Balance training reduces fear of falling and improves dynamic balance and isometric strength in institutionalised older people: a randomised trial

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Question: What is the effect of a balance training protocol with the Biodex Balance System in institutionalised older people with fear of falling? **Design**: Randomised controlled trial with concealed allocation and assessor blinding. **Participants**: Forty older people who lived in a nursing home and had fear of falling. **Intervention**: The experimental group completed a 12-week balance training protocol based on balancing/rebalancing training with the Biodex Balance System, with two sessions per week. During the training period, participants in both groups received the same multidisciplinary care (such as physiotherapy, occupational therapy and nursing) that they usually received in the nursing home. **Outcome measures**: The primary outcome was fear of falling (Falls Efficacy Scale International questionnaire). Secondary outcomes were dynamic balance (Fall Risk Test) and isometric strength (torque of knee flexor and extensor isometric strength measured with an isokinetic dynamometer). Outcome measures were taken before and after the training program protocol. **Results**: Compared to the control group, the exercise group had significantly greater improvements at 12 weeks in fear of falling (by 8 points, 95% CI 4 to 12), in dynamic balance (by 2 degrees, 95% CI 1 to 3), and in isometric strength of the knee flexors (by 7 Nm, 95% CI 3 to 11) and knee extensors (by 7 Nm, 95% CI 1 to 13). **Conclusion**: The training program was feasible and effective in reducing fear of falling and improving dynamic balance and isometric strength in institutionalised older people with fear of falling. **Trial registration**: ISRCTN21695765. **[Gusi N, Adsuar JC, Corzo H, del Pozo-Cruz B, Olivares PR, Parraca JA (2012) Balance training reduces fear of falling and improves dynamic balance and isometric strength in institutionalised older people: a randomised trial. *Journal of Physiotherapy* 58: 97–104]**

Key words: Balance, Fear of falling, Ageing, Elderly, Nursing homes

Introduction

Falls are a major health problem for older people, with 30–35% of those who live in the community falling at least once a year (Granacher et al 2011, Rubenstein and Josephson 2002). However, falls incidence is about three times higher in institutionalised older people than those in the community (Cameron et al 2010). About 20% of falls require medical attention: 15% result in joint dislocations and soft tissue bruising and contusions, while 5% result in fractures, with femoral neck fractures occurring in 1–2% of falls (Granacher et al 2011, Kannus et al 1999). Fall-related injuries are also associated with substantial economic costs. Implementing effective intervention strategies could appreciably reduce both the risk and the rate of falling, decrease the incidence of falls, and reduce associated healthcare costs (Stevens et al 2006).

Gait and balance disorders are important immediate causes and high risk factors for falls in nursing homes (Rubenstein et al 1994), and contribute significantly to fear of falling (Gillespie and Friedman 2007). Moreover, people with high risk of falls or fear of falling may be reluctant or ineligible to participate in regular physical activity programs such as aerobics and walking outside. Therefore, starting physical activity programs in a safe environment is recommended as a first step to acquire sufficient self-confidence and fitness levels to avoid falls and fear of falls. To achieve this, it is deemed necessary to design intervention strategies to improve or maintain balance and gait, thereby minimising the number of falls and fear of falling in institutionalised older people. Furthermore, gait, balance, co-ordination, and functional task training are moderately effective in improving clinical balance outcomes in older people and these interventions are probably safe (Howe et al 2011). Therapeutic interventions aimed at improving balance and gait in this population also lead to improvements in fear of falling (Kuramoto 2006).

Previous research has demonstrated the effectiveness of stability training (Hoffman and Payne 1995), dynamic proprioceptive exercises (Sinaki and Lynn 2002), and balance with visual feedback training (Zijlstra et al 2010). Sensory information has an important influence on balance activity in older people (Stelmach et al 1989), and the integration of visual, vestibular, and somatosensory information is necessary to generate appropriate balance responses (Dichgans and Diener 1989). Increasing dynamic

What is already known on this topic: Falls are frequent among institutionalised older adults, resulting in substantial morbidity and healthcare costs. Training of gait, balance, co-ordination and functional tasks is moderately effective in improving balance and reducing fear of falling in older people.

