

## Research

## A home program of strength training, movement strategy training and education did not prevent falls in people with Parkinson's disease: a randomised trial

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## KEY WORDS

Parkinson's disease  
Rehabilitation  
Randomised trial  
Physical therapy  
Falls



## ABSTRACT

**Questions:** For people with idiopathic Parkinson's disease, does a 6-week, comprehensive, home exercise program reduce falls and disability and improve health-related quality of life? Is the program cost-effective? **Design:** Randomised, controlled trial with concealed allocation and assessor blinding. **Participants:** One hundred and thirty-three community-dwelling adults with Parkinson's disease. **Intervention:** The experimental group completed a 6-week home program comprising progressive resistance strength training, movement strategy training and falls education. The control group completed 6 weeks of non-specific life skills training. Participants in both groups received weekly therapist-guided sessions for 6 consecutive weeks and a weekly self-directed home program. **Outcome measures:** The primary outcome was the rate of falls, documented for the 12-month period immediately after therapy. Secondary outcomes were disability and health-related quality of life, assessed before and after intervention and at a 12-month follow-up. **Results:** A total of 2255 falls were reported by the 12-month follow-up. The proportion of fallers in the experimental and control groups was 61 and 72%, respectively, which was not statistically significantly different (RR = 0.85, 95% CI 0.66 to 1.09). There was no significant between-group difference in the rate of falls (incidence rate ratio = 1.58, 95% CI 0.73 to 3.43). A survival analysis of participant time to first fall did not show a significant between-group difference (log-rank test  $\chi^2 = 0.79$ ,  $p = 0.37$ ). No significant between-group differences occurred for mobility, disability or quality of life. The mean cost of delivering the experimental intervention was AUD1596. **Conclusion:** A home program of strength and movement strategy training and falls education does not prevent falls when applied at the dose used in this study. Arguably, the dosage of therapy was insufficient. Future trials need to explore further therapy content, repetitions and duration, in order to optimise outcomes and cost-effectiveness. [Morris ME, Taylor NF, Watts JJ, Evans A, Horne M, Kempster P, Danoudis M, McGinley J, Martin C, Menz HB (2017) A home program of strength training, movement strategy training and education did not prevent falls in people with Parkinson's disease: a randomised trial. *Journal of Physiotherapy* 63: 94–100]

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## Introduction

Falls and movement disorders are both common and disabling in people living with idiopathic Parkinson's disease.<sup>1,2</sup> Over 60% of people with Parkinson's disease are predicted to fall at least once annually, and 50% are expected to have recurrent falls.<sup>3,4</sup> Falls lead to a loss of independence, reduced quality of life, and increases in morbidity, mortality, need for supported care, and care-giver burden.<sup>1,5,6</sup> The financial costs of falls are also substantial.<sup>7</sup> The annual direct costs of medical care for people with Parkinson's disease in the USA was USD12 164 higher than matched controls,<sup>8</sup> with falls being identified as a substantial contributor to increased costs.

Physiotherapy for people with Parkinson's disease aims to keep them moving, prevent falls, and enable them to remain living at home safely for as long as possible.<sup>9–12</sup> Pharmacological management of symptoms coupled with movement rehabilitation have shown promise for reducing falls and improving mobility.<sup>9–17</sup> Hospital and outpatient trials have reported positive effects for movement rehabilitation strategies such as cueing,<sup>18</sup> cognitive strategies that focus attention and avoid dual task interference<sup>19</sup> and progressive resistance strength training.<sup>20</sup> Despite this, exercises and movement rehabilitation therapy have received limited attention in the published literature.<sup>4,11</sup> This randomised, controlled trial aimed to compare the efficacy of an integrated physiotherapy exercise and rehabilitation program delivered in the

home with a placebo control group that received a non-specific life skills home-based program. The exercise program consisted of movement strategy training based on studies by Morris and Iansek,<sup>18,21</sup> progressive resistance strength training, and education on falls prevention and mobility. An integrated fall prevention program combining strengthening, cueing and education was provided, given the accumulating evidence for these interventions for Parkinson's disease.<sup>11,18,19</sup> The program was home based, so that participants would not have to travel and would presumably feel comfortable in their own premises.

Therefore, the research questions for this randomised, controlled trial were:

1. For people with idiopathic Parkinson's disease, does a 6-week, comprehensive, home exercise program reduce falls and disability and improve health-related quality of life?
2. Is the program cost-effective?

## Method

### Design

A randomised, controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis was conducted in the Melbourne metropolitan region, Australia. A study protocol with more detailed eligibility criteria and intervention descriptions was previously published.<sup>22</sup> Blinded assessors who were registered physiotherapists performed all of the assessments.

