Research Article

Five-Times-Sit-To-Stand Test and Activities-Specific Balance Confidence Scale in Thai Fallers

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Abstract

The purpose of this study was to compare Five-Times-Sit-To-Stand (FTSTS) test and Activities-specific Balance Confidence (ABC) scale in Thai elderly people between faller and non-faller groups. One hundred and ten people had an independently physical activity in the community, dividing into two groups (n=55) based on their history of falls, fallers (mean age of 67.8±7.1 yr) and non-fallers (mean age of 66.9±5.7 yr). They completed a questionnaire and were evaluated with the FTSTS test and according to the ABC scale. All data were analyzed by chi-square and unpaired t-test. The results showed mean time of FTSTS in fallers (18.12 ± 4.17 sec) was significantly longer than that in the non-fallers (15.61 ± 4.24 sec) at p-value = .001. In contrast, the mean score of ABC scale in the fallers (63.8 ± 13.7 %) was significantly lower than that in the non-fallers (80.0 ± 11.0 %) at p-value < 0.001. We also found that some of the Thai elderly reported ABC scores of 0% while standing on a chair, walking on a wet floor or slippery slope and walking in the crowd because of their fear of falling. Thai people with history of falls not only take longer time of sit to stand but also have less confidence of balance in doing specific activities. These findings suggest that clinicians should educate the elderly people who have risk of falls to be mindful while performing specific activities to avoid falling.

Keywords: Thai Elderly; Fall Risk; Five-Times-Sit-To-Stand; Activities-Specific Balance Confidence Scale.

1. Introduction

Thai elderly 60 years of age and over are likely to increase in the future and has been reported to be increasing from 11% of the population in 2010to 15.30 % in 2014[1]. Degenerative physiological changes occur with aging in all systems. These changes include muscle weakness, gait and balance impairment resulting in a high risk of fall. Most falls occur in the elderly. Falls are commonly caused by intrinsic and extrinsic risk factors.[2-4]. Leg muscle weakness is one of the most important risk factors in the older people. Rubenstein LZ in 2006 [4] reported that the weakness of the leg muscles, impaired balance, and gait disorders were signs and symptoms in the elderly who have the risk of falls. Moreland et al in 2004[5]found that elderly with the weakness of leg muscles were more likely to fall than those with the weakness of arm muscles. The muscle weakness caused by the reduction of muscle tissue and bones in the elderly limits the elderly' s ability to perform daily activities and consequently increases the risk of falls and fractures. Accordingly, leg muscle weakness usually unnoticeably affect daily activities of the elderly including walking and rising from chairs [6-8].From previous studies, instruments available in the

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community for measuring muscle strength may be limited because this type of equipment is often expensive, takes up space, and is hard to use. The Sit-to-Stand (STS) test is a method to measure lower limb muscle strength by measuring the time taken to completely stand from a seated position. [6-10]. Studies have been reported that leg muscle strength was correlated with time taken to stand up from a chair [11]. In addition, weakness of the knee extensor muscles would be a limitation of STS performance [12]. While a single STS test may be considered or evaluated in individuals who had balance disturbance or slow movement due to stroke, a single STS test in the elderly with no known pathology might lead to a large variation in test results because they move faster. Many studies suggested that repetitive rising from a chair would be a consistent motion. Five-times-sit-to-stand (FTSTS) test has consistently proved to be a reliable functional tool [7, 13, 15].

The FTSTS test is used for measuring functional leg muscle strength and balance [6-7]. Lord et al. in 2002 reported that knee extension and knee flexion strength were independent predictors of five-times-sit-to-stand performance [7]. Buatois et al. 2008 reported elderly who experienced falls and had taken longer than 15 seconds in the FTSTS test were twice or more times at risk of falls than healthy individuals [13].The reliability of the FTSTS test conducted on older community-dwelling people was high as reported by the following studies regarding the test-retest results of the FTSTS test: Tiedemann et al. in 2008 [14] in which ICC = 0.890 and Bohannon in 2011 [15] in which ICC = 0.957. The FTSTS test also has high test-retest reliability when applied in healthy elderly people: ICC= 0.89 – 0.96 [7]. The following time taken to complete the FTSTS test in elderly people, sorted by age range, has been reported: 60-69 yr at 11.4 sec, 70-79 yr at 12.6 sec, 80-89 yr at 14.8 sec [16]. Whitney et al. in 2005 [17] reported that the time taken to complete the FTSTS test in older people with and without balance dysfunction was 13.4 sec and 16.4 sec respectively. Some studies considered that the FTSTS test was a screening test for the risk of falls among the elderly people [13].