What this study adds: Among nursing home residents with fear of falling, a 12-week balance training program using an unstable platform reduced that fear while improving dynamic balance and isometric leg strength.

balance leads to a reduced risk and fear of falling (Chang et al 2010, Legters et al 2006, Madureira et al 2010). During the last decade, the Biodex Balance System[a] has been used for the assessment of neuromuscular and somatosensory control and individual training for the maintenance of postural control and balance (BMS 2003). Although the Biodex Balance System has been used as an assessment tool in a range of different populations, to our knowledge, this device has not been specifically used in training older people. It is a relatively new instrument and there is only a limited amount of published data regarding its use. Thus, we hypothesised that an intervention based on exercises requiring weight shifts and balance/rebalance with the Biodex Balance System would improve the dynamic balance and reduce the risk and fear of falling. The research questions for this study were as follows.

In institutionalised older people with fear of falling:

1. Does a balance training program with the Biodex Balance System reduce fear of falling?
2. Does the balance training program improve balance and isometric strength?
3. What baseline characteristics are predictors of the change after the training period?

Method

Design

A randomised, controlled trial was performed to test the effectiveness of a balance training program using the Biodex Balance System platform in older people with fear of falling. The patient files were checked against the inclusion criteria and, prior to the initial assessment, eligible participants were randomised to either the balance training group or the control group by a research administrator using a random number table that was concealed from the recruiting investigator. All participants were assigned a code number. Participants were blinded to group assignment before baseline measurements, after which all participants were informed of their assignment. The intervention was administered by two research assistants. Researchers were also blinded to the group assignments of the participants throughout the measurements and intervention period. Three investigators conducted all the measurements and a further two researchers performed the statistical analysis. The study flow diagram is outlined in Figure 1.

Participants

Participants were recruited from a public nursing home for older people with low socioeconomic resources in Spain. Residents were without severe cognitive or physical impairments (ie, they were able to walk and transfer independently). The nursing home provides food and accommodation, social attention (eg, recreational opportunities or hairdressing in the centre), and basic primary care monitoring (eg, monitoring of patients' blood pressure and medication use). The nursing home has 158 residents. The physiotherapy management usually provided to residents includes general physical activity classes and management of specific orthopaedic, neurological or respiratory problems, but balance training is not routinely provided. The inclusion criteria for the study were: age of 65 years or over, residence in a nursing home, fear of falling, with a score > 23 for the 16 item Falls Efficacy Scale International questionnaire (Delbaere et al 2010), legal capacity to give informed consent, and ability to

