ORIGINAL RESEARCH

Identifying Feasible Physical Activity Programs for Long-Term Care Homes in the Ontario Context

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ABSTRACT

Background

Structured exercise programs for frail institutionalized seniors have shown improvement in physical, functional, and psychological health of this population. However, the 'feasibility' of implementation of such programs in real settings is seldom discussed. The purpose of this systematic review was to gauge feasibility of exercise and falls prevention programs from the perspective of long-term care homes in Ontario, given the recent changes in funding for publically funded physiotherapy services.

Method

Six electronic databases were searched by two independent researchers for randomized controlled trials that targeted long-term care residents and included exercise as an independent component of the intervention.

Results

A total of 39 studies were included in this review. A majority of these interventions were led by physiotherapist(s), carried out three times per week for 30–45 minutes per session. However, a few group-based interventions that were led by long-term care staff, volunteers, or trained non-exercise specialists were identified that also required minimal equipment.

Conclusion

This systematic review has identified 'feasible' physical activity and falls prevention programs that required minimal investment in staff and equipment, and demonstrated positive outcomes. Implementation of such programs represents cost-effective means of providing long-term care residents with meaningful gains in physical, psychological, and social health.

Key words: exercise, long-term care homes, physical activity, falls prevention, feasibility

INTRODUCTION

Many Canadian seniors ultimately experience difficulty living independently. Long-term care homes (LTCH) are designed to provide 24-hour nursing care for individuals unable to independently undertake activities of daily living.(1) Most LTCH residents in Canada are elderly. In 2002, 34% of Canadians aged 85 years or older resided in LTCH.(2) Long-term care residents are generally frail, de-conditioned, have multiple co-morbidities, and are at risk of poorer physical function and a higher risk of falls.(3,4,5)

Compelling evidence suggests that engagement in physical activity can be effective in preventing or slowing health decline and maintaining functionamong this population. Studies have shown that physical activity interventions can not only restore and/or maintain functional independence in older population,(6) they may also prevent or delay the frailty process as well.(7) A systematic review conducted by Theou *et al*.(8) demonstrated that the benefits of physical activity in frail seniors include improved body composition, improved dietary intake, improved muscle function, improved upper and lower body flexibility, and reduced depression. A recent Cochrane review concluded that the physical rehabilitation treatments can be effective in improving the functional levels of people in LTCH.(9) Overall, the accumulated evidence shows that the beneficial effects of physical activity programs tailored specifically towards LTCH residents include: falls prevention,(10,11) improved muscular strength and function,(12,13,14) better sleep and awake patterns,(15,16) and reduced periods of

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agitation.[17] Additional benefits of such programs may extend to lower costs related to hospitalization and pharmaceuticals, and costs associated with extended staff time due to assistance required with activities of daily living.[8]

Health-care in Canada is a provincial responsibility. Therefore, there are multiple provincial and territorial jurisdictions within Canada, each constituting a different health-care funding system. In Ontario, LTCH are required to have falls prevention and management programs in accordance with section 49 of O.Reg 79/10 under the Long-Term Care Homes Act, 2007.[18] The individual Licensees are required to optimally utilize resources and to meet residents' care needs, including organization of falls prevention and management program(s). However, the Ontario government recently changed the funding system for physiotherapy services for seniors.[19] Physiotherapy services will be restricted to one-on-one treatment prescribed according to the treatment plan based on need. These services will not include exercise and falls prevention exercise programs led by physiotherapists. Under this new agreement, $10 million will be allocated each year for exercise and falls prevention classes three times a week for all long-term care residents.

Under this new funding system, there is an increased need to identify effective and efficient exercise programs for LTCH in Ontario. The following criteria for feasibility of implementation of an exercise and falls prevention program in LTCH were established based on a thorough review of the literature: a) demonstrated positive outcomes, b) minimal investment in equipment and staff, c) implementable within existing LTCH infrastructure, d) carried out three times per week, for 30–45 minutes per session, and e) group-based exercise regimen.[8,12,20-24,25,26-28] The programs carried out three times per week are not only favoured by the new legislation, but are also deemed more effective in improving outcomes in LTCH population by previous literature reviews.[8,12] In addition, Theou and colleagues[8] suggested that shorter duration sessions, lasting 30–40 minutes, might be more suitable for LTCH population to gain optimal benefits while minimizing the risk of adverse consequences. While high-intensity, one-on-one strength training interventions using sophisticated equipment have been shown to be effective, group-based programs using low-cost equipment and facility staff are considered more feasible and cost-effective for LTCH.[20,21] Relatively low-cost equipment includes cuff weights, elastic resistance bands (Therabands®), soft weights, and sand balls. In addition to being relatively inexpensive and portable, such equipment also requires less supervision and assistance, and has been shown to have beneficial impacts on LTCH population.[20,22-24] The purpose of this systematic review is to critically evaluate published exercise and falls prevention programs for LTCH with respect to the feasibility of their implementation according to the above criteria specified.

METHODS

Literature Search

The search criteria for this review were adopted from Theou *et al*.[8] Medline (OVID; 1990-), Embase (OVID; 1990-), Psycinfo (Scholars Portal; 1990-), Cinahl (OVID & EBSCO; 1990-), Ageline (AARP; 1990-), and Allied and Complementary Medicine (OVID; 1990-) were searched up to March 31st, 2014 to select relevant publications. The Medline (OVID) search criterion is available upon request.

Inclusion/Exclusion Criteria

The articles found through database search were assessed by two independent reviewers based on the following considerations: 1) acknowledged as a randomized controlled trial, 2) full-text published in English, after year 1990, 3) study participants residing in LTCH identified in title, abstract and/or text, and 4) exercise program specified in text as an independent component of the intervention.

Data Collection and Assortment

The search results were uploaded into citation management software. Two reviewers independently screened the titles and abstracts of articles that were identified from the literature search based on identified inclusion/exclusion criteria. The following information was extracted from the selected studies: participant characteristics (age, sex), recruitment process, program description, length, duration, frequency, staff and equipment required, outcomes, and inclusion criteria used to recruit participants. The reviewers paid particular attention to reporting of cost or any economic analysis (i.e., cost-effectiveness or cost-benefit analysis) in selected studies. Any discrepancies at any stage were resolved by the third reviewer.

Quality Assessment

Quality assessment was performed using Physiotherapy Evidence database (PEDro) scale designed to assess the quality of randomized control trials focusing on exercise programs. The validity and reliability of this scale is published in the literature.[29] It measures internal validity and interpretability of the trials by assigning 1 point for each of the following criterion met: random allocation; concealment of allocation; comparability of groups at baseline; blinding of patients, therapists and assessors; analysis by intention to treat and adequacy of follow-up; between-group statistical comparisons and reports of both point estimates and measures of variability; and whether or not the trial contains sufficient statistical information to make it interpretable.[30] The scale does not measure external validity of the trial or the size of the treatment effect. The PEDro score is determined by counting the number of checklist criteria that are satisfied in the trial.

RESULTS

Description of Studies

Figure 1 depicts the process of screening of identified publications. A total of 1751 studies were identified after removal of duplicates, of which 269 abstracts were screened before full-text assessment. Thirty-nine studies were included after full-text assessment of 69 randomized control trials. All studies were published after 1993 and, except for six,[13,20,22,25,31,32] the majority were published after 2000. Ten of the selected studies were from the United States,[22,31,3233,34,35,36,37,38,39] 18 from the European countries,[7,17, 21,40,41,42,43-45,46,47-50,51,52,53,54] two each from Japan,[55,56] United Kingdom,[13,25] Turkey,[57,58] and Canada.[20,59] There was one intervention each from Taiwan,[60] Norway,[61] and Brazil.[62] The number of participants who completed the study or were included in the analysis varied from 14[32] to 98.[47] with a total of 4470 participants included in this review. Studies with the same participants but different outcome measures for similar interventions were included.[17,40,44] If an updated version of the intervention was available, the latest version was included.

Patient Characteristics

Participants of the majority of studies were older than 60 years, with mean age ranging from 67 years[62] to 92 years.[45] The majority of participants were female. Three studies included only female,[50,55,62] while only one study included only male participants.[32] Most of the studies were designed for long term care sub-population with specific conditions — i.e., those with Alzheimer's disease,[31,39] dementia,[44] frailty,[13,33,46,49,55,59] mild to substantial cognitive impairment,[46,49] incontinence,[38] de-conditioning,[43,52] at-risk of falls,[58] gait and balance difficulties,[32] or impairment in one or more basic, physical, or personal activity of daily living (ADL).[7,17,22,35,37,40,44,53,54,61,60,)

Methodological Quality

The pre-determined quality scores from PEDro database were used. The total scores ranged from four to eight (out of ten). Two studies scored eight,[17,33] eight scored seven,[7,13,40,43-45,48,54] 12 scored six,[21,22,31.32.35,38,41,47,51,52,53,58] nine scored five,[20,39,46,49,50,55,57,60,62] and seven scored four.[25,34,36,37,42,59,61] The PEDro rating for one study was not found in the database, hence, the reviewers assigned a consensus rating of six to the study.[56] The studies were not excluded based on their quality score.

Intervention Characteristics

Type

A majority of studies included multi-component exercise regimens, usually focusing on a combination of resistance/strength, endurance, range-of-motion, balance, aerobics,