Falls also affects the confidence level of the elderly in daily activities. Activities-specific Balance Confidence (ABC) Scale, a subjective measure of balance confidence while performing activities, is composed of a 16-item questionnaire. Each item is rated from 0% (no confidence) to 100% (complete confidence). Elderly people are asked to rate their confidence while performing mobility activities in daily living. Powell and Myers in 1995 [18] reported that test-retest reliability for ABC scale of elderly people was high: r = 0.92. Lajoie and Gallagher in 2004 [19] found that ABC scores less than 67 percent indicated a risk for falling in older adults. Whitney et al. in 2005 [17] reported that the total ABC scales in older people with and without balance dysfunction were 60.6 (%) and 88.0 (%), respectively.

Shin et al. in 2012 [20] reported that hip flexor, knee extensor, and ankle plantar flexor muscles in fallers were significantly weaker than those in non-fallers. The strength of lower extremity muscles is an indicator of the ability to stand up from a chair [7, 11]. Older people with balance dysfunction showed time taken of sit to stand longer than those without balance dysfunction. Lajoie and Gallagher in 2004 reported that the total ABC scales in fallers (48%) were lower than those in non-fallers (85%) [19]. In Thailand, elderly people who have experienced falls might take longer to get up from a chair and have less confidence of balance while doing activities. However, to the best of our knowledge, no studies have explored this connection. Therefore, the objective of this study was to compare five-times-sit-to-stand (FTSTS) test and the Activities-specific Balance Confidence Scale (ABCs) in Thai elderly people between the fallers and non-fallers.

2. Materials and methods

2.1 Subjects

One hundred and ten community-dwelling Thai elderly people living in Bangkok and PathumThani province participated in this study. Each individual was explained about the study protocols before signing the informed consent form to participate in the study. They were divided according to the history of falls during the previous 6 months into two groups: fallers (n=55) and non-fallers (n=55) groups. A fall was defined as any event that led to an unplanned, unexpected contact with a supporting surface [21]. The faller group comprised the elderly who had a history of 2 or more falls in the previous 6 months. This study excluded people who had only 1 fall within 6 months. In contrast, the non-faller group comprised the elderly who never had a fall. The inclusion criteria were as follows. A subject must be at least 60 years old, living independently in the community, able to walk without any assistive device, able to follow simple instructions, and must have had no injuries of leg muscles and joints during the past 6 months. The exclusion criteria in this study were as follows: musculoskeletal, cardiovascular, neurological and balance disorders, as well as pain of both legs during the study. The study protocol was approved by Human Research Ethics Committee from Faculty of Allied Health Sciences, Thammasat University.

2.2 Procedure

After signing the informed consent form, each subject completed a general health questionnaire with the general information such as age, physical activity, exercise, medical history, current medical conditions, and history of falls. Before starting data collection, researcher informed and demonstrated the process of the FTSTS test to the subjects. Then, subjects were asked to sit on an armless chair with 43-cm seat height [22]. Their arms were crossed in front of their chest. The left hand was on the right shoulder, and the right hand was on the left shoulder. Next, the subjects were asked to perform 2 trials of the FTSTS test. Each trial was consisted of five repetitions of a subject continuously getting up from a chair into a full standing position defined by a full hip and knee extension and returning to a seated position as quickly as possible. The subjects stood up from a chair when given a "start" and sat back on the chair, then continued sit-to-stand and stand-to-sit movements until the 5th iteration ending in a standing position. The researcher said "stop" the moment the subject's buttocks reached the seat. Time taken in the FTSTS test of each trial was recorded. A 1-minute break was taken between trials. The average time from two trials for each subject was used in data analysis.