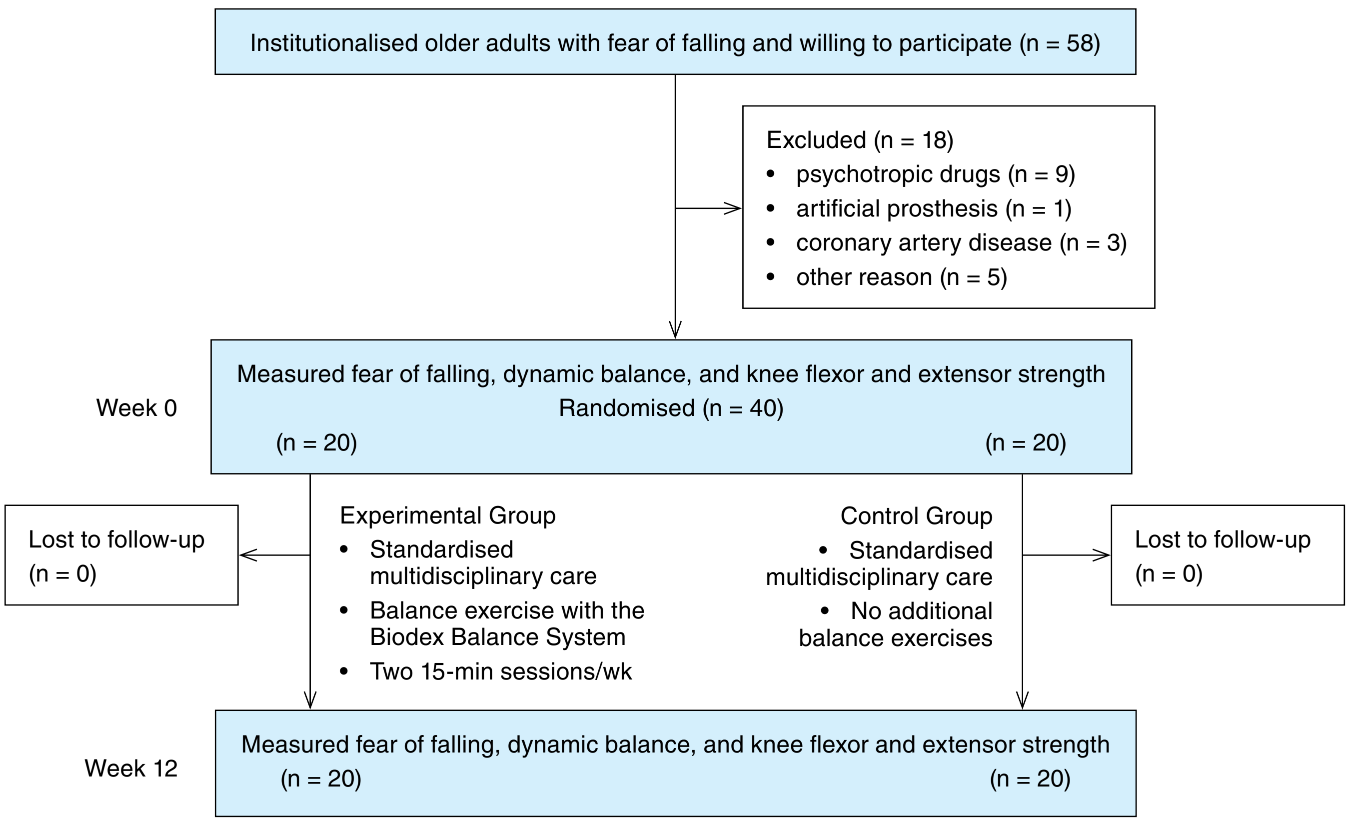

Figure 1. Design and flow of participants through the study.

Table 1. Balance training protocol.

Weeks	Platform stability level	Warm-up	Exercise 1		Exercise 2		Exercise 3	
			Rep	Rest	Rep	Rest	Rep	Rest
1–2	Static	5 min	3	10 s	3	10 s	2	40 s
3–4	12	5 min	3	10 s	3	10 s	2	40 s
5–6	11	5 min	3	10 s	3	10 s	2	40 s
7–8	10	5 min	3	10 s	3	10 s	2	40 s
9–10	9	5 min	3	10 s	3	10 s	2	40 s
11–12	8	5 min	3	10 s	3	10 s	2	40 s

Platform stability level: 12 is the minimum level of instability and 8 is the maximum level of instability used in the training program.
See Box 1 for an explanation of Exercises 1 to 3. Rep = repetitions.

understand instructions. The exclusion criteria were: artificial prosthesis, participation in any physical therapies other than those routinely provided in the nursing home, any symptom that a medical examiner deemed as warranting exclusion, any disease that contraindicated the exercise program or required special care (eg, coronary artery disease, thrombosis, moderate or severe bone, lung or renal diseases), and any disease requiring the daily intake of psychotropic drugs or affecting the vestibular system, in order to avoid any influence on balance measures.

Box 1. Content of the intervention.

Warm up: Walking at moderate speed, joint mobility exercises for the arms, hips and legs.

Exercise 1: Balancing/rebalancing and postural stability exercise with visual feedback. Participants maintained their center of gravity (projected on a computer screen) as close as possible to the center of the target. The exercise consisted of three series. In the first, the legs were semi-flexed at an angle of about 45 degrees at the knee joint; the feet were parallel and shoulder width apart. In the second series, the right leg was placed forward, maintaining knee flexion in both legs and in the third series, the left leg was placed forward. Participants could use their arms to rebalance or for safety if necessary. Each series of the exercise lasted 20 seconds.

Exercise 2: Balancing/rebalancing and postural stability exercise without visual feedback. The participant repeated the three series of Exercise 1, but with no visual feedback. Participants were positioned so that they could only see a white wall.

Exercise 3: Weight shift exercise. Participants had to displace their center of gravity above and below to the limits established by the Biodex Balance System. Six displacements outside the limits were required to complete the exercise, with the centre of gravity returning to the centre of the target between each displacement. Participants had visual feedback from the computer screen and they also were allowed to use their arms to rebalance or for safety if necessary. Participants performed two sets. In the first set, the right leg was placed forward and the target was inclined 45 degrees clockwise with respect to the vertical. In the second set, the left leg was placed forward and the target was rotated 45 degrees anticlockwise from vertical.