### Participants, therapists, centres

A total of 143 participants were assessed for eligibility and 133 were randomised into the study. Inclusion criteria were: idiopathic Parkinson's disease confirmed by a neurologist, modified Hoehn and Yahr (1967) stage  $\leq$  IV,<sup>23</sup> Mini Mental State Examination score  $\geq$  24,<sup>24</sup> and community dwelling. Exclusion criteria were: other health conditions that preclude safe participation in the exercise program, insufficient English to follow instructions, and unwillingness to be assessed and treated at home. Eligible participants were randomly allocated to either the experimental group or the control group. Randomisation was stratified according to referral source, and performed by an independent entity using a computerised random number generator.

### Intervention

#### Experimental group

The 6-week program included a weekly 60-minute individualised session delivered in the participant's home, supervised by a qualified and trained therapist who was guided by a physiotherapist. A physiotherapist also prescribed a weekly 60-minute unsupervised session via pre-printed, individualised worksheets that were explained to the participant by the treating therapist. Thus, the total dosage of therapy each week was 120 minutes for each of the 6 weeks.

People with Parkinson's disease are often very de-conditioned. Healthy adults typically receive up to 8 weeks of twice-weekly training to obtain strength gains. At the time of the trial design, 6 weeks of twice-weekly therapy was argued to be adequate for people with neurological impairments such as those with Parkinson's disease.<sup>25,26</sup> A position statement by the American Heart Association advised that 6-week interventions increased strength and endurance in people with cardiovascular problems.<sup>27</sup> The American College of Sports Medicine had similar advice with regards to progressive models of resistance training for healthy adults  $>$  60 years of age.<sup>28</sup> Moreover, a 6-week home program was thought to be feasible for people with Parkinson's disease.

The experimental program comprised three individualised components: progressive resistance strength training, movement strategy training, and education about methods with which to prevent falls. When the allocated 60-minute session was insufficient to complete all activities, the strength-training component was prioritised. The unsupervised sessions repeated activities from the therapist-guided sessions, with modifications made for specific individual needs or safety. To evaluate adherence and compliance with the experimental intervention, each participant recorded the activities that were performed, as well as perceived exertion for each session (therapist-guided and unsupervised), on pre-printed forms. Participants were monitored for adverse events during the intervention and follow-up periods, and requested to report any muscle soreness or joint stiffness from previous sessions. If this occurred, they were also asked to report whether they required any health service due to the adverse event.

For the unsupervised sessions, participants received an information pack containing a booklet with illustrations and descriptions of exercises, and a Modified Rating of Perceived Exertion scale.<sup>29</sup> They also received an exercise log book, a document with answers to frequently asked questions on strength training, a booklet of falls prevention,<sup>30</sup> and a standard help sheet from Parkinson's Victoria, listing support and resources.

#### Progressive resistance strength training

The strength-training component of the experimental intervention focused on the major muscle groups that are essential for functional gait and balance (quadriceps, glutei, hip abductors, hamstrings, gastrocnemius, soleus and trunk muscles). Strength training of these muscles was incorporated within step-ups, heel raises, sit-to-stand movements, standing hip abduction exercises, and trunk extension and rotation exercises. The American College of Sports Medicine guidelines were used to develop the training protocols, to ensure that the training stimulus and progression of resistance were optimal.<sup>28,31,32</sup> At each session, the participant aimed to complete at least three different exercises, each performed for two sets of eight to 12 repetitions, with a 2-minute rest between sets. Participants were able to progressively increase resistance by using a weighted vest, a resistance band, weights, or by altering their starting positions. The therapists trained the participants to perform exercises safely and with correct form, and assisted them in using the Modified Rating of Perceived Exertion scale.<sup>29</sup>

#### Movement strategy training

The movement strategy training component of the experimental intervention was derived from previously established techniques for people with Parkinson's disease.<sup>21,32</sup> These included the use of visual, auditory, cognitive or proprioceptive cues and attentional strategies to facilitate the ability of participants to initiate and execute daily activities. Visual cues included the use of white markers on the floor to step over, as well as written instructions. Auditory cues included metronome cues and rhythmical cues from music. The activities selected for movement strategy training and their rate of progression were based on individual abilities, needs, the home environment, and caregiver support. The daily activities included: standing up and sitting down; moving from chair to chair; standing and reaching; walking; walking whilst carrying objects; turning; and bed mobility.

#### Falls education

The falls education component of the experimental intervention was based on a booklet published by the Commonwealth of Australia entitled *Don't Fall for It! Falls Can Be Prevented*.<sup>30</sup> The booklet is a guide for the prevention of falls in older people, and contains information and advice on aspects of falls and safety. Topics include: risk factors, keeping mobile, medication, vision, safety in the home, and feet and footwear. Each session of the experimental intervention reflected the booklet content, with particular emphasis put on material relevant to the individual.

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