Next, subjects were asked to rate their confidence while performing common daily activities by using the Activities-specific Balance Confidence Scale (ABC). The ABC scale is a self-report measure of balance that includes 16 items of activities in daily living such as transferring, bending, reaching, or walking. The researcher asked "How confident are you that you will not lose your balance or unsteady when you perform activity. The rating scale of each item ranges from 0 to 100 where 0 indicates no confidence and 100 indicates a complete confidence. The total score is calculated by adding up all of the item scores for that subject and dividing the sum by 16.

2.3 Data analysis

Data were analyzed statistically using the SPSS program for Window. The Kolmogorov-Smirnov test was used to determine normal distribution of data. Time taken to complete FTSTS, scores of ABC, age, body mass index (BMI) were normally distributed data. We used an independent t-test to compare the means between groups. In addition, gender, exercise regularly, medical conditions, number of medications taking, dizziness, vision problems, and corrected vision problems were categorical data using Chi-square test so as to examine the

differences between groups. The level for statistical significance was set at the p-value of less than 0.05.

3. Results

3.1 Demographic characteristics

There were no significant differences in age and BMI between groups. This study also found that number of female, exercises regularly, medical conditions in faller group were significantly greater than those in non-faller group. In addition, the number of medications taking (≥4 medications) in the faller group was significantly greater than the number of those in the non-faller group. This study also found that the percentage of people who had a history of dizziness in the faller group is significantly higher than that in the other group. There were also significant differences in the number of visual problems and correction of visual problems between those two groups. These resultswere illustratedin Table 1.

Table1. Demographic Characteristic of Thai Elderly Fallers and Non-fallers**.**

Variables	**Fallers (n=55)**	**Non-fallers (n=55)**	***p*-value**
Age (years) [a]			.331
Mean ± SD	67.6 ± 5.9	66.5 ± 5.6	
Range	60 - 80	60 - 79	
Gender (n) [b]			<.001**
Female	41	28	
Male	14	27	
BMI (kg/m^2)[a]			.547
Mean ± SD	24.7 ± 3.5	24.2 ± 4.2	
Range (min-max)	14.8 - 32.4	18.0 - 37.5	
Exercises regularly (%) [b]			.005*
Yes	41.8	60	
No	58.2	40	
Medical conditions (%)[b]			<.001**
Yes	81.8	76	
No	18.2	24	
Number of medications taking (%)[b]			<.001**
0	12.7	14.6	
1	36.4	47.3	
2	25.5	18.2	
3	16.4	16.4	
≥4	9.1	3.6	
Dizziness (%) [b]			.016*
Yes	54.6	38.2	
No	45.5	61.8	
Vision problems (%) [b]			<.001**
Myopia	5.6	7.0	
Hypermetropia	42.6	51.9	

Cataract	24.1	10.9	
Pinguecula	7.9	13.8	
Normal	20.4	16.5	
Vision correction (%)[b]			.019*
With eye glasses	66.7	70.6	
Without eye glasses	4.8	9.3	
Cataract surgery	23.8	18.0	
Usual care	5.5	2.7	

*p<0.05, **p<.001 significant difference between groups, [a] independent t-test, [b] Chi-square test

3.2. Five-times-sit-to-stand test and Activities-specific Balance Confidence scale of Thai elderly fallers and non-fallers

There were significant differences in sit-to-stand performance between fallers and non-fallers in this study. The Thai elderly who have history of falls spend significantly longer time to stand up from a chair than Thai elderly non-fallers at p = .001 for the FTSTS test. The mean and standard deviation (SD) of time taken to complete the FTSTS test was 18.13 ± 4.08 sec in fallers and 15.61 ± 3.93 sec in non-fallers. Furthermore, the total score of confidence levels of balance while performing daily activities (ABC scale) in the fallers (63.8 ± 13.7 %) was significantly lower than that in non-fallers (80.0 ± 11.0 %) at p< .001.The results were displayed in Table 2.

