

## Research

# Long-term home and community-based exercise programs improve function in community-dwelling older people with cognitive impairment: a systematic review

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## KEY WORDS

Dementia  
Cognition disorders  
Exercise  
Falls  
Hospitalisation



## ABSTRACT

**Question:** Do long-term (> 3 months) home or community-based exercise programs improve function, reduce falls and prevent hospital readmissions in older people with cognitive impairment? **Design:** Systematic review and meta-analysis of randomised, controlled trials. Electronic databases (CINAHL, PubMed, Medline, Embase, AMED) were searched from the earliest date possible until March 2016. **Participants:** Older adults ( $\geq 65$  years) with cognitive impairment living in the community. **Intervention:** Supervised home or community-based exercise programs longer than 3 months. **Outcome measures:** The primary outcomes were function (including balance and activities of daily living), falls and hospital readmissions. **Results:** Of 1011 studies identified, seven trials with 945 participants met the inclusion criteria. Compared with no intervention, long-term exercise programs improved functional independence in basic activities of daily living by a moderate and significant amount (SMD 0.77, 95% CI 0.17 to 1.37,  $I^2 = 67\%$ ), and improved functional independence in instrumental activities of daily living by a small and significant amount (SMD 0.44, 95% CI 0.03 to 0.86,  $I^2 = 42\%$ ). Long-term exercise improved balance (mean difference in functional reach test 5.2 cm, 95% CI 0.5 to 9.9,  $I^2 = 76\%$ ). Data from two individual trials suggest that long-term exercise programs also reduce falls in older people with cognitive impairment. However, there was limited reporting of the effect of exercise on hospital readmissions for this group of people. **Conclusions:** Long-term home and community-based exercise programs improve function in older adults living in the community with cognitive impairment. **Review registration:** PROSPERO CRD42015029602. [Lewis M, Peiris CL, Shields N (2016) Long-term home and community-based exercise programs improve function in community-dwelling older people with cognitive impairment: a systematic review. *Journal of Physiotherapy* 63: 23–29]

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## Introduction

Functional independence in activities of daily living is often reduced by the progression of cognitive impairment. Older people with cognitive impairment (eg, dementia) are at risk of progressive physical deterioration, including loss of muscle strength, deconditioning, decreased standing balance and impaired walking, all of which can lead to falls, subsequent injury, further functional decline, and hospital admissions. An estimated 342 800 Australians and 44 million people worldwide live with dementia<sup>1,2</sup> and the ageing population means that these numbers will rise, putting further pressure on healthcare systems.

Hospitalisation of older people with cognitive impairment can have detrimental effects on their mental and physical wellbeing. An unfamiliar environment can cause behavioural problems, leading to further cognitive and functional decline. Readmission to hospital puts additional economic strain on an already overwhelmed healthcare system. Health services therefore need intervention strategies that assist older people with cognitive

impairment to maintain their functional independence and prevent them falling and being readmitted to hospital. By preventing hospital readmissions, these interventions would benefit health services by reducing costs and benefit people with cognitive impairment by helping them to maintain their mental and physical wellbeing.

Exercise is beneficial in maintaining function and preventing falls and hospital readmissions in older populations with and without chronic conditions. Exercise in healthy older adults has been shown to prevent disease, functional loss and cognitive decline.<sup>3</sup> Exercise can also improve function among older adults who are physically impaired.<sup>4</sup> Community-based exercise programs have been shown to reduce hospitalisations in people with pulmonary disease<sup>5</sup> and can reduce falls in older adults without cognitive impairment who were frequent fallers.<sup>6</sup>

Existing systematic reviews about exercise in older adults do not provide robust evidence about long-term exercise specifically for older adults with cognitive impairment living in the community. One systematic review<sup>7</sup> reported that long-term (> 3 months)

exercise programs were more beneficial than short-term programs (< 3 months) in improving health outcomes for people with dementia. However, this finding was based on evidence from trials completed primarily in institutional settings, and the review only included one randomised, controlled trial of a long-term exercise program in community-dwelling adults with cognitive impairment.<sup>8</sup> Two systematic reviews have investigated the effects of exercise on functional independence for people with cognitive impairment, but these reviews evaluated the effects of exercise programs of < 3 months duration.<sup>9,10</sup> People with dementia may need to participate in exercise programs over a longer duration to gain and sustain any improvements in physical function. Another two systematic reviews<sup>11,12</sup> investigated the effect of exercise on falls for people with dementia, but these reviews evaluated short-duration programs (< 3 months) and included studies of people with dementia living in institutional settings. No previous review has investigated the effect of longer-term exercise programs on falls and hospital readmissions for community-dwelling older people with cognitive impairment.