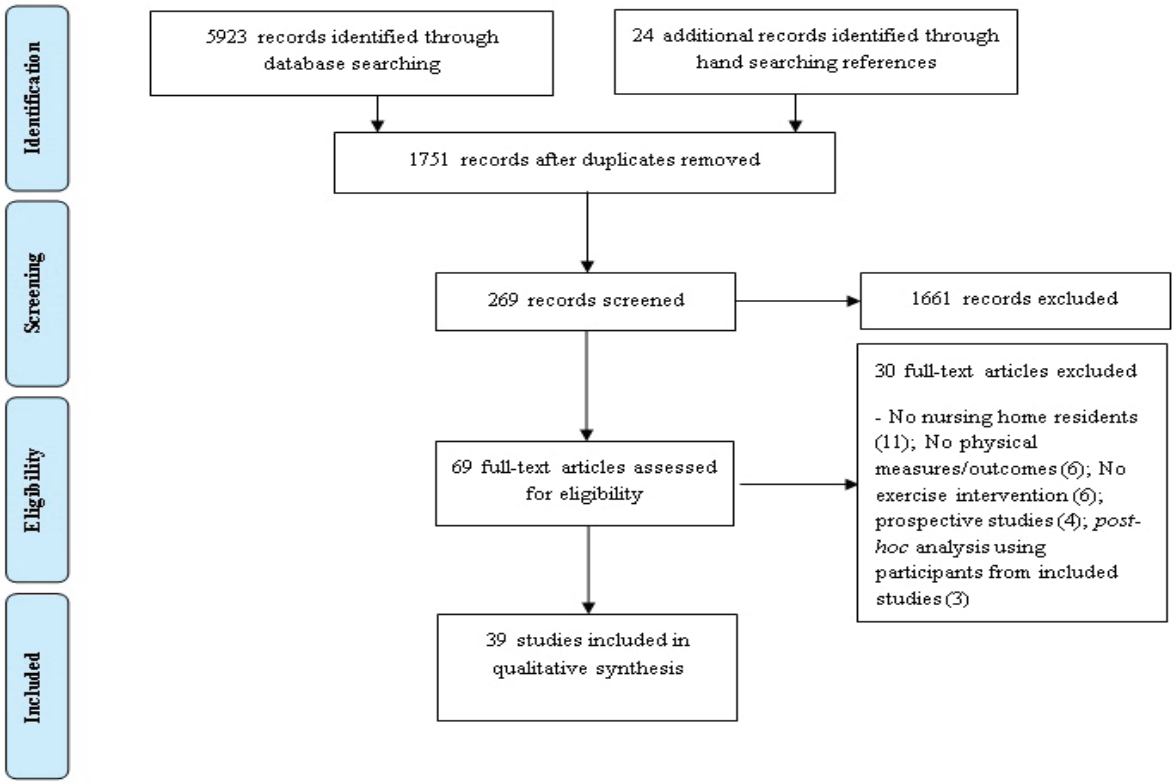

FIGURE 1. Flow diagram depicting literature screening process

walking, flexibility, and jumping. Some interventions focused specifically on resistance,[13,42,45] balance,[50,56] stretching,[62] low-intensity task oriented exercise program,[60] Tai Chi,[43] whole body vibration exercise,[7,51,52,56] or exercise therapy using the Takizawa Program.[55] Two training programs included a variety of multifaceted, non-pharmaceutical components (e.g., staff and resident education on falls prevention, environmental modification, adaptation, balance and resistance training, and use of hip protectors.[47,48] A nutritional component was part of three interventions.[13,17,54] 11 studies compared outcomes of two different exercise interventions with each other, with a control group, or combined both interventions to compare effects with the control group.[20,21,34,37,39,41,42,43,49,57,58] The control groups mostly received usual care, social visits, or non-exercise recreational activities. They comprised of an exercise regimen in five interventions.[7,20,42,51,57] No description of the intervention was provided in one study.[25]

Group vs. Individual Sessions

Nine programs were reported as being group bas ed,[20,21,25,32,33,3546,47,57] while other nine constituted an individualized regimen tailored to the needs or functional deficit of the participants but were performed in a group environment.[17,36,40,41,43,44,48,61,54] Only the supervised program was group-based in one study, while the unsupervised regimen was carried out by individuals in their rooms.[58] Twelve of the interventions were either individually tailored or constituted one-on-one training sessions.[7,13,22,38,39,45,49,50,52,53,56,60] Eight studies had unclear description of whether the programs constituted group-based or an individualized regimen.

Frequency

The majority of interventions were carried out three times per week.[7,13,20,22,31,32,33,36,42,45,46,48-50,51,52,55,57,58,59,60,61,62] Six interventions took place once to twice a week,[21,25,41,43,47,56] while four interventions occurred five times per week.[35,37,38,39] Four programs constituted of 29 sessions over a three-month period (five sessions per two weeks).[17,40,44,54] The number of sessions varied for three programs based on an individualized plan,[53,61] or because the two intervention groups had different frequencies.[43]

Duration

The duration of interventions ranged from four weeks[50,60] to two years.[34] The majority of programs lasted for either 30–45 minutes per session, [13,17,20,22,25,31,37,40,43,44,49,54,57,60] or less than 30 minutes per session.[36,39,50,51,52,56,62] Seven interventions lasted between 45–75 minutes per session. [21,32,33,45,46,47,58] Two interventions in one study lasted for 90 minutes per session, including a 30-minute social component. [41] One intervention started with 20 minutes per session but was extended to an hour by the end of 10 week intervention. [59] Duration was not reported for four interventions,[7,38,42,48] while it varied for the other five.[34,35,53,55,61]

Outcomes Measures

The most commonly studied patient based outcomes in the selected studies included functional fitness, strength, endurance, balance, flexibility, ability to perform activities of daily living (ADL), falls prevention, and alleviation of depression and incontinence symptoms. Exercise interventions, in general, improved a variety of functional, performance, and psychological outcomes in this population (see Appendix Table A.1 for list of major outcomes). Only six interventions showed negative, or non-significant outcomes as compared to the control group.[22,34,39,40,52,54] The studies comparing two different exercise regimes showed positive outcomes in at least one outcome measure for both regimens, except for one study that showed non-significant effects of strength training regimen.[21]

Resource Utilization

Summarized in Appendix Table A.2.

Staff Requirement

The staff requirements varied based on the type of exercise program. Sixteen programs were conducted by licensed physiotherapists.[7,17,21,22,25,32,35,44,51,52,53,54,55,56,57,58] Six interventions combined the services of trained exercise specialists (physiotherapists, exercise instructors, occupational therapist) and the facility staff members.[33,34,48,49,53,61] Eleven studies did not identify credentials of (at least one of) the exercise intervention instructors.[32,41,42,43,45,47,49,50,51,59,62] The rest of the interventions were conducted by either a certified therapeutic recreation therapist,[13] a sport scientist/teacher,[46,57] a Tai-Chi instructor,[34,43] long-term care nursing staff,[20,31,38] trained research staff (including nurses),[37] unspecified graduate and undergraduate students,[36] or graduate nurses and physiotherapy students trained by the investigators.[39]

Overall, exercise interventions that were conducted by in situ LTCH staff or non-exercise specialists and showed positive patient-based outcomes were found in the literature.[20,31,33,37,38,55] In one of the interventions conducted by trained non-exercise facility staff and volunteers, a 16-hour training workshop was provided by the study researchers.[20] The trained volunteers were used to conduct balance, flexibility, and walking exercises for both low- and high-mobility residents. A physiotherapist was initially used three hours per week in one program while the staff was being trained.[33] However, the physiotherapist was needed only for periodic consultation when the staff was adequately trained after one to two months. A multi-centre study reported that the physical therapist provided training to the participants in one centre, while nurses and care-workers served as physical exercise instructors in the other centre.[55] The physical therapist only visited the nursing homes once a month to ensure that proper exercise regimen was being followed. No differences in outcomes between the two centres were reported. While the supervised program was carried out by a physiotherapist, the unsupervised program was completed by the residents in their rooms without

any supervisions, and showed comparable results.[58] One study used an exercise instructor and trained nurses to train the facility nurses through a 60-minute session on incidence and consequences of falls.[47] The staff, however, participated in the educational component of the intervention only.

Equipment

Overall, interventions that used inexpensive and simple-to-use equipment and showed gains of comparable magnitude to interventions using relatively expensive and custom designed equipments were identified in the literature. None of these programs required additional infrastructure. Eight studies did not require any additional equipment as they used body weight, or consisted of walking, stretching, and balance exercises.[31,34,36,39,41,43,49,58] Nine studies utilized in-home, inexpensive, and simple-to-use equipment — i.e., cuff weights, elastic bands (Therabands®), non-elastic bands, soft weights, weight belts, exercise balls, sand balls, balance discs.[20,22,33,42,44,46,57,59,62] Relatively inexpensive equipment (e.g., free weights, hand-held weights, ankle weights, dumbbells) was used in three interventions.[38,47,48] Easily transportable and inexpensive equipment was reported to be used by one intervention for functional skills training group, while the equipment for resistance training group (i.e., gym machines) was reported to be expensive.[21] A Japanese study reported use of simple equipment including movable pulley, parallel or stall bars, and specially modified walker.[55] Hip protectors were worn by the participants in three interventions to reduce the risk of injury from falls.[47,48,56] Relatively expensive equipment involved weight machines (hip extension/leg press, seated chest press), treadmill, stationary air dyne or cycle ergometers, upper extremity ergometer, stationary cycle, weight and puller system, UNEX II chair, and recumbent stepper.[13,32,34,35,37,45,60] In addition, vibration platform (power-plate),[7] sinusoidal vibration platform and locometric system,[52] sinusoidal vertical vibration platform,[51] wobble board,[56] and computerized force platform with visual feedback,[50] were examples of more sophisticated equipment.

Cost

Overall, even though there were examples of interventions that were designed to be cost-effective or that used simple, inexpensive equipment, and used in-home staff, formal economic evaluations were not identified in the literature. Apart from one study,[22] the operating costs associated with the programs were not reported. Mulrow *et al*.[22] reported that the cost of a four-month physiotherapy program carried out by six physiotherapists was $1220 US per subject (95% CI: $402–$1832 US) and $189 US per subject ($80–$298 US) for the control group — a friendly visit program. There was no difference in total health-care charges (mean $11398 (US) per person during the four-month intervention) between the nursing home residents in the intervention and the control group. The intervention was reported to be substantially more expensive than the control with only modest improvements in the mobility of the participants. One individualized intervention was reported to require high resources,[50] while another reported to require a drastic change in staff levels to meet the resources required to successfully implement the intervention (i.e., 60 minutes per hour to care for 2–3 residents).[38] A formal cost-benefit analysis was recommended for one intervention given a large investment in staff personnel and equipment required.[35] A study comparing two different exercise programs with a control group concluded that the interventions would not be cost-effective in the institutionalized population with fixed costs for nursing.[43] It was reported that the "cognitive-action" intervention carried out twice per week would be less expensive (total expense less than 200 Euros/year) than the "adapted tai-chi" intervention carried out four times per week, given the comparable benefits.

There were some interventions that were designed to be cost effective and feasible in real-life situations by utilizing a low-frequency exercise regimen, using in-home and inexpensive equipment.[21,33,36,59] The use of inexpensive equipment (Therabands®) in a low-cost program was shown to have gains comparable to those seen in similar studies that used more costly and sophisticated training equipment.[59] Only one of the interventions was designed specifically to make the program less resource intensive by using facility staff and trained volunteers, in addition to using the low-cost equipment.[20]

DISCUSSION

This systematic review reinforces previous work showing that physical activity interventions have a positive impact on frail older adults residing in LTCH. A full assessment of outcomes and their relative significance in improving the health and quality of life of the residents of LTCH is beyond the scope of this study. The focus of this study was to discuss relative resource utilization of selected interventions to determine their feasibility of implementation in LTCH across Ontario, Canada. A majority of participants were female, aged 65 and over, and suffered from multiple co-morbid conditions. Improved effects on most physical, functional, and psychological outcomes were reported, with high compliance rates, and low risk of adverse events (see Appendix Table A.2). This supports the premise that physical activity is a safe and effective intervention for LTCH population.

