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## A novel approach to the issue of physical inactivity in older age

Anne Tiedemann\*, Leanne Hassett, Catherine Sherrington

The George Institute for Global Health, Sydney, Australia  
The University of Sydney, Camperdown, Australia

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## ABSTRACT

**Objective.** Well-designed exercise can prevent falls in older people but previous research indicates that promoting general physical activity may increase falls. This study aimed to evaluate uptake and adherence to a physical activity promotion and fall prevention intervention among community-dwelling people aged 60+ years.

**Methods.** This was a process evaluation of intervention group data from an ongoing randomised controlled trial. Participants were 38 Australian community-dwelling older people assigned to intervention group who had completed 3 months of a physical activity and fall prevention intervention. Study measures included baseline daily step count assessed by *Actigraph* accelerometers, 12 week follow-up step count assessed by *Fitbit* pedometers and rating of participant engagement with the health coaching intervention.

**Results.** 35 participants remained in the study at week 12 and were analysed. Mean daily steps significantly increased in week 12 compared with steps at baseline (change in mean = 1101 steps, 95% CI: 285–1917,  $p = 0.01$ ). Health coaching engagement was rated as high for 19 people (54%), medium for 12 (34%) and low for 4 people (12%). All participants used the *Fitbit* to provide feedback about daily activity.

**Conclusion.** The excellent intervention compliance and promising physical activity results demonstrate the acceptability and feasibility of this novel intervention.

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## Introduction

Despite the known benefits of physical activity across the lifespan, physical inactivity remains a major public health concern worldwide. People aged 60+ are the most inactive segment of society ([World Health Organisation, 2010](#)). This is despite the important role that physical activity plays in the prevention and control of chronic diseases that are particularly common in older age ([Australian Institute of Health and Welfare, 2012](#)).

Falls are a common and potentially devastating consequence of aging—often leading to ongoing disability and social isolation. Structured exercise that challenges balance is proven to prevent falls ([Gillespie et al., 2012](#)), however effective fall prevention exercise programmes are not likely to be of sufficient intensity or dose to also provide cardiometabolic benefits. Promotion of physical activity to this older cohort, however, is complicated by the possibility of increasing a person's risk of falling as a consequence of a more active lifestyle; this has been observed in several randomised trials ([Ebrahim et al., 1997](#); [Lawton et al., 2008](#)).

These issues of physical inactivity and fall risk in older age suggest a need for physical activity programmes for older adults to

include fall prevention components. Furthermore, in addition to recommending participation in 150 min of aerobic physical activity each week, physical activity guidelines recommend that older people at risk of falling should perform exercises to maintain or improve balance ([Nelson et al., 2007](#)). Achieving at least 7000 steps/day is approximately equivalent to older people taking part in 30 min of accumulated daily moderate-vigorous physical activity in addition to habitual daily activities ([Tudor-Locke et al., 2011](#)), and is in line with international guidelines on physical activity for health ([World Health Organisation, 2010](#); [Nelson et al., 2007](#)).

We have developed an intervention that combines a fall risk assessment and prevention approach with strategies and support to increase daily physical activity participation among older community-dwelling people ([Tiedemann et al., 2015](#)). This study aimed to describe uptake and adherence to the physical activity intervention in community-dwelling people aged 60+ years as well as evaluating impact in the intervention group.

The study questions were:

1. What proportion of study participants took up the intervention and were they more active at week 12 follow-up compared to baseline?
2. How well did study participants engage with the telephone-based health coaching?
3. Did the study participants use the *Fitbit* pedometer?

\* Corresponding author at: The George Institute for Global Health, Sydney, Australia.  
E-mail addresses: [atiedemann@georgeinstitute.org.au](mailto:atiedemann@georgeinstitute.org.au) (A. Tiedemann),  
[leanne.hassett@sydney.edu.au](mailto:leanne.hassett@sydney.edu.au) (L. Hassett), [csherrington@georgeinstitute.org.au](mailto:csherrington@georgeinstitute.org.au) (C. Sherrington).