Intervention

During the training period, participants in both groups received the standardised multidisciplinary care (such as physiotherapy, occupational therapy, and nursing) available in public nursing homes in Spain. Participants in the experimental group received an additional exercise program involving exercises focusing on balancing/rebalancing and weight changes training with the Biodex Balance System for two sessions per week for 12 weeks. The training protocol is detailed in Table 1 and Box 1. The average time per session was 15 minutes, divided into a 5-minute warm-up, 3–4 minutes of exercise (variable time because some participants took longer than others in Exercise 3) and 5 minutes and 20 seconds of rest. After the warm-up, Exercise 1 was performed (with 10 seconds of rest between each series as shown in Table 1), followed by Exercises 2 and 3, with two minutes of rest between exercises. The stability of the platform was progressively altered (from static to dynamic) by reducing the level of the platform by one increment every two weeks (four sessions). Level 12 was the minimum level of instability and 8 was the maximum.

Outcome measures

Primary outcome: Fear of falling was the primary outcome of this study and was measured using the Falls Efficacy Scale International questionnaire, developed and validated by Prevention of Falls Network Europe. This questionnaire has become a widely accepted tool for the assessment of fear of falling (Yardley et al 2005) and has excellent reliability and validity (Yardley et al 2005) in different cultures and languages (Kempen et al 2007). It is a self-reported questionnaire that provides information on the level of concern about falls for a range of daily living activities. The original questionnaire contains 16 items and is scored on a four-point scale (1 = not very concerned to 4 = very concerned). Therefore the best possible value is 16 and the worst is 64.

Secondary outcomes: Dynamic balance and isometric strength were the secondary outcomes. Balance assessments were performed using the Biodex Balance System (the approximate cost was €12 000 or A$ 15 000). This system has previously been used in dynamic balance assessment and training (Aydog et al 2006). It is a multi-axial device that objectively measures and records the ability of an individual to stabilise a joint affected by a dynamic stress. It is a circular platform that moves freely and simultaneously about the anteroposterior and mediolateral axes. The Biodex Balance System allows up to a 20-degree tilt of the platform for feet, which allows maximal stimulation of the mechanoreceptors of the ankle joint (Arnold and Schmitz 1998). A high score indicates poor balance. The Fall Risk Test was performed to measure the dynamic balance index (BMS 1999) according to the manufacturer's instructions; it involves three assessments in the Biodex Balance System at Level 8. Participants were instructed to maintain the vertical projection with their centre of gravity in the centre of the platform by observing a vertical screen located 30 cm in front of their face. Each assessment took 20 seconds, with 10-second rest periods in between. Participants stood barefoot on the platform with eyes open and the Biodex Balance System was set to constant instability (Level 8). The average of the results from three trials was obtained. The index of overall stability is measured in degrees (where 0° is the best possible value and higher scores indicate poorer dynamic balance). Free use of the arms during the test was allowed for safety reasons and because it is more likely to be associated with episodes of imbalance in life, during which rebalancing is usually done with the whole body, including the arms, thus increasing the external validity of the test. The evaluation was performed before and after training. The reliability of the tests used in the present study was measured in the university laboratory using 10 of the study participants in a 7-day test-retest protocol. Overall, the ICC was 0.89 and the standard error of measurement (%SEM) was 17.3%.

Isometric strength was measured using the Biodex System 3[a]. This dynamometer is one of the more objective methods for quantifying human muscle strength and its validity and reliability and the reproducibility of results has been demonstrated in many publications (Dvir 2003, Feiring et al 1990, Wilk and Johnson 1988). Participants were seated and secured to the seat of the dynamometer such that the knee axis was in line with the axis of the dynamometer (Perrin 1993). Participants performed a test consisting of three knee flexion/extension isometric contractions with the dominant leg starting at 45° knee flexion. The dominant leg was identified by asking the subject to kick a ball (Ross 2004). Participants were verbally encouraged to exert maximal effort, with similar speech for all participants (Perrin 1993). Participants rested for 30 seconds between each isometric knee flexion and extension (Parcell et al 2002). This measurement was undertaken before and after training. Isometric peak torque (Nm) was obtained from the System 3 software for both flexion and extension.