The most common exercise interventions for frail older adults included in this systematic review were multi-component exercise programs performed three times per week, with each session lasting 30–45 minutes. The interventions varied based on frequency, duration, type (e.g., balance, strength, endurance), and intensity of exercise(s) performed. Previous studies have reported that this variability in interventions and participant characteristics, the selection criteria, and the assessment and measurement of outcomes limits the ability to conduct meta-analyses.[8,12,63-65] Weening-Dijksterhuis *et al*.[12] conducted a systematic review to identify criteria for exercise protocols to improve physical fitness, activity

of daily living performance, and quality-of-life of frail institutionalized older people. Only interventions showing strong or very strong effect sizes were examined for setting the criteria. They proposed that physical training should comprise of a combination of progressive resistance training, balance training, and functional training, carried out three times per week, for at least 10 weeks.

Most of the studies failed to report cost associated with the interventions. Some programs required special or extra equipment and hence are deemed less feasible than the programs using simple and cheap equipment. Moreover, most of the interventions used trained physiotherapists. This presents with a challenge, since only the prescribed physiotherapy services will be publically funded under the new funding system. Examples of successful interventions run by LTCH staff or non-exercise specialists were identified in this systematic review. Four studies are noteworthy, as they were conducted by LTCH staff (or non-exercise specialists) and met most other criteria for feasibility.[20,31,36,39] Programs meeting three or more of our feasibility criteria are listed in Table 1. The table also includes programs that were conducted by licensed exercise professionals, but were designed in a way that they could easily be conducted by LTCH staff after some training.[33,36] Comparable effects were demonstrated for a program run by physiotherapists in one centre as compared to nursing home staff in the other centre.[55] One program conducted by LTCH nursing staff was excluded, given the high staff levels required to run it.[38] The staff required to lead the sessions was not specified in two interventions, but met most of other feasibility criteria.[41,59] Two programs designed for residents with Alzheimer's disease were conducted by non-exercise specialists but constituted individualized regimen.[31,39] These programs met most of the specified criteria for feasibility, except they were not conducted in a group-based setting.

Lazowski *et al*.[20] specifically designed a low-cost, group-based program in the Ontario context, run by trained *in situ* staff and volunteers, using simple and inexpensive equipment. The 'Functional Fitness (FFLTC) program was compared with the status quo (seated Range of Motion (ROM)) program. The FFLTC program consisted of progressive strength, balance, flexibility, and walking exercises. The participants were divided into high- and low-mobility groups, depending on their scores in 'Timed Up and Go' test. On average, 10 minutes were spent on stretching exercise for warm up and cool down, 15 minutes on walking, and 10 minutes each on strength and balance exercises for high-mobility residents. The balance exercises were cut short five minutes for low-mobility residents and that time was spent on lower body strengthening exercises. The attendance rate averaged 86% for the FFLTC and 79% for the range of motion classes. Overall, significant improvements in balance, mobility, flexibility, and knee and hip strength were reported for FFLTC in both high- and low-mobility residents. Only shoulder strength improved in ROM group, while hip strength, mobility, and functional ability deteriorated. The study did not exclude participants with mobility challenges, dementia, or incontinence, but emphasized tailoring the intensity levels of exercises based on mobility status of the participants.[20]

Group-based exercise programs have been recommended for LTCH population as they are likely to further enhance the broader effectiveness of such interventions, as compared to the individualized interventions. Participants in these programs stand to gain from not only the physical activity component, but also from the social aspects of the intervention.[66] The feasibility of group-based exercise programs for LTCH population has been increasingly documented in the literature.[20,23,25,26-28] The decision to adopt a group-based exercise regimen is also dependent on the cognitive and ambulatory status of the residents. A class size of up to 10 individuals has been suggested for residents that are non-cognitively impaired, and have retained higher mobility, while smaller class sizes (three to five individuals) are suggested for lower mobility residents.[20] Those with cognitive impairments require close supervision, and a four-to-one participant to instructor ratio is proposed for group-based programs for these residents.[27] Individualized exercise regimens are only recommended for severely de-conditioned and bed-bound residents.[67]

Limitations

The differences in intervention and patient characteristics, patient selection, measurement of outcomes, and assessment tools make it difficult to compare the outcomes of physical activity programs in LTCH population. A majority of residents were excluded from the interventions given strict inclusion/exclusion criteria, which could bias the study results and reduce generalizability of the findings to overall LTCH population. Moreover, the studies deemed feasible for our purpose had lower methodological quality scores (i.e., lower internal validity and interpretability). Therefore, there is a need for studies with better methodological quality in order to improve validity of study results to assist with evidence-based decision practices.

CONCLUSION

Overall, this systematic review provides evidence that effective exercise programs for frail LTCH residents can be implemented in jurisdictions with resource constraints, such as Ontario, Canada. With this paper we intended to provide LTCH administrators and program planners with a list of exercise programs that can be adopted to accomplish selected improvements in the health and functional status of the residents. Effective group-based exercise programs can be implemented in LTCH with the use of trained staff members (e.g., nurses, volunteers), using simple and inexpensive equipment and carried out three times per week for 30–45 minutes per session. An exercise specialist could be used to train non-specialized

TABLE 1.
Summary table of potentially feasible interventions

Ref #	*Outcomes (a)*	*Staff (b1)*	*Equipment (b2)*	*Frequency (c1)*	*Time Bout (c2)*	*Group-based (e)*	*Pedro*	*Feasibility Criterion Met*
(20)	Positive	Trained Facility Staff and Volunteers	Soft weights, Therabands®	3x/week	45 min/session	Yes	5	**a, b1, b2, c1, c2, e**
(41)	Positive only for pre-frail subjects	One Instructor (unspecified) + One assistant	Not required	1x/week for 4 weeks; 2x/ weeks for 16 weeks	90 min/session (including 30 min social component)	Yes (exercised tailored to functional needs)	6	**a, b2, c1, e** Falls-prevention program
(55)	Positive	Nurses and care workers in one center vs. PT in other (comparable effects)	Parallel or stall bars, specially modified walkers, movable pulley	3x/week	Variable	Not Clear	5	**a, b1, b2, c1**
(59)	Positive	Not reported	Therabands®	3x/week	20 min/session initially to 60 min by week 10	Not Clear	4	**a, b2, c1**
(46)	Positive	Sports Scientist	Elastic resistance bands; soft weights training, exercise balls, balance discs and blocks	3x/week	50 min/session	Yes	5	**a, b2, c1, e**
(33)	Positive	PT+LTCH staff -Staff adequately trained 1-2 mos later; PT needed periodically for consultation	Simple, portable, inexpensive equipment (soft ankle, wrist weights, Therabands®, weighted hand-sized balls and beach balls)	3x/week	60 min/session	Yes	8	**a, b1, b2, c1, e**
(31)	Positive	LTCH Staff (nurses)	Not Required (walking exercise)	3x/week	30 min/session	Not Clear	6	**a, b1, b2, c1, c2** Patients with Alzheimer's Disease
(47)	Positive	Trained nurses (not facility nurses)+ ex instructor	Ankle weights, dumbbells, falls prevention education, hip protectors	2x/week	75 min/session including breaks	Yes	6	**a,b1,b2,c1,e** LTCH staff not directly involved with ex training
(57)	Positive	Sports Teacher, PT, Research Assistants	Sand balls, arm-less chair, body weight	3x/week	45 min/session max	Yes	5	**a, b2, c1, c2, e** Not clear if it could be conducted by LTCH staff
(36)	Positive	Graduate and undergraduate students	Assistive device used by participants; straight chair Designed to have minimum equip and staff time need	3x/week	15-20 min/ session	Groups of 2 or more depending on mobility	4	**a, b2, c1, c2, e** Program implementable by LTCH staff
(58)	Positive for both supervised and unsupervised	Physiotherapist supervised vs. unsupervised intervention	Body Weight- no special equipment required	3x/week	45-50 min/ session [+10 min daily walk]	Yes (supervised program)	6	**a, b1, b2, c1, e** Unsupervised and supervised regimen had comparable effects
(39)	Positive for activity-specific exercise group	Graduate nursing and physical therapy students trained by investigators	- Body Weight - No specific equipment required/ reported	5x/week	15-30 min/ session	No Patients with Alzheimer's Disease	5	**a, b2, c2** Easily implemented by nursing assistants (no need for Physiotherapist)

LTCH staff initially, with exercise specialist only needed occasionally to ensure proper techniques were being followed. Further research should focus on assessing the validity of outcomes of interventions identified to be feasible.

CONFLICT OF INTEREST DISCLOSURES

The authors declare that no conflicts of interest exist.

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TABLE A.1
Description of interventions

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(7), Belgium	Static Whole Body Vibration (WBV) ex and two-weekly seated gymnastic sessions (for social interaction) vs. control (ex regimen without vibration and gymnastic sessions) **F**: 3x/week, 6 mos **T:** Variable [Volume and intensity progressively increased according to overload-principle] **I:** 30-50Hz with 2-5mm excursion [increased progressively] **G/In:** Supervised individually	- Feasibility (continuation of program and/or occurrence of complications) - Balance and Gait (TUG, Tinetti test) - Upper limb and lower body flexibility (back scratch, chair sit-and reach test) - Maximal grip strength and closed chain bilateral leg extension	- TUG: ↑ imprv in IG - Maintenance of baseline level of balance in IG, CG ↑ decline - Leg extension: imprv in both groups but diff. NS) - Lower body flexibility (chair sit-and reach test): ↑ imprv in IG - Upper limb flexibility: NS - All other measures: NS	7
(13), UK	Lower extremity resistance training (hip and knee extensors), or multi-nutrient supplement, or both treatments, or placebo and supplement **F:** 3x/week, 10 weeks **T:** 45min/session **I:** High; 80% 1RM **G/In:** Supervised individually	- Muscle strength and size - Body composition - Mobility - Dietary Intake	- Muscle-strength and muscle cross sectional area: ↑ incr in ex group - Total energy intake: ↑ incr in combined ex and supplement gr oup - Body weight: ↑ incr due to supplements - Whole body fat free mass: NS effect of supplement - Habitual gait velocity, stair-climbing ability, and overall level of physical ability: ↑ imprv	7
(17), Sweden	High-intensity functional ex program and protein supplements (4 comparison groups: ex+protein, ex+placebo, control+protein, control+placebo) **F**: 5x/two week , 3 mos **T:** 45 min/session **I:** High. Increased gradually (Strength tasks 8–12 repetition maximum (RM), Balance tasks integrated in daily activities) **G/In:** Group (3-9 residents/group); Individually tailored	- Balance (BBG) - Gait ability (4-meter timed test) - Lower-limb strength (1RM in leg press machine, modified chair-stand test)	- At 3mos: ↑ imprv in self-paced gait speed in ex group - At 6 mos: ↑ imprv in BBG, self-paced gait speed, 1 RM in lower-limb strength, and chair-stand test in ex group - NS effects of protein-enriched energy supplement on training	8
(20), Canada	Functional Fitness for Long-Term Care [FFLTC] program vs. seated Range of Motion Program (ROM) **F:** 3x/week, 4 mos **T:** 45 min/session **I:** Progressive incr (not individualized program but self-paced) **G/In:** Group (4-10 residents/group)	- Mobility (TUG) - Functional Balance (BBG), gait speed, stair climbing power - Functional ability (FIM) - Lower Body Flexibility (Modified Sit-and-reach test) - Upper Body Flexibility (shoulder flexion) - Strength (isometric, grip, upper extremity, isotonic)(dynamometer)	- FFLTC group: - Mobility, balance, flexibility, knee and hip strength: ↑ imprv - ROM group: - Shoulder strength: ↑ imprv - Hip strength, mobility and functional ability: ↑ deterioration	5