Comparing the balance confidence level of the Thai elderly while performing activities for each item in the ABC scale, we found that fallers had significantly lower balance confidence levels than people have never fallen at p < .001. Some of the activities could impose a risk of falling such as standing on a chair and reaching for something (ABC item 6), walking up or down a ramp (ABCitem 11), bumped by people as the subject walks through a mall (ABCitem 13), walking outside on a slippery footpath (ABC item 16). Elderly people in both groups had low score for these items compared to other items. However, the scores for the balance confidence levels of the items for fallers were significantly lower than those for non-fallers as shown in Table 3.

Table2. Comparison of Five-Times-Sit-To-Stand Test and the ABC Scale between Fallers and Non-fallers**.**

Parameters		**N**	**Min - Max**	**Mean**	**Std. Deviation**	**p-value**
FTSTS	Fallers	55	10.35 – 29.50	18.13	4.08	.001*
	Non-fallers	55	7.71 – 27.12	15.61	3.93	
Total ABC	Fallers	55	38.8 - 95.0	63.8	13.7	<.001**
	Non-fallers	55	53.8 - 97.5	80.0	11.0	

*p<0.05, **p<.001 significant difference (independent t-test)

Table3. Comparison of Activities-specific Balance Confidence between Fallers and Non-fallers.

Activities-specific Balance Confidence	Fallers	Non-fallers
1. Walk around house (ABC1)*	78.4 ± 24.1	93.2 ± 9.5
Range	0–100	60–100
2. Walk up or down stairs (ABC2)*	61.7 ± 27.3	83.6±14.2
Range	0–100	50–100
3. Bend over and pick up from closet floor (ABC3)*	69.1 ± 21.5	84.8 ± 14.5
Range	10-100	50-100
4. Reach for small box off a shelf at eye level (ABC4)*	70.6 ± 21.2	89.5 ± 12.0
Range	20–100	60-100
5. Stand on tiptoes and reaching above head (ABC5)*	58.2 ± 25.9	76.9 ± 17.2
Range	0–100	20-100
6. Stand on a chair and reaching for something (ABC6)*	40.7 ± 27.3	66.8 ± 20.3
Range	0-90	10-100
7. Sweep the floor (ABC7)*	83.6 ± 18.7	94.1 ± 9.6
Range	20-100	70-100
8. Walk outside house to a car parked in driveway (ABC8)*	75.2 ± 23.8	86.9 ± 13.4
Range	10-100	50-100
9. Get in or out of car (ABC9)*	61.4 ± 17.9	78.4 ± 18.8
Range	30-100	40-100
10. Walk across a parking lot to a mall (ABC10)*	70.6 ± 19.9	88.8 ± 12.8
Range	20-100	50-100
11. Walk up or down a ramp (ABC11)*	53.8 ± 22.8	73.0 ± 19.7
Range	0–100	20-100
12.Walk among the crowd where people rapidly walk by (ABC12)*	71.6 ± 20.6	85.4 ± 12.6
Range	0–100	50-100
13. Bumped by people as walking through mall (ABC13)*	50.7 ± 24.5	69.1 ± 18.9
Range	0-90	30-100
14. Step on/off escalator while holding on railing (ABC14)*	64.0 ± 25.3	79.4 ± 16.6
Range	0–100	30-100
15. Step on/off escalator with holding a box that cannot hold on railing (ABC15)*	52.3 ± 24.9	70.6 ± 18.3
Range	0–100	30-100
16. Walk outside on slippery footpath (ABC16)*	34.7 ± 25.3	62.7 ± 20.0
Range	0–100	10-100

*$p<.001$ significant difference (independent t-test), ABC items modified from Powell LE and Myers AM 1995 [18]