## Methods

### Design

This study is a process evaluation of intervention group participant data from an ongoing randomised controlled trial (n = 130, ACTRN12614000016639) evaluating the effect of a tailored physical activity promotion and fall prevention intervention compared to advice brochure on objectively measured physical activity and goal attainment among community-dwelling older people (Tiedemann et al., 2015). The trial protocol was approved by the Human Research Ethics Committee at The University of Sydney, Sydney, Australia (approval number 2013/789).

### Participants

People were eligible for inclusion in the trial if they were: aged 60 + years; living at home; regular (weekly) users of the internet via a computer or tablet device; able to leave the house regularly (at least once per week) without physical assistance from another person.

Potential participants were excluded from participation if they: were “house-bound” (not having gone outside without physical assistance from another person in the past month); had a cognitive impairment (a diagnosis of dementia or a Memory Impairment Screen (Lipton et al., 2003) score of less than 5); had insufficient English language skills to fully participate in the programme; have a progressive neurological disease (e.g., Parkinson’s disease); had a medical condition precluding exercise (e.g., unstable cardiac disease); already met the Australian Physical Activity Guidelines for older adults (Australian Department of Health, 2014) (operationalised as 150 min of moderate intensity physical activity per week, assessed using the Incidental and Planned Exercise Questionnaire (Delbaere et al., 2010)) and had a falls risk assessment in the past year, since they may already be receiving the fall prevention intervention. All participants gave written informed consent to take part in the study.

### Intervention

Intervention group participants (n = 65) underwent a fall risk assessment (Tiedemann et al., 2010) and tailored, evidence-based fall prevention strategies were implemented. All participants were recommended to commence balance-challenging exercise to reduce fall risk (Sherrington et al., 2011). In addition, other fall prevention strategies that could be recommended, depending on performance in the fall risk assessment, included: medication review for people taking four or more prescription medications or for those taking any psychoactive medications (Pit et al., 2007; Campbell et al., 1999); and eye health review for people who had not recently consulted their ophthalmologist or optometrist (Harwood et al., 2005). Participants nominated two mobility-related goals and an individualised physical activity plan was formulated that aimed to increase overall physical activity and to achieve the specific goals set.

Telephone-based health coaching was delivered by four trained research staff with professional backgrounds in physiotherapy. The health coaching aimed to identify barriers and facilitators to physical activity participation, and provide education and support to assist participants to achieve their mobility-related goals over the six month period. The health coaching also supported the implementation of fall prevention strategies as indicated by the results of the fall risk assessment. Participants also received a pedometer enhanced with a web-interface (“Fitbit”, [www.fitbit.com/au](http://www.fitbit.com/au)) to give feedback on the amount of daily physical activity achieved. The *Fitbits* served as a motivational tool to encourage ongoing physical activity participation.

### Study measures

The measures included in the current study were: baseline daily step count recorded over 7 days prior to intervention commencement using an *Actigraph* triaxial accelerometer (Actigraph LLC, Pensacola, FL, US); the mean daily steps recorded by *Fitbit* pedometers during week 12 of the intervention; and the level of engagement with the telephone-based health coaching.

Health coaching engagement was subjectively measured by the health coaches with 3 possible ratings: high, medium or low. A rating of “high” was given if the participant initiated contact with their health coach every 2 weeks to discuss progress, setting of new goals and any barriers to the achievement of set goals. A “medium” rating was given if the health coaches needed to initiate the fortnightly contact with the participant but once that contact was made the participants responded well to the advice and support received. A “low” rating was given for participants that did not engage with the health coaching intervention.

### Statistical analyses

The mean daily steps recorded by the *Actigraph* accelerometers at baseline and by the *Fitbit* pedometers during week 12 were compared with a repeated measures t-test. Ratings of engagement with the health coaching service were summarised with descriptive statistics.

### Results

Thirty-eight participants were included in the study. Three people (8%) withdrew from the trial within the first 8 weeks: 1 person withdrew due to ill health and the other 2 people gave no reason. The characteristics of the remaining 35 people (mean age (SD): 67.7 (5.5), 23(66%) females) included in the analyses are shown in Table 1. Overall, almost one third of the sample had fallen in the past year and around 40% of people reported being fearful of falling and/or reported their balance as being only fair or poor.