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(21), The Netherlands	Resistance training (ST), functional skills training (FS), or combination of both vs. control ('an educational program' unrelated to ex e.g. discussion on history) **F and T:** ST: 2x/week for 6 mos, 45–60 min/session, group of -FS:2x/week for 6 mos, 50-55 min/session - Combined: (ST (once weekly) and FS (once weekly) **I:** Moderate; increased gradually **G/In:** Group (5-7 residents/session)	- Physical fitness (9 tests e.g. block-transfer test, reaction time test, sit-and reach test, shoulder flexibility test) - Isometric strength (hand-held dynamometer) - Functional performance (fastest usual gait speed and step length over a distance of 8 m, chair-stand test, picking up a pen from the floor while standing, and putting on and off a standard lab coat) - Self-rated disabilities (difficulty in ADL measured through interviews)	- Functional performance, ADL-disability: NS diff - Arm extension strength and tandem stance performance: NS imprv in ST compared to CG - Reaction time, eye–hand coordination and the sit-and-reach score: NS imprv in FS compared to CG - Arm extension strength in FS compared to CG: ↑ lower imprv **Post-hoc Analysis** (only for those attending >75% of ex classes) - No effect of strength training (ST) compared to CG - Functional-skills training (FS): ↑ imprv in reaction time compared to CG - ↑ decr in tandem stance compared to CG - Combined training group: ↑ imprv in eye–hand coordination and chair rise performance - No effects of ex training on self rated disability with ADLs	6
(22), US	One-on-one individually tailored physiotherapy training (PT) vs. friendly visits (FVs) [control] **F:** 3x/week for 4 mos **T:** 30-45 min/session **I:** Incremental increase in difficulty **G/In:** One-on-one individually tailored regimen	- Physical Disability Index (PDI) - ROM, strength, balance, mobility - Self-perceived health status (SIP) - Observer-reported ADL score - Falls	- PDI), SIP, ADL scores, range-of-motion, strength, balance, assistive devices use for bed mobility, falls: NS diff - Mobility subscale of PDI, use of assistive devices and wheelchairs for locomotion: ↑ imprv in PT	6
(40), Sweden	High intensity functional ex program vs. control (non-ex) **F:** 5x/2 weeks; 29 sessions over 3 mos **T:** 45 min/session **I:** 8-12 RM, load increased gradually **G/In:** Group (3-9 residents/group); Individually tailored	- Fall rate - Proportion of participants sustaining a fall	- During 3 mos intervention period: 34% participants fell in ex group (4.6 falls per person year), 45% in CG (4.2 falls per person year) - AT 6 mos: Falls rate, proportion of participants sustaining a fall: NS diff	7
(25), UK	Full range of movement seated ex vs. reminiscence sessions (control) **F:** 2x/week for 7 mos **T:** 45 min/session **I:** Low-intensity; number of reps increased overtime **G/In:** Group	- Postural sway (Wright's ataxiameter) - Flexibility of the spine and knees - Hand-grip strength (dynamometer) - ADL (BI) - Psychological Measurements (MMSE, Life Satisfaction Index, GDS)	- Grip strength, spinal flexion, chair-to-stand time and ADL: ↑ imprv in IG; reminiscence group (CG) underwent a deterioration - Self-rating of depression: ↑ decr in IG - Knee movement, MMSE, and Life Satisfaction Index scores: NS diff	4

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(41), The Netherlands	1)Functional Walking [FW] (balance, mobility, transfer training), 2) In-balance [IB] (7 therapeutic elements of Tai Chi) vs. usual activity for control **F and T:** 1 session/week for 4 weeks, followed by 2x/week sessions for 16 weeks; 52-week follow-up **T*:*** 90 min/session, including a 30 min social component **I**: Moderate **G/In:** Group (exercises tailored to functional needs of participants)	- Falls - Mobility (POMA) - Performance based measures of physical function (Walking speed test, Timed chair stands test, TUG, FICSIT-4 balance test) - Self-rated disability (GARS)	- Fall risk reduction, disability: NS diff between 3 groups - Frail participants' risk for becoming faller: ↑ incr in FW - Pre-Frail subgroup's risk for becoming faller: ↑ decr in FW group after 11 weeks of training - POMA and physical performance score in the subgroup of pre-frail elderly: ↑ imprv in FW and IB	6
(42), France	Free weight low-moderate intensity (LI) resistance training vs. high intensity (HI) progressive resistance training vs. weight-free placebo control **F:** 3x/week for 10 weeks **T**: Not reported **I:** High intensity: 80% of 1 RM; Low Intensity: 40% of 1RM, Weight free placebo (330g empty ankle cuffs) **G/In:** Unclear	- Knee extensor (KE) muscle strength and endurance - Functional performance (6-minute walk, chair-rising, stair-climbing test) - Self-reported disability	- KE strength and endurance, stair-climbing power, and chair-rising time in HI and LI compared to CG: ↑ imprv - Physiologic capacity (muscle strength and endurance) and 6-minute walking distance in HI: ↑ incr - Overall, less robust effects of LI on functional impairments than HI	4
(55), Japan	Ex therapy (Takizawa program) vs. control (non-ex) **F**: 3x/week while sitting or standing for 3 mos **T**: Variable **I:** Not reported **G/In:** Unclear	- Range of Motion (ROM) - ADL performance (FIM)	- ROM values for flexions of shoulders, right knee extension, and dorsal flexions of both ankles: ↑ incr in IG (CG: NS imprv for before and after comparison) - ROM values for right knee extension, right ankle dorsal flexion and left ankle dorsal flexion IG: ↑ diff for care level 3 - ROM values for right shoulder flexion in IG: ↑ diff for care level 4 - FIM score (before and after ex intervention comparison): NS diff - FIM score for care levels 1 and 2 in CG: ↑ decr	5
(59), Canada	Simple, progressive lower body training vs. control (usual daily activity) **F:** 3x/week for 10 weeks **T:** 20 min initially, to a full hour by the end of 10-week intervention **I:** Progressive incr in resistance and speed **G/In:** Unclear	- Knee extension strength and power (isokinetic dynamometer) - Functional performance (6-m walk timed test, a 30s chair stand, and 8-ft TUG)	- Eccentric and concentric average power: ↑ incr in IG (44% and 60%, respectively) - Functional performance (6-m walk timed test, a 30s chair stand, and 8-ft TUG)*:* ↑ imprv in IG - CG for any of the measures: NS change	4

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*

(43), France	Adapted Tai Chi (AT) or Cognition-action (CA) program vs. control
	F and T: AT: 4 sessions/week, 30 min/session for 6 mos
	-CA: 2 sessions/week, 30-45 min/session for 6 mos
	I: Light to moderate (tailored to patient state)
	G/In: Group (8 residents/group); Individually tailored
		- ADL impairment score (Katz scale)
		- Neuropsychiatric Inventory (NPI) score
		- Physical functioning (TUG, chair rise test, walking speed, and the 1-leg stance)
		- Mood (GDS)
			- At 6 mos:
			  - ADL score in CG: ↑ decline
			  - ADL score in AT or CA: NS change
			- At 12 mos:
			  - Overall change in ADL score in CG vs. AT and CA: NS diff
			  - Walking, eating, and continence preservation: ↑ in IGs vs. CG
			- NPI scores in CA: ↑ better from baseline at 6 and 12 mos, and ↑ diff from CG over 1-year period
			- NPI score in AT: NS diff from CG
			- Overall, AT or CA for main outcomes: NS difference
			- Total NPI score in CG: ↑ decr at 6-mos and 12 mos
			- Depressive symptoms (GDS scale) at 6 mos in all 3 groups: ↑ reduction
				7

(44), Sweden	High intensity functional ex program vs. control (non-ex based activities) **F:** 5x/2 weeks; 29 sessions over 3 mos **T:** 45 min/session **I:** High; 8-12 reps max before increasing weight **G/In**: Group (3-9 residents/group); Individually tailored	- ADL (BI Score) for functional independence in personal care and mobility	- BI score: NS diff between groups at 3 and 6 mos follow-up - Indoor mobility: ↑ lower proportion of participants showed deterioration in IG at 3 and 6 mos compared to CG - Participants with dementia: ↑ difference in overall ADL performance in IG at 3 mos but not at 6 mos - Total BI score for participants with dementia: ↑ decline in CG at 3 and 6 mos compared to baseline; ↑ decline in IG at 6 mos follow-up from baseline -Short-term (3 mos) effect of exercise on overall ADL performance in participants with dementia	7
(45), Spain	Short-term, lower limb resistance ex vs. control (usual mobility exercises for social interaction) -8-week ex training followed by 4-week detraining **F and T:** 3x/week (24 sessions), 45-50 min/session including warm up and cool down (2x/week usual mobility ex) Detraining for IG and CG: Mobility ex sessions (40–45 min duration): 5x/week **I:** Light to moderate (gradual incr in load from 30–70% of 1RM over 8 weeks) **G/In:** Supervised individually	- Primary outcome: 1RM leg press - Secondary outcomes: handgrip strength, 8-m walk test, 4-step stairs test, TUG, and number of falls	- 1RM leg press: ↑ incr with training over time in IG; NS decr over detraining period - Mean group number of falls: ↑ less [1.2 falls fewer/ participant] in IG - Secondary outcome measures: NS diff	7