4. Discussion

The objective of this study is to compare the time taken to repeatedly stand up from a chair and the level of confidence in balance while performing activities (ABCs) between Thai fallers and non-fallers. The results showed that there were no differences for age and BMI between fallers and non-fallers. This might be because of the similarity of age, weight, and height of all the subjects. However, the ratio of female to male in the faller group was significant greater than

that in the non-faller group. It is consistent with previous studies possibly because elderly women have limitations in terms of postural control under stressing balance conditions which correspond to greater frequency of falling. Therefore, elderly females are more likely to fall than male [3-4, 21, 23]. In addition, medical conditions, and the number of medications being taken (≥4 medications) in the faller group is significantly greater than the number of those in the non-faller group. The results of this study is also agree with those from previous studies which reported that older adults taking more than three to four medications have more higher risks of recurrent falls [4-5]. Most of the people in both groups of our study have underlying conditions of hypertension, diabetes mellitus, hyperlipidemia, particularly in the faller group. Moreover, the number of people who exercise regularly in the faller group (42%) is less than that in the non-faller group (60%). This is because some of them said they were afraid of exercise due to fear of falling and feeling loss of balance during exercise. This may come from the side effects of various medications taken in the faller group. In this study, some individuals in the non-faller group regularly perform balance exercise such as dancing and Tai Chi which may contribute to their good balance. Allison in 1995 [24] mentioned that good balance is the ability to maintain the body's center of gravity under the base of support in various activities. In addition, in faller group, the number of people who have history of dizziness while changing posture (55%) is greater than that in the non-faller group (38%). One reason would be the side effects from taking multiple medications. Moreover, our results found that group of people with cataract is greater in number in fallers (24.1%) than in non-fallers (10.9%) and might have greater risk of falls due to the vision impairment. Furthermore, we found that the number of cataract surgery in fallers (23.8%) was also greater than in non-fallers (18.0%). This alarms us of increasing fall risk after cataract surgery. Meuleners et al. in 2013 [25] suggested that the elderly need to be careful of falling particularly after their first cataract surgery because of the impaired vision due to the limitation that only one eye is functioning well during the healing period which lasts until the second surgery can be performed.

4.1 Five-times-sit-to-stand performance of Thai elderly fallers and non-fallers

The mean time to complete five consecutive sit-to-stand movements was 18.13 ± 4.08 sec in fallers and 15.61 ± 3.93 sec in non-fallers. Our result showed that the time taken for the FTSTS test among fallers was significantly longer than the time taken among non-fallers. This may be because of the side effects from multiple medications taken by people in the faller group which results in loss of balance and the sluggish movements during the FTSTS test in our study. Additionally, the levels of balance confidence while performing the activities of seniors in the faller group are lower than those in the non-faller group. This is consistent with the finding of Whitney et al. in 2005 [17] that older people with balance dysfunction spent longer time to complete the FTSTS test than the people without balance dysfunction did. In contrast, Lord et al. in 2002 [7] reported that the mean completion time of the FTSTS test among community-dwelling older people over 75 years of age was 12.8 ± 5.9 sec. We cannot compare our results to the study of Lord because the level of physical activity and the life style of the elderly in our studies might be different from theirs.

As mentioned above, Thai elderly people in this study are more likely to get up from a chair slower than those in previous studies in the literature, particularly fallers. They reported a fear of recurrent falling and loss of balance confidence if they move too fast.We, however, are unable to assume that muscles strength of elderly people in this study is weaker than that in previous studies because our study did not measure lower extremity muscle strength from hand-held

dynamometer. Our study demonstrated that Thai fallers in this study had a lower sit-to-stand performance than the non-fallers suggesting that the fallers may have a decrease in functional leg muscle strength.

Nevertheless, Lord et al. in 2002 [7] and Lomaglio and Eng in 2005[11] reported that the strength of knee muscles and ankle dorsiflexor muscles was an indicator of the ability to stand up from a chair. Buatois et al. in 2008[13]stated that elderly who have experienced falls and who took longer than 15 seconds in their FTSTS tests were twice or more times at risk of falls than healthy individuals. It is possible that Thai elderly fallers in this study who took about 18.13 ± 4.08 sec might have a risk of fall. According to Nevitt et al. in 1989 [26] reported that changing posture from sit to stand in older adults who spend a long time to stand up from a chair might be at high risk of fall. This finding is in agreement with previous studies about the consequences of falls such as history of falls, leg muscle strength, balance impairment, and fear of falls in older people [2-5].