The reliability of the tests in the present study was measured in our laboratory using 10 of the participants and a 7-day test-retest protocol. For the knee flexor isometric strength, the ICC was 0.95 and the %SEM was 6.1%. For the knee extensor isometric strength, the ICC was 0.97 and the %SEM was 6.1%.

Data analysis

The different variables were analysed at baseline using descriptive statistics, and the distribution of the data was examined using the Kolmogorov-Smirnov test with Lilliefors correction. After confirming that the distribution of all variables was parametric, the comparisons between groups were performed using a two-way analysis of variance for repeated measures. The significance level was set at $p < 0.05$ and all analyses followed the principle of intention to treat. Means, SDs and 95% CIs were provided to depict the change within each intervention group during the course of the study and the treatment effect. The mean and 95% CI were calculated using Student's t-test.

Three linear regressions were performed. The first was performed to determine how much of the change in fear of falling, as measured by the Falls Efficacy Scale International questionnaire, was predicted by the baseline characteristics of the participants. To introduce a new variable in the prediction model, a significance level below 0.05 was required. The second linear regression was performed to determine the strength of the correlation between the change in fear of falling and the change in the Falls Risk Test. The last linear regression was performed to determine the strength of the correlation between the change in the Falls Risk Test and the change in the isometric strength of the knee extensors.

A 7-day reliability study was conducted on the dynamic balance and strength variables in our study with 10 study participants. The relative reliability was determined according to the $ICC_{3,1}$ obtained from two sessions (Shrout and Fleiss 1979). The absolute reliability was determined by the SEM, which was defined as $SD*\sqrt{(1-ICC)}$, where SD is the average SD of Day 1 and Day 2 (Weir 2005).

We anticipated that a 5-point improvement in the Falls Efficacy Scale International score would be sufficient to move typical patients in our nursing home from their current categorisation as 'high concern' into the 'moderate concern' category (Delbaere et al 2010), which we considered a clinically important change. Anticipating a standard deviation of 8.5, we calculated that 47 participants would provide 80% power to detect a difference of 5 points as significant at a two-sided, 5% significance level. To allow for some loss to follow-up, we aimed to recruit 50 participants.

Effect size was used to determine the magnitude of change and was calculated as the difference in the mean change in each group divided by the average of the standard deviations. Cohen's coefficient was used to assess the change. A change from 0–0.2 was considered very small, a change of 0.2–0.6 was considered small, a change of 0.6–1.2 was considered moderate, a change of 1.2–2 was considered large, and a change of > 2.0 was considered very large (Batterham and Hopkins 2006).

Results

Flow of participants through the trial

Fifty-eight people expressed an interest in participating in the study during the recruitment period, and 40 were included. All 40 participants (20 experimental and 20 control) completed the measurement and intervention period (Figure 1).

The baseline characteristics of the participants are presented in Table 2 and in the first two columns of data in Table 3. The groups were comparable with respect to their demographic characteristics and their baseline values of the outcome measures.

Table 2. Baseline characteristics of participants.

Characteristic	Randomised	
	Control (n = 20)	Exercise (n = 20)
Age (*yr*), mean (SD)	76 (8)	76 (8)
Gender, n male (%)	5 (25)	6 (30)
Weight (*kg*), mean (SD)	74 (15)	75 (14)
Height (*cm*), mean (SD)	151 (6)	155 (8)
Body fat (%), mean (SD)	44 (5)	44 (6)

Compliance with the trial method

All experimental participants attended all balance training sessions and no participants in the control group attended any of the sessions. One participant from the experimental group became dizzy during training. The participant was checked by medical staff and found to have sustained no problems. The participant then completed the training session and continued with all other sessions. Complete data sets were obtained from all participants.

Effect of intervention

Group data for all outcomes are presented in Table 3. Individual participant data are presented in Table 4 (see eAddenda for Table 4). Fear of falling measured by the Falls Efficacy Scale International questionnaire improved 7 points (SD 7) in the experimental group but deteriorated by 1 point (SD 4) in the control group during the intervention period. The between-group difference in change in the Falls Efficacy Scale International questionnaire scores was a mean of 8 points (95% CI 4 to 12), which equated to a moderate effect size of 0.96.

Dynamic balance improved by 2.1° (95% CI 1.3 to 3.0) more on the Falls Risk Test in the exercise group participants after the balance training than in the control group participants over the same period (Table 3, individual patient data in Table 4). This equated to a moderate effect size of 0.86.