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(56), Japan	Balance training using wobble boards vs. control (usual activity) **F:** 2x/week for 9 weeks **T:** 10 min/session **I:** 3 levels of difficulty for each task - Criteria for ex level to step up were: >1 min in the stability task and <2 min to finish 16 targets in the moving task **G/In:** Supervised individually	- Balance on wobble board (standing time and size fluctuation frequency analysis of the board) - Balance on an unstable surface (standing time on balance mat) - Static balance (standing postural sway, 1-leg standing) - Dynamic balance (maximum center pressure excursion, functional reach test (FRT)) - Agility (Stepping) - Ambulatory ability (5-m walking , TUG)	- Postural control parameters (i.e. standing time on the wobble board, standing time on the balance mat, distance of anterior–posterior displacement, and power spectrum): ↑ imprv in IG - NS changes in TUG and 5-m walking between groups - NS change in physical measurements in CG	6
(46), Austria	Structured strength and balance training vs. control (no description of activities) **F:** 3x/week for 10 weeks **T:** 50 min/session **I:** 1 set per muscle group, 10-15 repetitions **G/In:** Group (7-8 residents/group)	- Muscle function (manual examination on scale 0-5) - Cognitive function (MMSE) - Body Mass Index (BMI) - Lean body mass - ADL (Barthel-Index) - Mobility (Tinette Score) - Depression (GDS)	- Muscle strength, mean MMSE, and mean BMI: ↑ incr in IG from baseline - Muscle strength and cognitive function or BMI in CG from baseline: NS change - Mean lean body mass: NS imprv in IG; ↑ decr in CG - Mean MMSE between 2 groups at 10 weeks: NS diff - Mean muscle strength score, mean BMI, and mean lean body mass in IG vs. CG: ↑ diff - Proportion of lean body mass, Tinetti score (neither gait, nor balance test), BI, FIM or GDS scores between IG vs. CG: NS diff - Change in cognitive and muscle function in IG: ↑ correlation	5
(33), US	Strength and flexibility (seated ROM) program vs. CG (painting during first 6 mos, before crossing over to ex program) - Semi cross-over design **F and T:** 60min/session, 3x/week for 12 mos for ex group and 6 mos for CG (after initial 6 mos in recreational therapy) **I:** Initially one set of 5 repetitions; gradually progressed to two sets of 10 as tolerated **G/In:** Group	- Physical and cognitive function (TUG, BBG, PPT, and MMSE) M*easured at baseline,3, 6, 9, and 12 mos*	- Significant impact across four measures of ex intervention 1) TUG: ↑ decr in IG 2) PPT: ↑ incr in IG 3) Berg score: ↑ incr in IG 4) MMSE: ↑ incr in IG	8

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(31), US	Walking and conversation vs. walking-only ex vs. conversation-only intervention **F:** 3x/week for 16 weeks **T:** 30 min/session **I:** Self-paced walking with moderate physical assistance **G/In:** Unclear	- Functional Mobility (modified 6 min walk) *Measured at baseline and after 16 weeks*	- 2.5% decline in 6-min walk in combined group, 20.9% in walking group, and 18.8% in conversation group - 6-min walk distance from pre to post test: ↑ decline in walking group; NS decline in combined or conversation group - Conversation Group: ↑ shorter distance walked in 6-min at post-test as compared to walking and combined group; walking and combined groups NS diff from each other *Social interaction necessary to achieve compliance level to produce sufficient improvements*	6
(61) Norway	Individualized training program (transfer, walking-ability, balance, muscle strength, endurance) vs. control (usual care) **F:** Varied individually, for 3 mos **T:** Varied individually **I:** Varied individually **G/In:** Individualized (could be performed with groups- inadequate details provided)	- Urinary Incontinence (24-hour pad-weighing test)	- Leakage (adjusting for baseline leakage, age, sex, functional status) at 3 mos post intervention: - ↑ decr in IG; : ↑ incr in CG - Age and low functional level: ↑ predictor for imprv - Being women: ↑ predictor of poorer results *Best results for more physically dependent participants*	4
(34), US	1) Fit and Be Fit [FNBF] (resistance/endurance & basic enhanced educational program (BEP)), vs. 2) Living and Learning/Tai Chi [TC] (balance/concentration & BEP) vs. 3) Control (BEP) **F:** 3x/week for 2 years **T:** Not clear/not reported **I:** Varied individually, increased gradually **G/In:** Individualized (Not clear if group-based or not)	- Physical measures (stand time; walk time; grip strength (hand-held dynamometer), quadriceps and hip flexor strength)) - Cognitive functioning (MMSE, GDS) - Functional ability (IADL scale; Barthel's ADL Index) - Falls	- Time to 1st fall, time to death, # days hospitalized, and incidence of falls: NS diff - Falls: NS diff - Fallers vs. non-fallers at baseline: lower MMSE & IADL scores - Fallers (2yr follow up): NS but greater declines in adjusted walking times, MMSE and IADL scores; ↑ decr in ADL index score - # falls: NS diff between intervention adherers and non-adherers - Non-adherers: ↑ incr in time to stand, and # of medications	4
(47), Germany	Multifaceted program (progressive balance and resistance training, non-pharmaceutical intervention) vs. control (usual activities) -(staff & resident education on fall prevention, environmental modifications/adaptations) **F**: 2x/week for 12 mos **T**: 75min/session (including breaks) **I**: 10RM; load increased progressively **G/In:** Group (6-8 residents/group)	- Incidence density for rate of falls, and fallers - Frequent fallers (>2 falls/year) - Fractures (hip and other fractures) *Functional measurements could not be performed in all residents*	- Incidence density rate of falls/1000 resident years : ↑ decr in IG - # fallers: ↑ less in IG - Incidence density rate of frequent fallers (>2/year): ↑ less for IG - Incidence density rate of hip fractures/1000 resident years: NS diff between IG and CG (underpowered) - Incidence density rate of other fractures: NS diff between IG and CG (underpowered) (large n required) - Adherence to environmental corrections: not deemed feasible	6

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(48), Sweden	Falls prevention intervention vs. control (usual activities) for individuals at high risk of falls - staff education, environmental modification, ex program (strength, endurance, balance, flexibility), supplying and repairing aids, hip protectors, drug regimen, post fall problem solving conferences **F**: max 2-3x/week for 11 weeks; 9 mos and 34-week follow-up **T:** Not reported **I**: Intensive strength ex, balance, resistance training (HI:80% 1RM) **G/In:** Individually tailored (performed individually or in groups of 5-8 residents)	- Ambulation (Functional Ambulation Categories (FAC) scale) - Gait (timed self -paced gait speed, timed maximum gait speed) - Balance (BBG) - Balance and lower extremity muscle strength (Step Height) - Secondary Measures: reduction in risk of falls as a result of improved mobility	- Performance outcomes for higher and lower MMSE: ↑imprv in most short term and long term outcomes in IG; decline in most outcomes for CG - Risk of falls: NS diff between IG and CG **Short Term: 11 weeks** - Step Height (5 cm and 10 cm): ↑ imprv in IG - Balance: NS diff - Ambulation (independently), max gait speed, self-paced gait: ↑ reduction in CG; maintenance in IG **Long Term: 9 mos** - Ambulation: ↑ decline in CG; slight incr in IG - Ability to walk: ↑ incr in CG who had lost ability to walk - Max Gait Speed, self-paced walk: ↑ reduction in CG; unchanged from baseline in IG	7
(49), The Netherlands	1) Walking group, vs. 2) Hand and face ex group, vs. 3) CG (social visits for 1 sub-group, usual activities for other subgroup) **F**: 3x/week for 6 weeks **T:** 30 min/session for both IGs **I:** Mild **G/In:** Supervised individually	- Executive function (Category Naming test, Trail-making A and B) - Memory (Digit Span from Wechsler Memory Scale—Revised (WMS-R), Verbal Memory and Learning Test)	- Category Naming in combined treatment group (walking and hand/face) vs. CG, and separate treatment groups vs. CG: ↑ imprv (after controlling for pre-treatment effects) - Trail-making A-B for hand/face group vs. CG: ↑ imprv ; NS differences between combined vs. CG or walking vs. CG - Performance on short term and long term memory tests between three groups: NS diff - Pre-delayed analysis for Category Naming, and Trail-making A-B tests: NS diff between walking or hand/face vs. CG *i.e. treatment effects not maintained after treatment free period*	5
(50), Finland	Individual visual feedback-based balance training vs. control (usual routine activities) **F**:3x/week for 4 weeks; 1 year follow-up **T**: 20-30 min/session **I**: Not reported **G/In:** Supervised individually	- Balance tests (Force platform, BBG) - Falls incidence/recurrent falls	- Monthly risk of falling (at follow up): ↑ decr in IG - Balance: ↑ imprv in balance control and BBG scores in IG compared to CG - Proportion of participants fallen (1 year follow up): 55% in IG, 71% in CG (significance level not reported) - Recurrent falls: ↑ more common in CG - Proportion of injurious falls: higher in CG but NS - 12 mos risk of falling: ↑ lower in IG	5

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(35), US	Ex training (strength, endurance and function) vs. control (non training related activities) **F:** 3x/week resistance training; 2x/week endurance training for 4-8 weeks; 12 mos follow-up **T:** Not Reported **I:** Moderate **G/In:** Group (2 residents/group)	- Isometric strength in dominant arm and leg - Cardiovascular/aerobic fitness (heart rate response to timed endurance test) - Fitness Status (PADL, IADL) - Psychological status (GDS) - Mobility (self-selected walking speed over 20 feet distance)	- Mean change in isometric strength across muscle movements: ↑ imprv in IG vs. CG (at initial post-test) - NS diff at 6-mos and 12-mos follow-up - IADL and PADL scores between two groups at initial post-test, and at 6-mos and 12-mos follow-up: NS diff - Cardiovascular fitness, walking speed at initial post-test: NS diff - Depression scores at pre-test or initial post-test between the groups: NS diff between groups - At 12 mos follow-up: - # of hospitalizations, deaths, and # of hospital days: ↑ reduction in IG - Other intervention effects levelled off	6
(51), Belgium	Controlled whole body vibration + standard physical therapy vs. standard physical therapy (control) **F**: 3x/week for 6 weeks **T**: Vibration approx. 10 min/session; physical therapy 10 min/session; **I**: 4 series of 1 min of vibration alternating with 90 seconds of rest. Vibration set at 10Hz for first and third series, with a peak-to-peak amplitude of 3 mm; 26Hz with a peak-to-peak amplitude of 7 mm for second and fourth series **G/In**: Unclear	- Gait and body balance (Tinetti test) - Motor capacity (TUG) - HRQoL (SF-36)	- Gait: ↑ imprv in IG; no imprv in CG - Body balance: ↑ imprv in IG; decr in CG - TUG test time: ↑ reduction in IG; incr in CG - SF-36: ↑ greater imprv from baseline on 8 of 9 items in IG compared to CG	6
(57), Turkey	Combined ex program (strength, stretching, and aerobics) with jumping training vs. combined ex program only **F:** 3x/week for 6 weeks **T:** maximum of 45 min/session (including warm-up and cooling down) [10 min/session dedicated to jumping] **I:** Variable (participants encouraged to maintain hard level of effort) **G/In:** Group	- Falls risk & dynamic balance (BBG, biodex balance system) - HRQoL (SF-36) - Depression (GDS)	- Balance and falls risk: ↑ imprv in both groups - Statistically "better" imprv in balance and reduction of fall risk in jumping combined group - ↑ imprv in HRQoL in both groups - NS differences between two groups for HRQoL - NS differences in intra-group, or inter-group comparison a for depression for both groups any time of trial	5