4.2 Activities-specific Balance Confidence (ABC) Scale between Fallers and Non-fallers

This result revealed that elderly people living in the community had the mean score of ABCs of 63.8 ± 13.7(%) in fallers and 80.0± 11.0(%) in non-fallers. The balance confident scores while performing activities in the faller group were significantly lower than those in the non-faller group. We found that individual in the faller group who slowly got up from a chair also reported low scores of balance confidence while performing activities. Additionally, the number of the elderly who had dizziness among the fallers (55%) was greater than that among the non-fallers (38%). They also reported in the questionnaire that they feel dizzy while changing posture. One reason would be the side effects from taking multiple medications from Table 1. We found there were more people with underlying health conditions such as diabetes, hyperlipidemia, and hypertension among the fallers (81.8%) than among the non-fallers (76.4%). According to previous studies, elderly people taking four or more medications together were likely to be at risk of falls because of drowsiness, dizziness, postural hypotension, blurred vision [23, 27]. Moreover, our results found that there were more people with cataract in fallers (24.1%) than the non-faller group (10.9%) and that these people might have a greater risk of falling due to vision impairment. Furthermore, we found that the number of cataract surgery in the faller group (23.8%) was also greater than in non-fallers (18.0%) leading us to be more concerned with the fall risk after cataract surgeries.

Shumway-Cook et al. in 2000 [21] reported that the mean of the ABC scores in fallers was 53.84+-17%, which is lower than the figure observed in our study. We suspect that the reason is that the subjects in the study of Shumway-Cook were frail, older adult who had experienced falls more than twice before the experiment commenced. Lajoie and Gallagher in 2004 [19] studied elderly people with age 75.5 yr. (fallers), and 73.8 yr. (non-fallers) and found the total score on the ABC scale to be significantly lower in fallers (48%) than in non-fallers (85%). This finding is consistent with our results. From studies [13-14], people with experience of fall might take longer to complete the FTSTS test than those who have never fallen.

In addition, participants in faller group reported that they had no balance confidence in some items of the ABC assessment scale compared to other items including standing on a chair and reaching for something (ABCitem 6), walking up or down a ramp (ABCitem11), getting bumped by people while walking through a mall (ABCitem13), and walking outside on a slippery footpath (ABCitem 16). There were a number of older people in the faller group who reported no balance confidence (ABC

score = 0%) while walking up and down stairs (8%), walking on the ramp with slippery or wet floors (6%) or walking in a crowded place (11%). In contrast, in the non-faller group, nobody reported the ABC score of 0% for any items. From our results, it is possible that older people who have experienced previous falls would have low confidence of balance particularly in standing on a chair and reaching for something (ABCitem 6), walking up or down a ramp (ABCitem11), getting bumped by people while walking through a mall (ABCitem13), and walking outside on a slippery footpath (ABCitem 16). Moreover, participants in the faller group reported that they have no balance confidence in some items of the ABC assessment scale compared to other items including standing on a chair and reaching for something (ABCitem 6), walking up or down a ramp (ABCitem11), getting bumped by people while walking through a mall (ABCitem13), and walking outside on a slippery footpath (ABCitem 16). There were a number of older people in the faller group who reported no balance confidence (ABC score = 0%) while walking up and down stairs (8%), walking the ramp with slippery or wet floors (6%) or walking in a crowded place (11%). In contrast, in the non-faller group, nobody reported the ABC score of 0% for any item. From our results, it is possible that older people who have experienced previous falls would have low confidence of balance particularly in standing on a chair and reaching for something (ABCitem 6), walking up or down a ramp (ABCitem11), getting bumped by people while walking through a mall (ABCitem13), and walking outside on a slippery footpath (ABCitem 16). The elderly with previous falls showed low scores of balance confidence during these activities might feel that their leg muscles were not strong enough to hold their legs and trunk while standing on a chair, and walking on a ramp with slippery or wet floors. Moreover, some of them may have felt a loss of balance while performing activities. This feeling may have stemmed from the side effects of various medications taken in the faller group.