Therefore, the research question for this systematic review was:

Does long-term (> 3 months) exercise in the home or community setting improve function and reduce the risk of falls and readmission to hospital in community-dwelling older people with cognitive impairment?

## Method

This systematic review was conducted and reported with reference to the PRISMA guidelines.

### Identification and selection of trials

Articles were identified through a search of the electronic databases CINAHL, PubMed, Medline, Embase (OVID) and AMED (OVID), from the earliest date available until March 2016. The search strategy covered two main concepts: 'cognitive impairment' and 'exercise', along with synonyms of each (see Appendix 1 on the eAddenda). A manual search of reference lists of included articles was also conducted to ensure that all relevant articles were included.

Two reviewers (ML, CP) independently applied the eligibility criteria in Box 1 to the titles and abstracts of all relevant articles. All discrepancies between reviewers were resolved through discussion. If consensus could not be reached, a third reviewer was consulted. Articles that could not be excluded were obtained in full text for further analysis and the eligibility criteria reapplied. Articles were limited to English language.

### Assessment of risk of bias

All included trials were subject to critical appraisal by two independent reviewers (ML, CP) using the PEDro scale ([www.pedro.org.au](http://www.pedro.org.au)). The PEDro scale is an 11-point scale used for assessing risk of bias in randomised, controlled trials. The scored items are presented in Table 1. For each item, 1 point is awarded when that criterion is met. An 11th item (specified eligibility

### Box 1. Inclusion criteria.

#### Design

- Randomised, controlled trial

#### Participants

- Older adults (mean age  $\geq 65$  years) with cognitive impairment living in the community or in an independent living unit
- Cognitive impairment can include vascular dementia, Lewy Body dementia, Alzheimer's dementia, short-term memory loss, fronto-temporal dementia and progressive supranuclear palsy
- Not living in a residential aged care facility

#### Intervention

- Home-based or community-based exercise program of > 3 months duration
- Supervision provided by a physiotherapist (or other exercise professional) or by a trained carer or family member
- Exercise could include aerobic training, resistance training, balance, walking, stretching or a combination of exercise types
- No co-intervention (eg, cognitive training) in addition to exercise

#### Outcome measures

- At least one outcome measuring function, falls and hospital readmissions
- Functional outcomes included activities of daily living (eg, FIM), balance (eg, functional reach test), strength (sit to stand test), endurance (eg, walking endurance)

#### Comparisons

- Supervised exercise versus usual care (usual care could include interventions that would be considered inert from the perspective of what exercise might achieve and that might reasonably be offered in the community, such as education only, advice only or social activities only)
- Supervised exercise versus no supervised exercise programs

criteria) is rated but is not included in the score because it relates to external validity, whereas the tallied score combines the items related to control of bias and completeness of reporting. Any discrepancies between reviewers were resolved through discussion. If consensus could not be reached, a third reviewer was consulted. A trial with a score < 4 was categorised as being of poor methodological quality.<sup>13</sup>

The Grades of Recommendation, Assessment, Development and Evaluation (GRADE) approach was applied to evaluate the quality of the body of evidence in each meta-analysis.<sup>14</sup> The quality of each body of evidence was downgraded or upgraded from the baseline 'high quality' (given as all trials were randomised, controlled trials) according to a set of pre-defined criteria. The levels of quality were very low, low, moderate, or high quality. Evidence was downgraded by one level: if most trials scored  $\leq 6$  on the PEDro scale, indicating poor-to-moderate methodological quality; for indirectness, as indicated by varied participant populations or interventions; for inconsistency, as indicated by an  $I^2$  value > 50% that could not be explained in sensitivity analyses, indicating substantial heterogeneity; or for imprecision of results, as indicated by a

**Table 1**  
PEDro scores of included studies.

Study	Random allocation	Concealed allocation	Groups similar at baseline	Participant blinding	Therapist blinding	Assessor blinding	< 15% dropouts	Intention-to-treat analysis	Between-group difference reported	Point estimate and variability reported	Total (0 to 10)
Arcoverde et al (2014)	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Doi et al (2013)	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Kwak et al (2008)	Y	N	Y	N	N	N	Y	N	Y	Y	5
Lam et al (2015)	Y	N	Y	N	N	Y	N	Y	Y	Y	6
Pitkala et al (2013)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Suttanon et al (2012)	Y	Y	N	N	N	Y	N	Y	Y	Y	6
Vreugdenhil et al (2011)	Y	N	Y	N	N	Y	Y	N	Y	Y	6

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