Prior to intervention commencement, the mean daily step count recorded by the *Actigraph* accelerometer was 6775 steps (SD: 3231, range 1796–16,600). At 12-week follow-up the mean number of daily steps was 7876 steps (SD: 3025, range: 2717–14,338). This represents a statistically significant increase of 1101 steps overall (95% CI: 285–1917, p = 0.01). Furthermore, at the 12 week follow-up 20 people (57%) averaged more than 7000 steps/day, compared with just 13 people (37%) at baseline.

**Table 1**  
Characteristics of the Australian study participants (n = 35).

Characteristic	Mean (SD)
Age, years	67.7 (5.5)
Lives alone: n (%)	13 (37)
English spoken at home: n (%)	34 (97)
Accommodation type: n (%)	
House	20 (57)
Unit/independent living unit	15 (43)
Total medications <sup>a</sup>	3.0 (2.9)
Total co-morbidities <sup>b</sup>	3.3 (2.3)
Fallen in the past year: n (%)	11 (31)
Number of fall risk factors identified <sup>c</sup> : median (range)	1 (0–4)
Self-rated balance fair/poor: n (%)	15 (43)
Self-rated fear of falling ≥ moderate: n (%)	14 (40)

<sup>a</sup> Total number of prescription medications taken.

<sup>b</sup> Possible comorbidities recorded included: arthritis, osteoporosis, asthma, COPD/emphysema, angina/ischaemic heart disease/heart attack, congestive heart disease, hypertension, Parkinson’s disease, atrial fibrillation, stroke/TIA, peripheral vascular disease, diabetes mellitus, upper gastrointestinal disease, depression, cognitive impairment, anxiety/panic disorder, visual impairment, hearing impairment, cancer, and gout.

<sup>c</sup> Score out of a possible total of 8 on QuickScreen fall risk assessment.

Participants set a wide variety of goals ranging from wanting to improve their balance and strength to weight loss and improving overall fitness. All participants were offered access to the health coaching service, with the level of engagement rated as high for 19 people (54%), medium for 12 (34%) people and rated as low for 4 (12%) people.

All 35 participants used the *Fitbit* enhanced pedometer to provide feedback about daily activity and synchronised it to the internet-based software via their smart phone or computer to download the activity record at least once/week.

## Discussion

The study results demonstrate excellent intervention uptake, a low overall number of dropouts and a significant increase in average daily steps taken after 12 weeks of participation. These are promising signs of an effective physical activity promotion intervention over the longer term. It is widely documented that dropout from physical activity programmes mainly occurs during the first 3 months of a programme (Dishman, 1982; Oldridge, 1988) so these results are particularly encouraging.

More than half of the sample (54%) had a high level of engagement with the telephone-based health coaching, meaning that the participant initiated contact with their health coach every 2 weeks to discuss progress, setting of new goals and any barriers to the achievement of set goals. Furthermore, just over one third of the sample (34%) was rated as having a medium level of engagement with the health coaching intervention, and while the health coaches needed to initiate the fortnightly contact, once that contact was made the participants responded well to the advice and support received. These results demonstrate the definite potential of telephone-based health coaching for engaging older community-dwelling people in behaviour change strategies.

There are some limitations associated with the study results. The rating of engagement with the health coaching aspect of the intervention was a purely subjective rating from the point of view of the health coach and did not take into account the views of the individual participants. Further research to evaluate the impressions of the intervention from the point of view of the participants is planned. Additionally, the overall improvement in step counts at week 12 should be interpreted with caution since we used different devices to measure daily step counts at baseline (*Actigraph*) and week 12 (*Fitbit*), which weakens the validity of the results. This approach was necessary because *Actigraph* measured step count data were not available at the week 12 time point. Recent reports however have identified correlations in step counts between these two devices that range from  $r = 0.91$  to  $r = 0.97$ , indicating excellent measurement agreement (Tully et al., 2014; Gusmer et al., 2014).

## Conclusion

The excellent intervention compliance and promising physical activity results demonstrate that this novel intervention is acceptable and feasible for older people. It remains to be seen if this intervention can increase physical activity levels over the longer term without also increasing falls among the older participants.

## Conflicts of interest

The authors declare that there are no conflicts of interest.

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