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(36), US	Ankle strengthening and walking program vs. control (book reading or friendly visits) **F:** 3x/week for 3 mos **T:** 15-20 min/session **I:** 3 sets of 10-15 repetitions (ankle strengthening), maximum 10 min of sustained walking **G/In:** Performed individually or in groups of 2 or more residents depending on mobility of participants	- Interviews (information on demographics, mobility/activity, fear of falling) - Balance measured in three stances (parallel, semi-tandem, tandem) for up to 10 seconds each - Ankle strength (mechanical force transducer) - Walking speed (time to walk 6 meters) - Cognition (MMSE) - Falls risk assessment (RAFS- II) - Falls efficacy (modified falls efficacy scale)	- Parallel stance for 10 seconds: NS change between or within groups over time - Semi-tandem stance at 3 mos completion, and at 6 mos follow up for those using assistive devices and for all mobility levels: ↑ large proportion of IG participants showed maintenance or imprv - Fear of falling in those using assistive devices at 3 mos completion and at 6 mos follow up: ↑ large proportion of those in IG vs. CG showed maintenance or imprv - Ankle strength in IG for all mobility levels: NS incr - Walking speed, falls risk, and falls efficacy in IG (for some mobility levels): NS incr	4
(62), Brazil	Active static stretching program vs. control (cultural activities) **F:** 3x/week for 8 weeks (24 sessions total) **T:** 10min warm up, ~16 min stretch exercises **I:** 4 consecutive repetitions of 60 seconds each **G/In:** Unclear	- Muscle-tendon length and flexibility (photogrammic method using a digital camera) - Peak torque assessment (isokinetic dynamometer)	- Hamstring flexibility: ↑ imprv (30%) in IG vs. initial assessment - Flexibility of knee flexor muscles: ↑ incr in IG vs. CG - Ability to stretch hip biarticular flexors: ↑ reduction in CG compared to initial assessment - Peak torque differences in knee extensor or flexor muscle groups (eccentric or concentric): No diff in IG - Knee extensor eccentric peak torques: ↑ decr in CG	5
(52), Belgium	Whole body vibration training vs. control (normal daily activities) **F:** 3x/week for 3 mos **T:** less than 10min/session **I:** 5 series of 15 seconds of vibrations at 30 Hz intensity, 2 mm of amplitude, alternating with 30 seconds of rest **G/In:** Supervised individually	- Balance and gait abnormalities (Tinetti test) - Functional mobility (TUG test) - Quantitative walking (Locometrix) - Falls recorded by nurses - Risk of falls	- No intervention effect on risk of fall - Tinetti test scores for balance and gait in IG and CG (after adjusting for age, BMI MMSE scores): NS diff - TUG score: ↑ decr in median time in IG vs. CG (after adjusting for age, BMI, and MMSE scores) - Quantitative walking analysis, number of falls: NS diff between groups	6

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(32), US	Moderate to high intensity strengthening and aerobic ex program vs. control (usual activities) F: 3x/week for 12 weeks (36 sessions) T: 45-75min/session I: Moderate to high - Strength training: 40-60% 1RM for 10 reps. Intensity adjusted to maintain maximum fatigue level after 10 reps - Aerobic training: heart rate >70% for 20 min G/In: Group (3-4 residents/group due to resource limitations)	- Clinical gait and balance (Manual muscle and Tinetti mobility score) - Isokinetic strength (quadriceps and hamstring muscle groups) - Ex stress test - Gait and balance test - VO2max - Stance time - Gait duration	- Lower extremity muscle strength, endurance, gait and VO2max (Tinetti mobility scores, combined right and left quadriceps muscle strength, right and left lower extremity muscular endurance, left stride length, gait velocity): ↑ incr in IG vs. CG - Aerobic work capacity and balance: NS imprv in IG vs. CG by 12 weeks - Combined right and left hamstring muscle strength: ↑ imprv in CG	6
(60), Taiwan	Task-oriented ambulation training program vs. control (usual care) **F:** 3x/week for 4 weeks **T:** 30-45 min/session **I:** Low; increased progressively based on individual's tolerance **G/In:** Supervised individually	- Walking speed - TUG - 6-min walk test - Functional balance (BBS) - Daily functional activities (BI)	- Walking speed and BBS: ↑ incr in IG vs. CG - TUG: ↑ decr in IG vs. CG - 6-minute walk test, and BI score: NS imprv in IG vs. CG	5
(37), US	1) Resistance strength training and walking (E), vs. 2) individualized social activities (SA), vs. 3) combined E and SA (ESA), vs. 4) usual care (UC) **F and T:** E group: 3x/week strength training, 40 min/session; 2x/week walking, up to 45 min/session SA group: 1 hour session, 5x/week ESA group: combination of activities for both E and SA groups **I:** High; warm-up and cool-down (1 set of 8 reps at 20% 1RM, 3 sets of 8 reps) **G/In:** Unclear	- Every day function (NHPPT) - Night-time Sleep (Overnight Polysomnography) - Chronic Illness burden (Cumulative Illness Rating Scale- Geriatrics (CIRS-G))	- ESA: ↑imprv in everyday function as compared to US and SA - E: NS imprv in everyday function as compared to US and SA - SA: NS imprv in NHPPT total score - No relationship found between change in any sleep variable and change in everyday function	4

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(53), Multicentre (Sweden, Norway, Denmark)	Balance, strength, walking, endurance, group or individual social activities vs. control (ordinary care and treatment) F: 3-5 sessions/week, 3 mos T: Variable (mean dosage of intervention of 117 min/week by the end of intervention period I: Program weekly revised to progressively increase intensity level based on discussion with each participant G/In: Individually tailored	- ADL (FIM) - Functional balance (BBS) - Physical Activity Level (Nursing Home Life Space Diameter (NHLSD)) - Mobility (10 m indoors walking or wheelchair propulsion at self-selected and maximum speed) - Grip Strength (dynamometer) - Ability to transfer (Physiotherapy Clinical Outcomes Variables (COVS)) - Fall-related self-efficacy (Falls Efficacy Scale Swedish Version (FES))	- Balance, physical activity, transfers, walking/wheelchair speed and functional muscle leg strength: ↑ imprv in IG - ADL, balance and transfer: ↑ deterioration in CG - Balance and physical activity levels: ↑ imprv for those participating in intervention for more than 150 min/week - Physical activity and walking/wheelchair speed for those participating in more than 10 weeks of intervention: ↑ imprv; deterioration in those who participated less than 10 weeks	6
(38), US	Incontinence care and functional ex intervention (Functional Incidental Training i.e. walking, repeat sit-to-stand, upper body resistance training including arm curls or arm raises) vs. control (usual care) **F:** 5x/week (4 care episodes/day) for 8 mos **T:** Every 2 hours from 8:00 am to 4:00 pm -10 min max for walking or wheeling and sit-and-stands per trial -no max for resistance training **I:** Low **G/In:** Individually tailored (one-on-one sessions)	- Endurance (e.g. average and maximum distance walked or wheeled) - Incontinence - Level of assistance required to stand - Strength (e.g. maximum pounds lifted by arms) - Fecal and urinary incontinence frequency - Staff time required for implementing the intervention	- Task performance: ↑ imprv or maintenance in IG; declined on 14 of 15 outcome measures in CG - Mean time of 20.7± 7.2 min required to implement intervention each time care was provided - Estimated 5 to 1 resident to aide ratio reported - *"Fundamental changes in the staffing of most nursing homes will be necessary to translate efficacious clinical interventions into everyday practice"*[38]	6
(54), Sweden	Functional ex program + protein supplement, vs. 2) ex+placebo, vs. 3) control+protein, vs 4) control+placebo **F**: 5x/2 weeks for 3 mos (29 sessions) **T**: 45 min/session **I**: High **G/In:** Group (3-9 residents/group); Individually tailored	- Muscle Mass (Intra Cellular Water (ICW)) - Body Weight (BW)	- ICW and BW: NS differences in ex program vs. control, nor in protein vs. placebo group - No interaction effects between ex and nutritional intervention - Between-group analyses at the 6-mos follow-up: ↑ lower ICW and BW in the ex group than in CG	7

TABLE A.1
Continued

Ref. #	*Intervention Description*	*Outcome Measures*	*Outcomes*	*Pedro Score*
(58), Turkey	Unsupervised home ex vs. supervised group ex **F:** 3x/week for 8 weeks **T** 45-50 min/session; 10 min daily walk recommended for both groups **I:** Slow progression to higher levels **G/In:** Group (supervised intervention only)	- Fear of Falling (Visual Analogue Scale) - Quadriceps Muscle Strength (dynamometer) - Flexibility (Sit and reach test) - Functional mobility (TUG) - Balance (one-leg and tandem standing, BBG) - Proprioception (knee position sensing)	- Fear of falling: NS change within either group - Balance, functional mobility, and flexibility: ↑ imprv in unsupervised home ex group - Balance, functional mobility, flexibility, strength and proprioception: ↑ imprv in supervised home ex group - Number of walking sessions completed for unsupervised and supervised home ex groups: ↑ diff - Number of ex sessions completed for unsupervised and supervised home ex groups: NS diff	6

(39), US	1) Activity specific ex program (strength, flexibility, balance, endurance, and supervised walk), vs. 2) supervised walking group, vs. 3) social conversation group (control)
	F: 5x/week for 16 weeks
	T: Started with 15 min; 30 min by the end of intervention (10-20 min for unsupervised walk)
	I: 2 to 3 repetitions and progressed to 7 to 9 repetitions by end of intervention period
	G/In: Supervised individually
		- Ability to perform bed mobility and transfers (subscales of Acute Care Index of Function)
		- Functional mobility (6-minute Walk test)
			- Transfer Scale score: 6% incr in ex group 2.5% decr in conversation group , and 5.7% decr in walking group (significance level not reported)
			  - Low mobility participants: 17.4% incr in ex group, 5.6% decr in conversation group, and 6.1% decr in walking group
			- Bed Mobility scores of subjects in all 3 groups remained unchanged (NS diff for low mobility residents between groups)
			- 6-minute walk test scores: NS diff between groups
			  - Low mobility participants: NS diff (29.5% incr in ex group, 23.3% incr in walking group, 7.1% incr in conversation group)
				5

↑=Significant difference; NS=Non-significant difference; Mos=Months; x=times e.g. 3x/week=3 times per week; Ex=Exercise; Intervention Group= IG; Control Group=CG; Diff=difference; RM=Repetition maximum; Incr=Increase; Imprv=Improvement; F=Frequency; I=Intensity; T=Time Bout; G/In=Group or Individual sessions; MMSE=Mini-Mental Status Exam; TUG=Timed-up and Go; BBG= Berg Balance Scale; BI=Barthel Index Score; HRQoL=Health Related Quality of Life; GDS=Geriatric Depression Scale; PADL=Physical Activity of Daily Living Scale; IADL=Instrumental Activity of Daily Living; RAFS-II=Risk Assessment for Falls *Scale* II; SF-36=36-Item Short-Form Health Survey; PPT=Physical Performance Test; FIM=Functional Independence measure; POMA= Performance Oriented-Mobility Assessment; NHPPT=Nursing Home Physical Performance test; SIP=Sickness Impact Profile; GARS=Groningen Activity Restriction Scale;

