

Educational Intervention for Reducing the Fear of Falling and Improving Balance in the Elderly: A Single Blind Randomized Controlled Trial

Narjes Nick¹, MSc; Iran Jahanbin^{1,2}, MSc; Peyman Petramfar³, MD; Fariba Ghodsbin¹, MSc; Sareh Keshavarzi⁴, PhD

¹Department of Community Health Nursing, Fatemeh School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran;

²Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Shiraz, Iran;

³Department of Neurology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran;

⁴Department of Epidemiology, Faculty of Health and Nutrition, Shiraz University of Medical Sciences, Shiraz, Iran

Corresponding author:

Iran Jahanbin, MSc; Department of Community Health Nursing, Shiraz University of Medical Sciences, Zand Avenue, Nemazee Square, Shiraz, Iran

Tel:+98 711 6474254; Fax: +98 711 6474252; Email: jahanbii@sums.ac.ir

Received: 29 June 2013 Revised: 4 August 2013 Accepted: 14 August 2013

ABSTRACT

Background

Falling is a major health threat for the elderly and has a significant impact on their well-being and quality of life. Yet, falls are preventable among the elderly. We sought to determine the effectiveness of an educational intervention in reducing the fear of falling and improving balance among the elderly visiting Jahandidegan center in Shiraz, Iran.

Methods

A preliminary study was conducted to determine the validity and reliability of the Modified Fall Efficacy Scale (MFES) for the Iranian elderly. Then, 40 individuals, 17 males and 23 females, between 60 and 74 years old were selected for the survey. The inclusion criteria were “MFES” score of less than 8 and Berg Balance Scale (BBS) score of less than 45. After completing the demographic questionnaire, MFES, and BBS, the participants were randomly allocated to the training or control groups. In the training group, each participant took part in one fall prevention class per week for 8 consecutive weeks. On the other hand, the control group received no interventions. BBS and MFES were completed immediately after the intervention. Finally, the data were analyzed using independent sample t-test and Chi-square test. Besides, $P < 0.05$ was considered as statistically significant.

Results

A statistically significant difference was found between the two groups regarding BBS and MFES mean scores (pre-post 8 weeks) ($P < 0.001$). The intervention reduced the fear of falling by 26.5% and improved balance by 4.3%.

Conclusion

The study results indicated that attending the training classes was effective in decreasing the fear of falling and improving the balance.

Trial Registration Number: IRCT201109127531N1

KEYWORDS: Aged; Postural Balance; Fear; Education; Accidental Falls

Please cite this article as: Nick N, Jahanbin I, Petramfar P, Ghodsbin F, Keshavarzi S. Educational Intervention for Reducing the Fear of Falling and Improving Balance in the Elderly: A Single Blind Randomized Controlled Trial. *IJCBNM*. 2013;1(4):208-215.

INTRODUCTION

According to World Health Organization (WHO) reports, 600 million individuals over 60 years old lived around the world in 2000 and this measure will be 1.2 billion in 2025 and almost 2 billion in 2050. Based on the same report, 7% of the Iranian population aged over 60 years in 2011.^{1,2} Usually after the age of 65, many systems and organs, including the neuromuscular system, undergo regressive changes in the elderly.³ Therefore, falling is one of the most important health problems among the elderly.⁴ Each year, about 30% of the community's elderly aging over 65 experience at least one fall. Among these falling accidents, 55–70% result in physical injury 20% of which require medical attention.⁵ The Center for Disease Control (CDC) estimates that the costs of fall related injuries are expected to reach 54.9 billion dollars by 2020.⁶

Impaired balance is one of the common causes of falling.⁷ To perform mobility-related activities, such as doing manual tasks while standing, rising from a chair, and daily walking, adequate balance control mechanisms are required. One third to one-half of the population older than 65 years report some difficulty with ambulation and keeping their balance.⁸ Fall is in fact a multi-dimensional problem among the elderly. Therefore, an individual's risk of falling cannot be assessed just by the physical risk factors, and other important aspects such as fear of falling have to be taken into account, as well.⁹

Fear of falling, affecting up to 60% of the 60-79 year old individuals, is a common consequence of falling. Nevertheless, it can also occur without a previous falling experience.¹⁰ Fear of falling has been linked to inadequate activity, low quality of life, increased risk of institutionalization, depression, decreased social activity, and physical weakness.¹¹ According to Zijlstar's study in the Netherlands, fear of falling has been reported to exist among 54.3% of the elderly population in which 37.9% reported lack of physical activity.¹²

