall: 69.77 Mean age intervention (SD): 68.93 (3.81) Mean age control (SD): 70.38 (5.22)
Gender: I n (%); C n (%)	Female: 12 (80.0); 18 (85.7) Male: 3 (20.0); 3 (14.3)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	Education, n (%) No degree: I: 0 (0); C: 1 (4.7) Junior high degree or less: I: 6 (40.0); C: 8 (38.1) Senior high degree or above: I: 9 (60.0); C: 12 (57.2)
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	Intervention Mean (SD): 22.96 (3.42) kg/m^2 Control Mean (SD): 24.77 (2.85) kg/m^2
Description of Intervention	Subjects of the intervention group were asked to have a 30-minute prescribed stepper walking program twice per week in the research center affiliated with the teaching hospital. Subjects of both groups were asked not to change their usual diets or activity patterns during the study period. The prescribed stepper walking program protocol consisted of three sessions (including

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	warm-up, workout, and cooldown). Subjects were instructed to give at least a five-minute warm-up of stretching prior to starting exercise. They ended with a five-minute cooldown walking and stretching. The Borg rating of perceived exertion scale and target heart rate zone (calculated by the heart rate reserve method) served as measures of exercise intensity. The prescribed stepper walking program was a tailored development program based on subjects' rating of perceived exertion and target heart rate. The stepping speed was encouraged to increase until subjects reached an individual exercise intensity. The aerobic component of the program consisted of 30 minutes of light-moderate to moderate intensity, with heart rate and rating of perceived exertion being monitored continuously throughout the second session. Subjects were asked to have a 30-minute stepper exercise, with an exercise intensity of 60% to 80% target heart rate measured by heart rate reserve or 13 to 15 rating of perceived exertion twice per week for eight weeks in the research center. The intensity of the program would be individually prescribed based on the results of comprehensive geriatric assessment. For the reason of progressive exercise, during the initial two weeks, participants exercised at 40-60% heart rate reserve or 11-13 rating of perceived exertion. The intensity of the stepper walking exercise was progressively increased from the third week (based on subjects' heart rate response and rating of perceived exertion). The intervention duration was eight weeks.
Type of intervention	Physical Intervention Category: Aerobic Type of Intervention: Walking/marching, jogging, running
Physical Activity Intervention Intensity	Moderate intensity.
Frequency and Duration of Physical Activity Intervention	2x/week; 30 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Researcher
Description of Control	Subjects in the control group were asked to keep their routine activity and record their activity in a diary.
Length of Follow-Up	Post-intervention (eight weeks).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	NR

Developing and testing the effectiveness of a novel health qigong for frail elders in Hong Kong: A preliminary study. Tsang et al.	
Study (Year Published)	2013
Country	China
Objective/purpose	Examined the effectiveness of a novel health qigong protocol for frail elders on psychosocial, cognitive, physical, and physiological functioning.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	A total of 182 elders aged ≥ 60 were recruited from the Elderly Service Unit from the Yan Chai Hospital Social Services Department in Hong Kong. A total of 134 eligible participants (36 males, 98 females) from an original sample of 182 participants were eventually included in this study from March 2012 to July 2012.
Inclusion Criteria/Exclusion Criteria	Inclusion: aged ≥60 years and obtained a score of eight or higher in the 62-item frailty index.
Frailty index used *Include if modified (y/n) and how*	Frailty index (not specified, 62 items). A score of ≥ eight was considered frail.
Total sample n (number invited)	134
Intervention n (number invited)	69
Control n (number invited)	65
Loss to follow-up: I n (%); C n (%)	I: 8 (11.6); 10 (15.4)
Age	Mean age intervention (SD): 83.33 (6.30) Mean age control (SD): 84.85 (6.03)
Gender: I n (%); C n (%)	Female: I: 47 (77%); C: 40 (72.7%) Male: I: 14 (23%); C: 15 (27.3%)
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	Education level, n (%) No school completed: I: 15 (24.6); C: 17 (30.9) Primary: I: 38 (62.3); C: 28 (50.9) Secondary: I: 8 (13.1): C: 9 (16.4)
Co-morbidities/chronic conditions	NR
Smoking Status	NR
BMI	NR
Description of Intervention	The Yan Chai Yi Jin Ten Section Brocades protocol consisted of ten sequential forms of movements which was either practiced in both standing and sitting styles depending on the participants' abilities. A complete cycle of the Yan Chai Yi Jin Ten-Section Brocades took 10 to 15 minutes. Each training session lasted for 60 minutes. Participants were led by certified qigong instructor to practice each of the movements of the qigong protocol two to three times with guided practice on mindfulness and rhythmic breathing at the beginning and short breaks between successive cycles. Participants were encouraged to practice qigong daily after the intervention