Some seniors feel the fear of falling while walking outside the house with slippery floor, especially when wearing sandals. In a recent study, Menz et al. in 2006[28]reported that walking barefoot or putting on socks might lead to slipping or stumbling in the home and that wearing shoes with heels might cause a stumble on the surface level leading to fall. In addition, some people who have vision problems feel the loss of confidence in balance while walking on rough surfaces.Lord in 2006 [29] reported that the older people with impaired vision might be vulnerable to falls and fractures caused by flawed detection of ground-level hazards. A contribution of this study is to remind Thai elderly people who had experienced falls to be careful while performing activities whether indoor or outdoor to prevent risk of recurrent falls. However, a limitation is that the elderly in this study from Bangkok and suburban are not representative of the entire population. We recommend that further study focus on factors that affect falls in the elderly.

5. Conclusion

Time to complete a sit-to-stand performance is significantly longer in fallers than in non-fallers. The mean time required to complete the FTSTS test in fallers is 18.13 ± 4.08 sec and is 15.61 ± 3.93 sec in non-fallers.

Thai elderly who have history of falls have the ABC scale mean score of 63.8 ± 13.7for fallers and 80.0± 11.0 for non-fallers. In addition, some activities such as standing on a chair and reaching for something (ABC item 6), walking up or down a ramp (ABC item 11), getting bumped by people while walking through a mall (ABC item 13), and walking outside on a slippery footpath (ABC item 16) correspond to lower levels of confidence while the subjects perform the activities.

Clinical implication

Longer time for a sit-to-stand movement in this study might inform clinicians about the decrease in sit-to-stand performance. Additionally, people with history of falls not only take longer time for a sit-to-stand movement but also have less confidence of balance in doing specific activities.

6. Acknowledgment

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7. References

[1] Mahidol University. Institute for Population and Social Research 2014

[2] Jittapunkul, S., Songkla, M., Chayovan, N., Chirawawatlarl, A., et al. Falls and their associated factors: a national survey of the Thai elderly. J Med Assoc Thai, Vol. 81, pp. 233-242, 1998.

[3] Assantachai, P., Praditsuwan, R., Chatthanawaree, W., Pisalsarakij, D., Thamlikitkul, V. Risk factors for falls in the Thai elderly in an urban community. Med Assoc Thai, Vol. 86, pp. 124-130, 2003.

[4] Rubenstein, L.Z., Josephson, K.R. Falls and Their Prevention in Elderly People: What Does the Evidence Show? Med Clin North Am, Vol. 90, pp. 807–824, 2006

[5] Moreland, J.D., Richardson, J.A., Goldsmith, C.H., Clase, C.M. Muscle Weakness and Falls in Older Adults: A Systematic Review and Meta-Analysis. J Am GeriatrSoc, Vol. 52, pp. 1121–1129, 2004.

[6] Bohannon, R.W. Sit-to-stand test for measuring performance of lower extremity muscles. Percept Mot Skills, Vol. 80, pp. 163–166, 1995.

[7] Lord, S.R., Murray, S.M., Chapman, K., Munro, B., Tiedemann, A. Sit-to stand performance depends on sensation, speed, balance, and psychological status in addition to strength in older people. J Gerontol A BiolSci Med Sci, Vol. 57, pp. 539-543, 2002.

[8] Cheng, P.T., Chen, C.L., Wang, C.M., Hong, W.H. Leg muscle activation patterns of sit-to-stand movement in stroke patients. Am J Phys Med Rehabil, Vol.83, pp. 10-16, 2004.

[9] Csuka, M., McCarty, D.J. Simple method for measurement of lower extremity muscle strength. Am J Med, Vol. 78, pp. 77–81, 1985.

[10] Bohannon, R.W., Bubela, D.J., Magasi, S.R., Wang, Y.C., Gershon, R.C. Sit-to-stand test: Performance and determinants across the age-span. IsokinetExercSci, Vol. 18, pp. 235–240, 2010.