However, falls are preventable among the elderly.¹³ In order to reduce the risk, prevention strategies should emphasize education, training, creating safer environments, prioritizing fall-related studies, and establishing effective policies.¹⁴ The elderly's awareness of falls and efforts to reduce such events should be increased and complemented by culturally relevant health education and promotion activities.¹⁵ Safety promotion includes i) raising awareness about the importance of preventing specific injuries (i.e., falls) and ii) changing the public values so that people no longer consider falling of the elderly as an unpredictable accident.¹⁶ The training program in the current study provided the opportunity for social interaction and discussions on the concerns related to falling and environmental hazards for fall.

This study aims to assess the effectiveness of an educational intervention in improving the balance and reducing the fear of falling in the elderly with fear of falling and impaired balance. To the best of our knowledge, this is the first study evaluating the effect of intervention on fear of falling in the elderly in Iran.

MATERIALS AND METHODS

The present single blind clinical trial was conducted in Shiraz, Iran. Design and protocol of the study is shown in figure 1. The study participants included the elderly who visited Jahandidegan center in Shiraz, southern Iran. This center is supervised by Shiraz Welfare Organization. It was established in 1997 and has various entertainment activities and classes for the old individuals.

Recruitment began in March 2011 and ended in June 2011. The researcher took part in the entertainment classes and announced the research program to the individuals asking for willing participants. The study was approved by the Ethics Committee of Shiraz University of Medical sciences, Shiraz, Iran.

CONSORT Flow Diagram

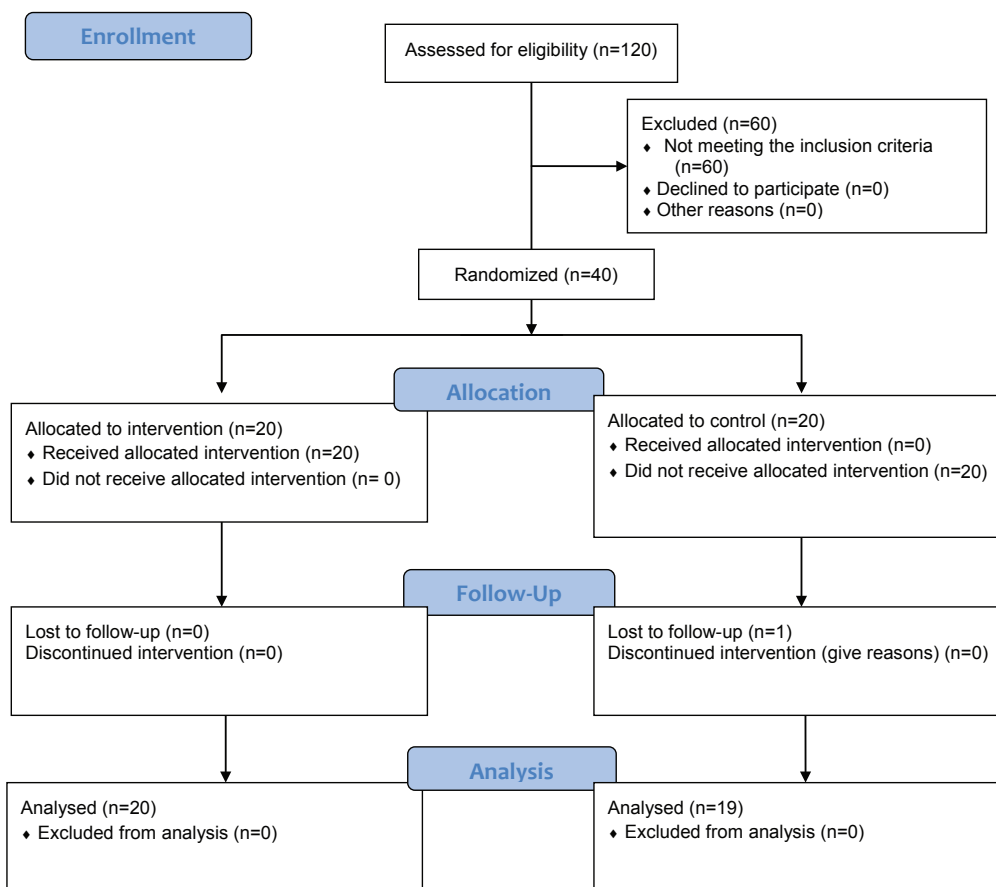


Figure 1: Diagram of design and protocol of the study.