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	program throughout the project period. The intervention duration was 12 weeks.
Type of intervention	Physical Intervention Category: Mobility/rehab Type of Intervention: Tai Chi
Physical Activity Intervention Intensity	Light.
Frequency and Duration of Physical Activity Intervention	NR; 60 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Certified qigong instructor.
Description of Control	Each session lasted for 60 minutes. The instructor read aloud the newspaper articles chosen from the news headlines during the week. The participants were asked to answer brief questions about the article and express their views. The newspaper reading and discussion activity was chosen as a comparison group activity because it was a basic rehabilitation activity that was often provided in geriatric settings and was able to neutralize the attention given by therapist compared with the experimental group.
Length of Follow-Up	Post-intervention (12 weeks).
Adherence to intervention (# or % of sessions attended/completed)	NR
Serious adverse events	NR
Funding Source	Social Welfare Development Fund.

Effects of yoga on sleep quality and depression in elders in assisted living facilities. Chen et al.	
Study (Year Published)	2010
Country	Taiwan
Objective/purpose	Tested the effects of a six-month yoga exercise program on improving sleep quality and decreasing depression in transitional frail elders residing in assisted living facilities.
Study Design	Randomized controlled trial.
Recruitment setting and/or recruitment methods	A convenience sample of 69 elders was recruited from two assisted living facilities.
Inclusion Criteria/Exclusion Criteria	Inclusion: transitional frail elders aged ≥65 years or older with a Barthel Index score of 91-99 (mildly functionally dependent); no previous training in any forms of yoga; ability to walk without assistance; cognitively intact as demonstrated by a Mini-Mental State Examination score of 24 or higher.
Frailty index used *Include if modified (y/n) and how*	Activities of daily living Barthel Index (score of 91-99 which represented mild functional dependence).
Total sample n (number invited)	69
Intervention n (number invited)	38
Control n (number invited)	31
Loss to follow-up: I n (%); C n (%)	I: 7 (18.4); C: 7 (22.6)
Age	Mean age overall (SD): 75.40 (6.70)
Gender: I n (%); C n (%)	Female: 52.70% Male: 47.30%
Race/Ethnicity	NR
SES status *(reported by income or education level ONLY)*	NR
Co-morbidities/chronic conditions	More than half of the participants (65.50%) had chronic illnesses, with an average number of 1.22 (SD = 1.13).
Smoking Status	None of the participants in the intervention group was a smoker. However, nearly half of the participants in the control group reported having a smoking habit (45.80%).
BMI	NR
Description of Intervention	The silver yoga exercise program was implemented as the intervention. It was a safe and manageable yoga program specifically designed by the research group to accommodate the reduced body flexibility experienced by many elders. The program included four phases: warm-up (20 minutes): eight postures to loosen up the body structure; hatha yoga (20 minutes): seven gentle stretching postures to increase range of motion and progressive muscle relaxation in older adults with special consideration for their physical abilities and tolerances; relaxation (10 minutes): three activities to rest the body; guided-imagery meditation: (15 minutes): two imagery-guiding directions to facilitate a state of relaxation. A five-minute break was arranged between the warm-up and hatha

	yoga phases to accommodate the physical tolerance of elders. The entire program took about 70 minutes to complete. Abdominal breathing was emphasized in each program phase. Silver yoga program postures were considered less strenuous than those used in traditional yoga. The intervention duration was six months.
Type of intervention	Physical Intervention Category: Mobility/rehab Type of Intervention: Yoga (including chair yoga)
Physical Activity Intervention Intensity	Light intensity.
Frequency and Duration of Physical Activity Intervention	3x/week; 70 minutes.
Who Delivered the Intervention (Nutrition and/or Physical Activity), (i.e. doctor, volunteer, researcher, physiotherapist)	Certified yoga instructors.
Description of Control	Control group participants were instructed to follow their usual daily activities in the institution and invited to participate in silver yoga exercises after study completion.
Length of Follow-Up	Post-intervention (six months).
Adherence to intervention (# or % of sessions attended/completed)	80.83%
Serious adverse events	NR
Funding Source	Social Affairs Bureau of Kaohsiung City Government, Taiwan.

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