The effect of the balance training on isometric strength in the knee is also presented in Table 3 (individual patient data in Table 4). The exercise group had substantial improvements while the control group had minor deteriorations in strength. On average, the effect of the training was to increase knee flexor strength by 7 Nm (95% CI 3 to 11), which equated to a moderate effect size of 0.81. The increase in knee extensor strength of 7 Nm (95% CI 1 to 12) equated to a small effect size of 0.24.

Predicting the change after intervention

The regression analysis indicated that the initial Falls Efficacy Scale International and Falls Risk Test scores predicted improvements after training in fear of falling (Table 5). The regression model predicted 64% of the observed changes in the Falls Efficacy Scale International scores (Table 5). These improvements in fear of falling can also be explained (26%) by the improvement in dynamic balance after treatment (Table 6). Improvements in dynamic balance (29%) can be partly explained by the improvement in knee extensor isometric strength after treatment (Table 7).

Discussion

This study analysed fear of falling as the primary outcome after an exercise-based fall prevention intervention in institutionalised older people. The main findings were that the balance training protocol using the Biodex Balance System in institutionalised older people reduced their fear of falling and improved their dynamic balance and knee strength. The feasibility of this training protocol was also demonstrated in institutionalised older people with fear of falling by 100% adherence to the protocol in this population.

Fear of falling (Falls Efficacy Scale International score > 26) is a powerful predictor of falls (Ersoy et al 2009). Our results are consistent with other studies examining the effects of dynamic balance training on fear of falling. For example, participation in Tai-chi exercises by older people living in the community led to a 12% decrease in fear of falling measured with a 10-cm visual analogue scale (Lin et al 2006). In another study, a program of Tai-chi exercises induced an 11% reduction in fear of falling as measured by the Activities-Specific Balance Confidence Scale questionnaire (Sattin et al 2005). One study involving traditional balance training in a geriatric setting achieved a 3% decrease in fear of falling measured using the Falls Efficacy Scale International questionnaire (Hagedorn and Holm 2010). To our knowledge, the present study is the first to achieve a moderate effect size on fear of falling with only 30 minutes of balance intervention per week for 12 weeks.

The improvement in dynamic balance with the experimental intervention was consistent with the results of previous studies (Hoffman and Payne 1995, Sinaki and Lynn 2002). Orientation in space and maintenance of balance requires inputs from the vestibular, somatosensory and visual

Table 3. Mean (SD) of groups, mean (SD) difference within groups, and mean (95% CI) difference between groups for all outcomes.

Outcome	Groups				Difference within groups		Difference between groups
	Week 0		Week 12		Week 12 minus Week 0		Week 12 minus Week 0
	Exp (n = 20)	Con (n = 20)	Exp (n = 20)	Con (n = 20)	Exp	Con	Exp minus Con
Falls Efficacy Scale International questionnaire (*16-64*)	32 (9)	33 (7)	26 (6)	34 (7)	–7 (7)	1 (4)	–8 (–4 to –12)
Falls Risk Test (*deg*)	4.7 (2.4)	4.9 (2.5)	2.4 (1.9)	4.6 (2.5)	–2.4 (1.7)	–0.3 (0.8)	–2.1 (–1.3 to –3.0)
Knee flexor strength (*Nm*)	27 (10)	28 (8)	31 (10)	26 (7)	5 (8)	–2 (4)	7 (3 to 11)
Knee extensor strength (*Nm*)	80 (29)	72 (27)	86 (27)	72 (26)	6 (10)	–1 (7)	7 (1 to 12)

Exp = experimental group, Con = control group, FES-I = Falls Efficacy Scale-International, shaded row = primary outcome.

Table 5. Predictive model through a linear regression of the change in fear of falling after 12 weeks in institutionalised older people (n = 40).

Predictors	Model (R = 0.80)			
	R^2 = 0.64		R^2 corrected = 0.61	
	Beta	Standard error	Standardised Beta	*p*
Group[a]	–7.869	1.374	–0.571	< 0.001
Falls Efficacy Scale International (Week 0)	–0.577	0.102	–0.675	< 0.001
Fall Risk Test (Week 0)	0.853	0.346	–0.295	0.019
Constant	15.687	2.964	—	< 0.001

[a] experimental = 1, control = 0

Table 6. Linear regression model of change in fear of falling in institutionalised older people after 12 weeks (n = 40).