First, to determine the validity and reliability of Modified Fall Efficacy Scale (MFES)¹⁷ for the Iranian elderly, a preliminary pilot study was carried out. The original questionnaire was translated into Persian by three professors of Nursing and Midwifery School, Shiraz University of Medical Sciences. The preliminary Persian version was then back translated into English by another translator who had enough proficiency in English language. To find the unclear phrases, the researcher discussed with two participants separately. In the next step, as approved by Shiraz Welfare Organization, 30 individuals aging between 60 and 74 years who were willing to participate in the pilot study were selected from Shiraz Jahandidegan Center to fill out the questionnaire twice with an interval of

three weeks. Then, Cronbach’s alpha and test-retest reliability were calculated.

Afterwards, the original study was performed. It should be mentioned that the participants who took part in the pilot study were not entered into the original study. The inclusion criteria were being 60–74 years old, MFES score of less than 8, Berg Balance Scale (BBS) score of less than 45, and being willing to participate in the study. On the other hand, the exclusion criteria of the study were missing more than two training sessions, suffering from cognitive–neuro–muscular diseases or advanced osteoporosis, dizziness, using anticonvulsive, narcolepsy, or sedative drugs, and dependence on walking aids.

All the study participants were asked to first sign the written informed consents and

then complete the MFES and the demographic questionnaire. MFES is a 14 activity questionnaire that is an expanded version of the original 10 activity Falls Efficacy Scale (FES). MFES includes outdoor activities which are not covered by FES. A 10 point visual analogue scale was used to score each item. The scoring criteria were as follows: 0=not confident/not sure at all, 5=fairly confident/fairly sure, and 10=completely confident/completely sure. Overall, the scores could fall between 0, 5, and 10. According to Hill's study, MFES has excellent reliability (ICC=0.93) and is internally consistent (0.95).¹⁸ In the pilot study that was conducted among the Iranian elderly, Cronbach's alpha coefficient was 0.92 for MFES. The results of test-retest also revealed MFES to have desirable reliability ($r=0.99$).

Moreover, the postural balance of each participant was measured by a research assistant using BBS. BBS includes 14 items developed to measure balance in old individuals. Each item is scored on a five-point scale ranging from 0 to 4. Accordingly, "0" and "4" indicate the lowest and highest levels of function, respectively. Thus, the total score of the scale is equal to 56. According to the study by Berg et al., Cronbach's alpha was 0.96 and inter- and intra-rater reliability for the test as a whole were 0.98 and 0.99, respectively.¹⁹ BBS also has excellent reliability (ICC=0.997) and is internally consistent (0.921) for the Iranian elderly population.²⁰

According to Hill's study, MFES scores of less than 8 indicate fear of falling, while 8 or greater scores indicate lack of fear.¹⁸ Furthermore, Thorbahn's study showed that the old individuals with BBS scores of higher than 45 were less likely to fall compared to those who scored below 45.²¹ Therefore, the individuals with MFES scores of less than 8 and BBS scores of less than 45 were selected for this study.

Among the 120 volunteered older adults, 40 met the inclusion criteria of the study. Among these participants, 20 were allocated

to the intervention and 20 to the control group. The study sample size was calculated by means of Power Analysis and Sample Size (PASS) program in NCSS software based on the previous related studies and considering $\alpha=0.05$ and $\text{power}=80\%$.⁷ Then, the participants were randomly assigned to either the intervention or the control group using block randomization.

The intervention group attended one-hour training classes once a week for 8 consecutive weeks. The classes involved both lectures and discussions and were guided through with handouts and worksheets. Each session began by giving a summary of the previous session and continued with the main topic of the session. The intervention program also engaged the participants in discussions about their concerns regarding falling and on topics pertaining to identifying and reducing the risk factors of falls, including environmental hazards in and out of the house, the importance of good nutrition and activity, proper footwear, and medication assessment to minimize the side effects. Overall, seven topics were covered during the classes. The titles of the training classes were physiological changes during aging (musculoskeletal system, visual system, auditory system, and central nervous system), fall risk factors, recommendations for prevention of falls, home safety, recommendations for appropriate diet, the importance of exercises, balance exercise, and summary. The control group, on the other hand, received no interventions, but received the content of the fall prevention classes as a booklet at the end of the study.