TABLE A.2
Staff, equipment, and participant-related factors

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(7)	- 33/98 met inclusion/exclusion criteria; 24 gave informed consent (15 female, 9 male); 21 completed study DO: 3 in IG (reasons unrelated to the program) ED: 9/33 MA: 77.5 ± 11.0	- Vibration platform (Power- Plate) installed in rehabilitation room - Identical adjustable sandals	- PTs	- 96% of ex sessions completed in IG - 86% in CG
(13)	- 100/349 eligible consented; 94 completed study (majority female) DO: 6/100 (3 in ex; 2 in supplement; 1 in CG) - 2 due to lack of interest, 2 due to illness, and 2 due to death - No severe adverse events ED: 249/349 (71.35%) due to time commitment and inconvenience MA: 87.1±0.6	- UNEX II chair - Wall mounted cable pulley system - Double leg press equipment	- Certified therapeutic RT	- Median compliance - Ex sessions=97% - Use of nutrition=99% - Use of placebo=100%
(17)	- 191/487 recruited (73% Female); 68% with either severe cognitive or physical impairment, 57% normally used a walker and 14% used a wheelchair - 175 at 3 mos; 148 at 6 mos DO: 16 at 3 mos: 2 in ex and protein, 7 in ex and placebo, 4 in control and protein, 3 in control and placebo - No adverse events reported - "study could not be excluded as cause of death in one case".[17] ED: 71/487 MA: 84.7 ± 6.5	- Not reported	- 5 PTs working full time & 2 shared a full time position - 2 PTs required for each session for ex group	- 72% in ex group - 70% in CG - Protein-enriched energy supplement taken on 82% of occasions - Placebo drink taken on 78% of occasions (package completely emptied on 80% of these occasions)
(20)	- 96 met exclusion criteria and agreed to participate; 68 completed study (57 Female) DO: 28/90 (18 in FFLTC, 9 in ROM) - Reasons for drop-out same for both groups - No adverse events associated with intervention ED: 15/28 drop-outs declined for change of mind or being too busy MA: 80±0.9	- FFLTC - Soft weights - Therabands® (Elastic resistance) - ROM - Not reported (most likely none required)	- Trained facility staff **(*delivered by non ex specialists)* - 16 hour workshop to train LTC staff; staff in turn trained volunteers and aides	- Average - FFLTC=86% (87% and 85% for High mobility and low mobility residents) - ROM classes= 79% attended

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(21)	- 224/257 randomized; 159(71%) completed the study (majority female) DO: 65/224 (Strength training 30%, Functional skills training 27%, Combined training 21%, and CG 39%) - NS difference between groups - Slightly older (83 yrs), more often male ED: 5/257 declined to participate - 11/57 refused to continue in ex, 8/60 in functional-skills, 6/56 in combined, and 13/51 in CG MA: 81.7 ± 5.4	- Functional Skills Training: - Small, easily transportable and inexpensive equipment - Strength Training: - Expensive resistance equipment needed for leg press, lattisimus pull down, biceps curl and triceps press (TechnoGym equipment) and heel raises with dumbbells (1–5 kg each), ankle and/or wrist weights (1 and 2 kg per pair)	- PT for all 3 ex programs - Assistants (volunteers or students) - Professional Creative Therapist for CG	- Median - Strength training=76% - Functional-skills training=70% - Combined training=73% - CG= 67% (↑ lower)
(22)	- 194/252 eligible consented (70.5% Female), 180 completed follow-up assessment DO: 14/194 (5 in PT, 9 in FV group) - all PT and 7 FV dropouts due to death - No severe adverse effects reported ED: 58/242 MA: 79.7±8.5 for IG, 81.4±7.9 for CG	- Minimal equipment needed - Cuff weights or elastic bands	- 6 PT's *intervention reported to be substantially expensive than CG with only modest improvements in mobility only*	- Sessions attended - PT=89% - FV=92%
(40)	- 191/487 recruited (73% Female); Mean Mini-Mental State Examination: 17.8+5.1 - 183 completed trial, 158 at follow-up DO: At 3 mos: 4/91 in IG; 4/100 in CG - At 6 mos follow-up: 14/87 in IG; 11/96 in CG ED: 71/487 MA: 84.7 ± 6.5	- Not reported	- 2 trained PTs and one staff member	- IG=76% - CG=70%
(25)	- 41/49 completed for 7 mos (%Female not reported) DO: 8 (2 deaths in IG, 3 in CG) - 3 in IG due to lack of interest - No adverse events related to interventions ED: Not reported MA: 81	- Equipment not reported - Intervention carried out in the dining room or sitting room of the homes	- Research PT	- Ex sessions=91% - Reminiscence sessions=86%

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(41)	- 278 recruited, 238 included in analysis (188 Female) - Elderly with varying degree of frailty - 60% of the withdrawers and 48.9% of the non-withdrawers classified as frail DO: 24 (17 in IG, 7 in CG) ED: 40/278 immediately dropped out (older, more cognitively impaired, reported dizziness more often, used a walking aid less often, had a lower level of physical activity) - 4/24 drop-outs lost interest in study MA: 85 ± 6	- Not required for both ex groups	- One instructor experienced in providing ex activities - One assistant (received one day training course)	- FW=88% (25th–75th percentile, 74%–94%) - IB=84% (65%–92%)
(42)	- 27/39 enrolled and randomized, 22 completed the study (%F not reported) DO: 5 drop-outs - Unrelated to intervention effects - No study related adverse effects ED: Not reported MA: 81.5	- Adjustable ankle weight cuffs (for all three groups)	- Instructor(s) not specified	- Both ex groups=99% - CG=89%
(55)	- 145/149 completed the trial (all Female), in stable health, stratified to care levels (1-5) before randomization DO: 4 drop-outs ED: Not clear MA: 84.85±7.30 in IG, 86.25±6.59 in CG	- "Simple instruments" - Movable Pulley, "PATA", "KORO" *(no description of PATA or KORO available)* - Parallel or Stall Bars, specially modified walkers	- PTs in one centre - Nurses and care workers as physical ex instructor in other center (PT required once a month only)	- Not reported
(59)	- 25/30 residents completed study (19 Female) DO: 25 (2 in IG, 3 in CG) - Characteristics not mentioned ED: Not mentioned MA: 84.9 ± 4.8 in IG, 80.6 ± 4.6 in CG	- Body Weight - Therabands® *(claimed gains comparable to those seen in similar studies that used more costly and sophisticated training equipment)*	- Not reported	- Ex. group=71% adherence rate
(43)	- 160/270 eligible enrolled in study (71.7% Female), 146 completed 6-mos assessment, 135 completed 12 mos assessment DO: 25 at 12 mos (10 in AT, 6 in CA, 9 in CG) ED: 40/270 eligible refused to participate MA: 82.3 ± 9.1	- None required for AT - Small to medium sized balls for CA	- Experienced Tai Chi instructor for AT - Trained physical activity instructor for CA	- Attendance rates for the 6-mos period similar in both ex groups (mean [SD], 48.9% [29.8%] in the CA group and 38.8% [32.3%] in AT group

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(44)	- 191/487 included (100 with dementia, 73% Female), 180 at 3 mos, 169 analyzed at 6 mos follow-up (intent-to-treat analysis) DO: 11 at 3-mos (5 in IG, 6 in CG), 28 at 6-mos (18 in IG, 10 in CG) ED: 71/487 (27%) - At 3-mos: 1/6 drop-outs in CG declined to continue - At 6-mos: 2/18 in IG, and 1/10 in CG declined to continue MA: 85.3 ± 6.1 for IG, 84.2 ± 6.8 for CG	- Only weight belts for ex group	- PT's - Individual sessions when group session not attended - OT for CG	- Ex group=72%; CG=70% (about the same in dementia patients) - At 6 mos follow-up: - 39.2% (29/74) still performing 1 or more tasks as frequently as recommended; 39.2% not performing any - Adherence rate for patients with dementia = 35.9% and 46.2% respectively
(45)	- 40/65 randomized (90–97yeras) (32 Female), 38 at 8 week post-assessment, 32 after 4-week detraining DO: 2 (1 in IG, 1 in CG) at 8-week post-assessment, 6 after 4-week detraining (3 in each group) - No major adverse events attributable to intervention ED: 7/48 - 1 in CG declined to be assessed at 8 weeks, 2 in CG declined to be assessed after 4-week detraining period MA: 92 ±2	- Cycle Ergometer - Variable resistance weight machines - Dumbbells - Resistance bands	- Specialists in ex training and health educators (not specified)	- IG average=74% ±6% (mean of 18 completed sessions of the total of 24 planned sessions)
(56)	- 23 subjects recruited, 22 completed the study (20 Female) DO: 1 in IG (illness unrelated to the program) - No adverse events during ex ED: Not reported MA: 84.2 ± 5.9	- Wobble board (Sakai Medical Co. Ltd., Tokyo, Japan) - Personal computer - Hip protectors - Walker (present nearby for safety reasons)	- PT supervising each participant	- Mean percentage attendance rate in IG=86%
(46)	- 42 recruited; 30 completed the study (23 Female) DO: 12 (6/15 in each group) ED: 3/12 drop-outs withdrew consent MA: 86.7 ± 5.8 for IG	- Strength training - Elastic resistance bands (Thera-bands®), soft weights - Balance training: - Ex balls, balance discs and blocks (20 cm high)	- Sports Scientist	- Mean attendance in IG=91.8%

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(33)	- 21/50 met inclusion criteria, 20 included in analysis (intent to treat), (Majority Female) DO: 13% repeated measurements after baseline missing because of death or patient inability to perform the test because of acute illness. Only 1 resident (a member of the IG group at 10 mos) died during follow up ED: 1/20 MA: 88	- Simple, portable, inexpensive equipment - Soft ankle and wrist weights (2 to 4 pounds), Therabands® (color-coded resistance ranging from 2.5 pounds to 9 pounds), weighted hand-sized balls and beach balls for kicking and throwing	- PT and LTCH staff conducted ex sessions - *Initially, PT required 3 hrs/week* - *Staff adequately trained after 1-2 mos; PT needed periodically for consultation* - Art therapist and social worker for CG	- Ex group=80% - Recreational therapy group=56%
(31)	- 65/71 completed post-test measurements (84% Female) DO: 6 (3 from walking, 2 from conversation, and 1 from combined group) - Loss to follow-up: - NS diff across groups - ↑ older and had more co-morbidities than subjects who completed the study ED: Not reported MA: 87	- Not Required	- LTCH staff (nurses)	- Average attendance of intended treatments - Conversation group=90% - Walking group=57% - Combined group=75%
(61)	- 98/115 randomized, 68 included in analysis (intent to treat), (51 Female) DO: 26/48 in IG, 34/50 in CG ED: 4/115 - 20 in IG lost to follow-up, withdrew or moved - 21 in CG lost to follow up, withdrew or moved MA: 84.3 ± 8.6	- Not Reported	- All LTCH staff involved - 2 PT's and 2 OT's hired from outside for intervention related services	- Not reported
(34)	- 112 randomized, 110 included in analysis (data from last available data point), (majority Female) DO: 23 died (20.9%) and 7 (6.4%) moved out of the facilities ED: Not reported MA: 84	- Not specifically reported - FNBF: - Possibly treadmill, cycle ergometer, weights - LL/Tai Chi - Probably none required	- FNBF - PT - LL/Tai Chi - Tai Chi instructor, Social worker, nurse Staff training Intended to be cost-effective fall prevention program	- ↑ diff in adherence between two groups - FNBF average overall adherence=55.8% ±29.4% - LL/TC average overall adherence=24.2% ±30.8%