[11] Lomaglio, M.J. and Eng, J.J. Muscle Strength and Weight-Bearing Symmetry Relate to Sit-to-Stand Performance in Individuals with Stroke. Gait Posture, Vol. 22, pp. 126–131, 2005.

[12] Van der Heijden M.M., Meijer, K., Willems, P.J., Savelberg, H.H. Muscles limiting the sit-to-stand movement: an experimental simulation of muscle weakness. Gait Posture, Vol. 30, pp. 110-4, 2009.

[13] Buatois, S., Miljkovic, D., et al. Five times sit to stand test is a predictor of recurrent falls in healthy community-living subjects aged 65 and older. J Am GeriatrSoc, Vol. 56, pp. 1575-1577, 2008.

[14] Tiedemann, A., Shimada, H., et al. The comparative ability of eight functional mobility tests for predicting falls in community-dwelling older people. Age Ageing, Vol. 37, pp. 430-435, 2008.

[15] Bohannon, R.W., Bubela, D.J., Magasi, S.R., Gershon, R.C. Relative reliability of three objective tests of lower limb strength. IsokinetExercSci, Vol. 19, pp. 77–81, 2011.

[16] Bohannon, R.W. Reference values for the five-repetition sit-to-stand test: a descriptive meta-analysis of data from elders." Percept Mot Skills, Vol. 103, pp. 215-222, 2006.

[17] Whitney, S.L., Wrisley, D.M., Marchetti, G.F. Clinical measurement of sit-to-stand performance in people with balance disorders: validity of data for the Five-Times-Sit-to-Stand Test. PhysTher, Vol. 85, pp. 1034 –1045, 2005.

[18] Powell, L.E., Myers, A.M. The activities-specific balance confidences (ABC) scale. Journals of Gerontology, Series A: Medical Sciences, Vol 50, pp. M28-M34, 1995.

[19] Lajoie, Y., Gallagher, S. P. Predicting falls within the elderly community: comparison of postural sway, reaction time, the Berg balance scale and the Activities-specific Balance Confidence (ABC) scale for comparing fallers and non-fallers. Archives of Gerontology and Geriatrics, Vol. 38, pp. 11-26, 2004.

[20] Shin, K.R., Kang y., Jung, D., Kim, M., Lee E. A Comparative Study on Physical Function Test between Faller Group and Non-faller Group among Community-Dwelling Elderly. Asian Nurs Res, Vol. 6, pp. 42-48, 2012.

[21] Shumway-Cook, A., Brauer, S., Woollacott, M. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. PhysTher, Vol. 80, pp. 896–903, 2000.

[22] Guralnik, J.M., Simonsick, E.M., Ferrucci, L., et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. J Gerontol, Vol 48, pp. M85-94, 1994.

[23] Tromp, A.M., Pluijm, S.M.F., Smit, J.H., Deeg, D.J.H., Bouter, L.M., Lips,P. Fall-risk screening test: A prospective study on predictors for falls in community-dwelling elderly. Journal of Clinical Epidemiology, Vol. 54, pp. 837–844, 2001.

[24] Allison, L. Nerological Rehabilitation, St Louis: Mosby, 1995, pp. 802-837.

[25] Meuleners, L.B., Fraser, M.L., Jonathan, Ng and Nigel Morlet. The impact of first- and second-eye cataract surgery on injurious falls that require hospitalisation: a whole-population study. Age Ageing, (2013) doi: 10.1093 /ageing /aft177.

[26] Nevitt, M.C., Cummings, S.R., Kidd, S., et al. Risk factors for recurrent nonsyncopal falls. A prospective study. JAMA, Vol. 261, pp. 2663–2668, 1989.

[27] Tinetti, M.E., Kumar, C. The patient who falls: "It's always a trade-off". JAMA, Vol. 303, pp. 258-66, 2010.

[28] Menz, H.B., Morris, M.E., Lord, S.R. Footwear characteristics and risk of indoor and outdoor falls in older people. Gerontology, Vol. 52, pp. 174-80, 2006.

[29] LORD, S.R. Visual risk factors for falls in older people. Age and Ageing, Vol. 35, pp. S2: ii42–ii45, 2006.