Finally, all the participants filled out the MFES and BBS immediately after 8 weeks.

Statistical analysis of the data consisted of both descriptive and inferential statistics. The results of descriptive statistics were expressed as mean \pm SD for continuous variables and as frequencies and percentages for categorical ones. In this study, chi-square test was used to compare the two groups regarding sex. In addition, the mean differences of age, height,

weight, and BMI were compared between the two groups using independent sample *t* test. Changes in MFES and BBS scores were also compared using independent sample *t* test. Besides, a P value of less than 0.05 was considered as statistically significant. All the analyses were performed using the SPSS statistical software (version19; SPSS Inc., Chicago, IL, USA).

RESULTS

Among the 120 volunteered participants, 40 met the inclusion criteria of the study. Thus, 20 participants were allocated to the intervention and 20 to the control group. However, one control group participant was excluded from the study because of not completing the questionnaires after 8 weeks.

The results of Chi-square test revealed no significant difference between the two groups regarding sex (P=0.86) (table 1). Also, independent sample *t* test showed no significant difference between the study groups concerning age, weight, height, and BMI (table 1). Overall, no significant difference was observed between the two groups with respect to the baseline characteristics.

As shown in table 2, the mean scores of fear of falling and BBS were similar in the two groups before the intervention.

However, a significant difference was found between the two groups' MFES scores after 8 weeks (P<0.001) (table 2). The mean of fear of falling increased about 1.49 in the intervention group after 8 weeks of intervention.

Moreover, the study results indicated a significant difference between the two groups' BBS scores 8 weeks after the intervention (P<0.001) (table 2). The mean of BBS increased about 1.70 in the intervention group after 8 weeks of intervention.

DISCUSSION

This study aimed to assess the effect of educational intervention on the postural balance and fear of falling in the old individuals with low BBS and MFES scores. The results of the study showed that the educational intervention improved the postural balance and reduced the fear of falling in the participants.

The results of independent sample *t* test revealed a statistically significant difference between the two groups regarding the MFES scores after the intervention. This result is consistent with that of other studies conducted on the issue,^{7,22} indicating the effectiveness of training classes in reducing the fear of falling. However, this study was conducted on both women and men and included a larger sample size compared to the study by Morris which

Table 1: Comparison of the baseline characteristics of the two groups

Groups	Training	Control	P value
Gender	9 male, 11 female	8 male, 11 women	0.86
Variable	mean±SD	mean±SD	
Age	67.45±4.89	68.79±4.81	0.40
Weight	70.70±11.65	68.89±14.18	0.67
Height	1.62±0.09	1.60±0.07	0.28
BMI	26.96±5.04	27.02±5.40	0.97

Table 2: Comparison of the variables between the study groups before and after the intervention

Group	BBS		MFES		Difference Pre-Post intervention	
	Pre-BBS	Post-BBS	Pre-MFES	Post-MFES	BBS	FOF
	mean±SD	mean±SD	mean±SD	mean±SD	mean±SD	mean±SD
Training	39.80±5.34	41.50±5.88	5.60±1.67	7.08±1.54	1.70±1.59	1.49±1.18
Control	39.79±4.40	38.63±5.96	5.34±1.54	5.13±1.69	-1.16±3.17	-0.21±0.88
P value					<0.001	<0.001

only involved women.⁷

Other researchers reported that screening and education in a health fair setting appeared to promote the behaviors that could reduce the risk of fall among the elderly. Of course, they recommended future studies to include a control group not receiving any educational intervention.²³

According to another study, home assessment, training regarding home hazards, and setting up the home safety devices did not significantly reduce the falls or fall injuries since the intervention strategies had a limited effect on the number of hazards in the intervention subjects' houses.²⁴

On the other hand, social support and communication about falling are important covariates of fear of falling which can provide effective strategies to improve mental well-being.²⁵ The results of another study showed that an educational intervention was not effective in reducing the fear of falling or the recurrent falls in community-dwelling patients.²⁶ This contrast may be due to the difference in the study protocol. In the mentioned study, the intervention group received brief printed educational materials with evidence-based recommendations on fall prevention in the Emergency Department without attending the classes. Therefore, the study participants were not involved in social interactions. In our study, however, the training program provided the opportunity for social interaction and discussion of concerns related to falling.