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(47)	- 981/1048 randomized and analyzed (79% Female) DO: 93 died and 5 discharged in IG; 81 died and 1 discharged in CG - No major adverse events during classes reported ED: 45/1048 did not provide consent, 364/509 in IG participated in education sessions (145 not interested), 167/509 for ex classes MA: 83.5 ± 7.5 for IG, 84.3 ± 6.9 for CG	- Ankle weights - Dumbbells - Hip protectors	- Ex instructor - Trained study nurses (not facility nurses) - Nursing Staff training - 60 min session on incidence and consequences of falls	- Mean number of ex classes=33 - 127/167 attended one class; 42 attended up to 29 sessions; 56 attended 30-59 classes; 29 attended >60 classes (maximum 88) - Hip protectors: Worn on 27.9% of all resident days - 160 residents agreed to wear hip protectors; 108 with 100% adherence - Environmental Modification: Reporting of adherence to environmental corrections not feasible
(48)	- 187 high risk residents selected and included in analysis (75% Female) DO: Not reported - Drop-out reported to be unrelated to intervention ED: 75/89 offered ex, 66 participated in ex program MA: 84	- Free weights - Elastic band - Body weight - Hip protectors	- PT's - All LTCH staff members participated	- Ex. group=47% (31/66 during 11 weeks)
(49)	- 43 frail, elderly subjects with mild cognitive impairment drawn from a sample of 500 residents (39/43 Female) DO: Not reported ED: Not reported MA: 84 ± 6 for Walking, 89 ± 2.40 for Hand/face, 86 ± 5.05 for CG	- Not required	- Not Reported	- Not reported
(50)	- 27/28 completed trial (all Female) DO: 1 excluded in CG (hospitalization), 4 lost during 1yr follow up ED: 79 inhabitants (72 Female-invited), 32 participated (4 excluded at initial stage (1-hip surgery, 1 acute illness, 2 dementia)) MA: 80.7 ± 6.1 for IG, 82.9 ± 4.2 for CG	- Computerized force platform with visual feedback	- Not Specified - *"Individually specifically targeted training may demand high resources".*[50]	- Training programs=95.7% compliance

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(35)	- 78 subjects randomized (39 in each group), 58 (9 women, 49 men) completed intervention and initial post test DO: 13 drop-outs in IG, 7 in CG during intervention and initial post test - 10 drop-outs in IG, and 14 in CG at 6-mos follow-up - 2 drop-outs in IG, and 8 in CG at 12-mos - 1 IG participant dropped out due to shoulder strain - No other ex-related adverse events ED: 3/81 MA: 75	- Upper extremity ergometer - Stationary cycle - Recumbent stepper	- PT and an aide - Individuals transported to ex site - *"Large investment in personnel and equipment required".*[35]	- Mean in resistance sessions = 19.8 (range:10 24) - 26 participants - Mean in endurance training sessions = 14 (6-22) - 22 participants *Considered to have completed intervention if completed 10 session over 4 weeks*
(51)	- 42/48 enrolled in study, 40 included in analysis (intent to treat) DO: 6 lost to follow up in IG, 2 for minor adverse events (transient minor tingling of lower limb) ED: 2/48 MA: 81.9 ± 6.9	IG: - Vertical vibration platform CG: - None reported	- PT for physical therapy and CG - Not reported for vibration intervention	- Not reported
(57)	- 78 allocated to groups, 66 included in analysis (70% Female) DO: 4 lost to follow up or discontinued in combined jumping group vs. 8 in combined group - No injuries or adverse events reported ED: 11/168 MA: 79 ± 5.4 for IG, 81.5 ± 6.3 for CG	IG and CG: - Sand Balls - Body weight mostly - Arm less chair	- Sport Teacher - PT - Research Assistants	- Not reported
(36)	- Initial sample of 81 (62 women, 19 men), 67 at 3 mos, 58 at 6 mos DO: At 3 mos: 9 in IG, 5 in CG - At 6 mos: 3 in IG, 8 in CG - Drop-outs due to attrition and illness (not reported if they were related to intervention) ED: Not reported MA: 84.1 ± 7.7	- Assistive devices - Straight chair	- Trained graduate and undergraduate students	- Not reported

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(62)	- 142 women contacted, 61 excluded due to mobility issues (10 due to health problems, and 52 due to physical restrictions in performing physical activities) - 17 included in study (9 in CG, 8 in stretching program) DO: 2/10 excluded from IG due to cellulitis in lower limbs ED: None MA: 67.0 ± 9.0	- Thick, non-elastic bands (1 m in length) - Stretching ex so no other specific equipment required	- Not mentioned	- 100% participation in 24 sessions for both groups
(52)	- 62/115 residents included (47 Female) - 62 volunteered, 55 included in intent-to-treat analysis DO: 6/31 in IG, 6/31 in CG - 2 hip pains seemed to be related to intervention ED: 27/115 MA: 83.2 ± 7.99	- Sinusoidal Vibration Platform	- 2 PTs - 2 investigators	- Ex sessions=91.9% attended
(32)	- 15/23 eligible consented to participate, 12 assigned to groups (all Men), (6 in each group), 4 in CG completed ex protocol after completion of control protocol - (Total 14 subjects in study) DO: 2 forced to withdraw from IG due to illness ED: 8/23 - About 10% of total residents eligible, about 8% consented MA: 73.38 ± 4.04 for IG, 73.83 ± 4.74 for CG	- Multipurpose weight machine - Stationary air dyne or cycle ergometers - Treadmill - Weight and pulley system	- Not Specified	- Ex sessions=95% compliance rate
(60)	- 59 residents randomized, 50 included in analysis (20 Female) DO: 6/31 in IG, 3/25 in CG - Appeared to be unrelated to intervention (no discussion provided however) ED: 4/6 drop-outs in IG, 1/3 in CG MA: 75.4 ± 12.2 for IG, 78.4 ± 12.8 for CG	- Treadmill - Stool	- Trained PT	- 50 (84.7%) subjects (25 each in IG and CG) attended every session and completed the study

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(37)	- 379 residents of 10 nursing homes approached, 355 consented to enroll, 193 randomized to groups - 119 participants (77 Female) included in analysis - *(66% (n = 79) had cognitive impairment based on an MMSE score of 26 or less18)* DO: Not reported - 5 adverse events possible related to study (4 in the E group and 1 in the ESA group) ED: Not reported MA: 81.7 ± 7.9 for E, 80.9 ± 9.4 for SA, 81.90 ± 9.9 for ESA, 81.9 ± 6.7 for CG	- Ex and Ex +Social Group - Gym machines - Hip extension/leg press - Seated chest press	- Trained Research staff (including nurses) - Research staff trained through 40 hours training on how to adapt intervention to each participant's ability	- E=81% - SA=94% - ESA=80% (for resistance and walking training) - CG=100% for social activity
(53)	- 322 allocated to groups, 266 assessed at 3-mos follow up (73% Female) DO: 27/170 dropouts in IG, 29/152 in CG - Drop-outs unrelated to intervention effects - No major adverse events associated with intervention ED: 97/419 (mostly because of perception that they were too old to benefit from training) - 2 drop-outs from IG, 5 from CG refused to participate MA: 85 ± 7.74 for IG, 84.9 ± 7.60 for CG	- Not mentioned (most likely none required)	- PT and OT for IG	- IG=68% compliance rate for 10-13 weeks
(38)	- 257/330 (78%) of eligible residents agreed to participate, 190 (74%) completed baseline assessment - Female 81% in IG, 86% in CG - 175 (91%) completed first post-assessment - 148 (78%) completed 32 week post assessment DO: Attrition due to death or prolonged illness ED: 73/330 (22%) MA: 87 ± 8 for IG, 88 ± 7 for CG	- Hand Held Weights	- Nursing Home Staff Note:*" Fundamental changes in level of staffing required"*. [38]	- Not Reported
(54)	- 177 allocated to groups; 174 at baseline assessment; 149(84%) analyzed at 3 mos; 139 (79%) analyzed at 6 mos (74% of 177 Female) DO: At 3 mos: 6 in ex and protein group, 5 in ex and placebo, 4 in control and protein, 4 in control and placebo ED: 71/481 declined participation MA: 84.5 ± 6.4	- Not reported (possibly some weights)	- PT's	- Ex group=79% - CG=72% (at baseline and 3 mos follow up) - Protein-enriched drink taken in 84% occasions - Placebo drink taken in 79% of all occasions

TABLE A.2
Continued

Ref #	*Participation and Dropout*	*Infrastructure & Equipment Required*	*Staff Required*	*Attendance/Compliance*
(58)	- 42/535 recruited, 32 completed the study (20/32 Female) DO: 6 in unsupervised group, 4 in supervised group ED: 11 eligible refused to participate - 1/10 drop-out died; rest either gave up attending ex, or did not come to evaluation - NS differences between those who competed the study and the drop-outs MA: 79 for unsupervised, 81 for supervised	- Supervised and Unsupervised - No Equipment required - Used body weight	- PT for supervised intervention - "*Easy, safe and economical*".[58]	- ↑ diff between groups (median) for # of walking sessions completed - 42 for unsupervised home ex - 55 for supervised ex - NS diff between groups for # of ex sessions completed - 21 for unsupervised home ex - 17 for supervised ex
(39)	- 135 consented, 105 started intervention, 82/105 completed post-testing DO: 23/105 withdrew before post-testing completed due to illness, hospitalization, death due to unrelated causes, or transfer out of the facility - NS difference in drop outs between 3 groups ED: 30 eligible consented but withdrew due to illness, disability, or death MA: 89.18 ± 6.54 for Ex, 88.24 ± 5.80 for Conversation, 87.31 ± 6.08 for Walking	- Activity specific ex group - Body Weight - Gait belt - (No other specific equipment required/reported)	- Graduate nursing and physical therapy students trained by the investigators - Visits by investigators every 2-3 weeks to check quality and consistency Note: "Could be easily implemented by nursing assistants without need of PT's".[39]	- Not reported

DO=Drop-out; ED=Eligible Declined; MA=Mean Age; ↑=Significant; diff=Difference; #=Number; PT=Physiotherapist; OT=Occupational Therapist; RT=Recreational Therapist