	Model A (R = 0.51)			
	Change in Falls Efficacy Scale International Model (R^2 = 0.26; R^2 corrected = 0.24)			
	Beta	Standard error	Standardised Beta	*p*
Change in Falls Risk Test	2.103	0.578	0.509	0.001
Constant	–0.132	1.235	—	0.916

Table 7. Linear regression model of change in dynamic balance in institutionalised older people after 12 weeks (n = 40).

	Model (R = 0.54)			
	Change in Falls Risk Test Model (R^2 = 0.29; R^2 corrected= 0.29)			
	Beta	Standard error	Standardised Beta	*p*
Change in knee extensor isometric strength	–0.097	0.025	–4.642	< 0.001
Constant	–1.090	0.236	—	< 0.001

systems, which is why many interventions incorporate the visual system. One study used a computerised visual feedback system with three infrared sensors that recorded body position together with four different games to train dynamic balance; this protocol led to a 5% improvement in dynamic balance measured by Dynamic Gait Index (Hagedorn and Holm 2010). In the present study, we used similar exercises that included visual feedback because vision is very important for the maintenance of postural control in older people (Perrin et al 1997). The moderate effect sizes reported in our study could be due to the feasibility of our intervention, the incorporation of both static and dynamic balance elements, the lower initial level of participants, and specific work on visual and proprioceptive components of balance.

The intervention also improved knee flexor and extensor isometric strength. Although the magnitude of the change was small, the changes in knee extensor isometric strength in our subjects may be important to explain the improvements in dynamic balance induced by the interventions. The participants had a deficit in knee flexor isometric strength at baseline compared with similarly aged, healthy, community-dwelling older subjects (Dvir 2003), but their isometric strength was partly restored after the training. The current protocol was not specifically designed to improve isometric strength in the participants, but the improvement in isometric strength in our older participants was an additional benefit. We therefore hypothesise that complementary strength training to improve posture-related muscle strength may be especially helpful in older people with low initial levels of knee isometric strength. Our findings are in accordance with other studies that have related balance and isometric strength (Cameron et al 2010). The findings suggest that monitoring leg strength could be important in determining further steps in progressive training protocols in persons with better baseline scores for strength, balance or fear of falling.

Fear of falling is associated with physical performance elements such as balance and strength (Deshpande et al 2008). In our study, a substantial amount of the improvement in fear of falling could be predicted by the initial dynamic balance and fear of falling of the participants. Participants with poor scores for these measures, particularly for dynamic balance, were the most likely to improve their fear of falling. Based on these results, it may be possible to predict which participants are most likely to respond positively after the intervention program.

We acknowledge some limitations in this study. The clinical trial registration did not specify a single primary outcome so the Falls Efficacy Scale was nominated *post hoc*. Many of the residents did not meet the inclusion criteria because they had additional health problems that prevented their inclusion in the study to avoid confounding variables or misinterpretations. As a result, we cannot be certain whether our findings can be extrapolated to all of the older institutionalised population. Similarly, the study population was restricted to institutionalised older people and therefore comparisons with older persons living in the community and even with those institutionalised in other residences should be made cautiously. In future studies, it will be important to analyse the extent to which our findings can be generalised to the broader older population and to determine whether the effects last beyond the end of the intervention period. Although we did not attain our calculated sample size, statistically significant results were identified on all outcomes, so the power was adequate to show that the effects observed are unlikely to be due to chance. However, the 95% CI around the effect on Falls Efficacy Scale International did not quite exclude the clinically important difference we nominated, although it would be enough to move typical patients in the experimental group from 'high' to 'moderate' concern category (Delbaere et al 2010).

This study investigated the efficacy of a balance training protocol designed to reduce fear of falling in institutionalised older people. The results demonstrated that the protocol, which utilised an unstable platform, was both feasible and effective in institutionalised older persons with fear of falling. We recommend that the intervention be implemented in institutionalised older people under professional supervision. ■

Footnote: [a]Biodex Medical Systems, Shirley, NY, USA.

eAddenda: Table 4 available at jop.physiotherapy.asn.au

Ethics: The study was performed according to the principles established with the Declaration of Helsinki (1964), as revised in 2000 in Edinburgh, and was approved by the Research Ethics Committees. All participants gave written informed consent before data collection began.

Competing interests: Nil

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