Although a significant difference was found between the two groups regarding the fear of falling score in this study, the intervention group's fear of falling mean score did not reach above 8. In fact, only 8 participants in the intervention group gained 8 or above scores. This might be due to the fact that fear of falling is not only related to physical characteristics and falls, but it is also associated with emotional and cognitive factors.²⁷ Therefore, more training sessions are needed to affect the fear of falling. Thus, further researches are recommended

to be conducted on the effect of educational interventions on the fear of falling.

In this study, balance was measured using BBS. The results of independent sample *t* test revealed a statistically significant difference between the two groups' BBS scores after the intervention. In spite of this statistically significant difference, the minimal detectable change was not reached. The minimal detectable change for determining a true change in the functional balance ranges from 4 to 7 points in BBS.²⁸ Yet, although the intervention was effective in improving the balance, further researches are required to confirm the effect of educational classes on improvement of balance in this age group. This is because of the fact that in the present study, the participants attending the educational classes had no physical activity until the sixth week and performed the balance exercises in the seventh and eighth weeks of the study. Therefore, it is recommended that both theoretical and practical training sessions be held simultaneously in each session.

This study had some limitations. First, more frequent balance training sessions in the intervention group could have had better impact on the postural balance. In addition, the study results cannot be generalized to all age groups since the study sample was limited to 60 to 74 year old individuals. Furthermore, the long-term effects of training classes is needed to be investigated by following the participants up and evaluating their behavior at least 3 to 6 months after the classes.

CONCLUSION

The findings of this study suggested educational classes as an appropriate intervention for reducing the fear of falling and improving the balance in the elderly. In comparison to other studies, the present study participants had low BBS and MFES scores at baseline. However, we suggest further investigation of the effect of mixed education and exercise interventions on the fear of falling and balance in the elderly.

ACKNOWLEDGEMENT

Hereby, the authors would like to express their sincere appreciation to those who helped in this endeavor such as the chief and staff of Jahandidegan Center and the participants of the study whose commitment was admirable. The authors would also like to thank the Research Vice-chancellor of Shiraz University of Medical Sciences for financially supporting this research which was done in partial fulfillment of the requirements for M.Sc. degree awarded to Narjes Nick. Thanks also go to Ms. A. Keivanshekouh at the Research Improvement Center of Shiraz University of Medical Sciences for improving the use of English in the manuscript.

Conflict of Interest: None declared.

REFERENCES

- 1 Ageing and life course. WHO Age-Friendly Environments Programme: World Health Organization. 2011. [Cited 18 December 2011]. Available from: http://www.who.int/ageing/age_friendly_cities/en/
- 2 WHO Statistical Information System (WHOSIS). World Health Statistics 2011: World Health Organization. 2012. [Cited 13 December 2012]. Available from: <http://www.who.int/whosis/whostat/2011/en/>.
- 3 Shamsipour -Dehkordi P, Asalnkhani MA, Shams A. Effect of physical, mental and mixed practices on the static and dynamic balance of aged people. *Sharekord University of Medical Sciences Journal*. 2011;12:71-77.
- 4 Zeeuwe PE, Verhagen AP, Bierma-Zeinstra SM, et al. The effect of Tai Chi Chuan in reducing falls among elderly people: design of a randomized clinical trial in the Netherlands [ISRCTN98840266]. *BMC Geriatrics*. 2006;6:6.
- 5 Logghe IH, Verhagen AP, Rademaker AC, et al. The effects of Tai Chi on fall prevention, fear of falling and balance in older people: a meta-analysis. *Preventive Medicine*. 2010;51:222-7.
- 6 Costs of falls among older adults. Centers for disease control and prevention. 2013. [Cited 2013 10/07]. Available from: <http://www.cdc.gov/HomeandRecreationalSafety/Falls/fallcost.html>.
- 7 Morris DM. An evaluation of yoga for the reduction of fall risk factors in older adults. ProQuest; 2008.
- 8 Zijlstra A, Mancini M, Chiari L, Zijlstra W. Biofeedback for training balance and mobility tasks in older populations: a systematic review. *J Neuroeng Rehabil*. 2010;7:58.
- 9 Lopes K, Costa D, Santos L, et al. Prevalence of fear of falling among a population of older adults and its correlation with mobility, dynamic balance, risk and history of falls. *Revista Brasileira De Fisioterapia*. 2009;13:223-9.
- 10 Harding S, Gardner A. Fear of falling. *Australian Journal of Advanced Nursing*. 2009;27:94-100.
- 11 Boyd R, Stevens JA. Falls and fear of falling: burden, beliefs and behaviours. *Age and ageing*. 2009;38:423-8.
- 12 Zijlstra G, Van Haastregt JC, et al. Prevalence and correlates of fear of falling, and associated avoidance of activity in the general population of community-living older people. *Age and ageing*. 2007;36:304-9.
- 13 Roland KP, Jakobi JM, Jones GR. Does yoga engender fitness in older adults? A critical review. *Journal of Aging and Physical Activity*. 2011;19:62-79.
- 14 Media centre . Falls. Fact sheet World Health Organization; [Cited 14 November 2012]. Available from: <http://www.who.int/mediacentre/factsheets/fs344/en/index.html>.
- 15 James K, Eldemire-Shearer D, Gouldbourne J, Morris C. Falls and fall prevention in the elderly: the Jamaican perspective. *West Indian Med J*. 2007;56:534-9.
- 16 Prevention of Falls and Injuries Among

- the Elderly British Columbia: Office of the Provincial Health Officer. B.C. Ministry of Health Planning; 2004 [cited 23 July 2013]. Available from: www.health.gov.bc.ca/library/publications/year/2004/falls.pdf.
- 17 Tinetti. Modified Falls Efficacy Scale: National Ageing Research Institute. adapted from Tinetti et al, 1990 [Cited 1 January 2013]. Available from: http://www.health.vic.gov.au/agedcare/maintaining/falls_dev/Section_b1f2_a.htm.
 - 18 Hill KD, Schwarz JA, Kalogeropoulos AJ, Gibson SJ. Fear of falling revisited. *Archives of Physical Medicine and Rehabilitation*. 1996;77:1025-9.
 - 19 Berg K. Measuring balance in the elderly: preliminary development of an instrument. *Physiotherapy Canada*. 1989;41:304-11.
 - 20 Davatgaran Taghipoor K. Translation and Validation of a Persian Version of Berg Balance Scale in an Iranian Elderly Population [MSc]. Tehran: University of Social Welfare and Rehabilitation Sciences; 2006.
 - 21 Bogle Thorbahn LD, Newton RA. Use of the Berg Balance Test to predict falls in elderly persons. *Physical Therapy*. 1996;76:576-83.
 - 22 Brouwer BJ, Walker C, Rydahl SJ, Culham EG. Reducing fear of falling in seniors through education and activity programs: a randomized trial. *Journal of the American Geriatrics Society*. 2003;51:829-34.
 - 23 Ness KK, Gurney JG, Ice GH. Screening, education, and associated behavioral responses to reduce risk for falls among people over age 65 years attending a community health fair. *Physical Therapy*. 2003;83:631-7.
 - 24 Stevens M, Holman CAJ, Bennett N, De Klerk N. Preventing falls in older people: outcome evaluation of a randomized controlled trial. *Journal of the American Geriatrics Society*. 2001;49:1448-55.
 - 25 Howland J, Lachman ME, Peterson EW, et al. Covariates of fear of falling and associated activity curtailment. *Gerontologist*. 1998;38:549-55.
 - 26 Rucker D, Rowe BH, Johnson JA, et al. Educational intervention to reduce falls and fear of falling in patients after fragility fracture: results of a controlled pilot study. *Preventive Medicine*. 2006;42:316-9.
 - 27 Schmid AA, Van Puymbroeck M, Kocejka DM. Effect of a 12-week yoga intervention on fear of falling and balance in older adults: a pilot study. *Archives of Physical Medicine and Rehabilitation*. 2010;91:576-83.
 - 28 Donoghue D, Stokes EK. How much change is true change? The minimum detectable change of the Berg Balance Scale in elderly people. *Journal of Rehabilitation Medicine*. 2009;41:343-6.