Weight and Body Mass Index in Men and Age and Height in Women Relate to Difficulty and Ability in Performing Activities in Community-Living Thai Elders

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Objective: *To compare difficulty between male and female community-living elderly in performing activities (DDA), ability in performing living activities (ADA) and balance, and to explore associations among them related to age, weight, height and body mass index (BMI).*

Material and Method: *In all, 1,964 participants (646 men, 1,318 women) aged 60 or over reported their age, weight, height, DDA, ADA, and performed the Berg balance scale (BBS). Male and female elderly were divided into low and high BBS groups (BBS cutoff point score: male = 26, female = 28.5). The Mann-Whitney U test was conducted to compare age, weight, height, BMI, DDA, ADA and the BBS. Associations among them were tested using Spearman's rank correlation.*

Results: *A low BBS score represented high risk of falling and vice versa for a high BBS score. No difference in DDA, ADA, and BBS was found associated with sex. Weight and BMI correlated to DDA, ADA, and BBS in elderly men with high fall risk, while age and height was related to DDA and ADA, respectively in elderly women with low fall risk.*

Conclusion: *Male and female community-dwelling Thai elders were similar in ability in performing activities and balance. Weight and BMI was important among elderly men, whereas age and height was significant among women.*

Keywords: *Activity, Balance, Community, Elderly, Sex*

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Activities of daily living require balance tasks of moving within and between the postures of sitting and standing. Among the elderly, a decline in ability to perform activities has been reported[1-3] and is a fall risk factor[4]. Therefore, decreased ability in performing activities may be associated with a decline in balance performance.

Many fall risk factors have been identified. A controversial risk factor is gender for Thai elderly, females were likely to fall more than males[4]. Some reports showed poorer balance performance[3,5,6] in female elderly than in males, while others reported better performance in elderly women[7,8]. Others have reported no gender difference in functional balance[9], particularly when body height is considered[8,10].

In Thailand the older population segment is increasing[11]. To prevent effectively falls in this population, understanding the relationship among body characteristics, balance, and the difficulty and ability in preforming activities is crucial. Therefore, the present study compared age, weight, height, body mass index (BMI) difficulty in performing activities (DDA), ability in performing living activities (ADA) and balance between male and female community-living elderly and investigated significant associations among these variables.

Material and Method

Participants

A random sampling of Thai population, aged between 60 and 99, and living in Bangkok, and urban and rural areas in Nakhonpathom and Phra Nakhon Si Ayutthaya participated in the study. The areas were chosen by stratified random cluster sampling.

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Procedures

Ten physical therapy undergraduates and five graduate students were trained to use the Berg balance scale (BBS)[12] by the researchers (VH, MV, and PC). The training was conducted until all students understood and could score correctly.

Researchers met participants face-to-face at their residences to inform them about the study and invite them to participate. Those who agreed, signed an informed consent form approved by the university ethics committee (MU-IRB 2011/121.0906). Participants self-reported their age, height, and weight. The age and height were confirmed by date of birth and height in identification card of participant. They were interviewed regarding difficulty in performing activities in the past 30 days (DDA) and ability in performing daily living activities (ADA), then performed the BBS[12].

Questionnaires

A self-reported, ten-item DDA questionnaire assessed the difficulty the participant had because of diseases, illnesses, or other health and mental problems in the past 30 days affecting the performance of daily activity of daily. The questions were: 1) 30-minute standing, 2) doing your household duties, 3) joining in community activities, 4) 10-minute concentration on doing something, 5) washing whole body, 6) health problems affecting your emotion, 7) dealing with people you do not know, 8) maintaining friendships, 9) working as usual, and 10) learning a new task. Each item ranged from 0 to 3 (0 = cannot do, 1 = moderate difficulty, 2 = mild difficulty, and 3 = no difficulty). Scores ranged from 0-30; the higher the score, the less difficulty in performing the activity.

Another self-reported questionnaire was a 20-item ADA based on daily activities in Thailand. It was composed of: 1) washing hair, 2) brushing teeth, 3) getting dressed, 4) putting on socks and shoes, 5) eating, 6) writing, 7) using a computer, 8) walking on a flat surface, 9) walking up and down stairs, 10) sitting on a low chair, 11) squatting, 12) sitting-to-standing from a chair, 13) sitting-to-standing from the floor, 14) retrieving object from the floor, 15) reaching an object above the head, 16) exercising/playing sport(s), 17) cooking, 18) buying/shopping, 19) getting on and off a bus, and 20) driving a car. Each item ranged from 0-3 (0 = able to perform independently, 1 = able to perform with assistance of a device (s)/environment adjustment, 2 = unable to perform, and 3= never perform). Score ranged from 0-60; the higher the score, the greater the inability.

Berg balance scale[12]

The BBS consisted of 14 functional balance items in sitting and standing postures. Each item had a 5-point scale, with 0 indicating the worst performance and 4 being the best. Score ranges from the minimum 0 to the maximum 56, and the higher the score the better the balance function.

Statistical analysis

SPSS 18.0 software package (SPSS, S/N 5089368) was used for statistical analyses. The Kolmogorov-Smirnov test showed non-normal distribution of data. Box plot of the total BBS score was used to obtain low and high BBS groups. Between sexes, the Mann-Whitney U test was conducted to compare age, weight, height, BMI, DDA, ADA and the BBS. Associations between these variables were tested by Spearman's rank correlation. Statistical significance was set at p-value <0.05.

Results

From the box plot (Fig. 1), elderly men and women who obtained BBS scores greater than 26 and 28.5, respectively, were in the high BBS group, representing low risk of falling. Those with the BBS score equal to or lower than 26 in men and 28.5 in women were in the low BBS group, demonstrating high risk of falling.

Elderly men were significantly (p = 0.0001) heavier and taller than the women. However, the men had significantly (p = 0.0001) less BMI than women

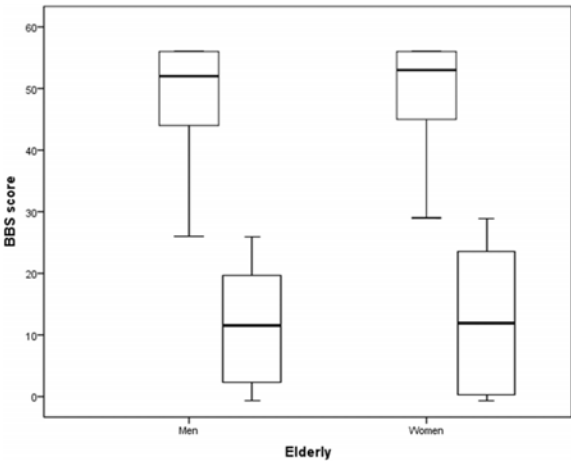

Fig. 1 Box plot of high and low Berg balance scale (BBS) scores of elderly men and women.

Table 1. Mean±SEM (min-max) of age, weight, height, body mass index (BMI), difficulty in performing activity in the past 30 days (DDA), ability in performing activity of daily living (ADA) and Berg Balance Scale (BBS) scores of all participants and subgroup by sex with high and low BBS

	All participants (n = 1,964)	Elderly men			Elderly women		
		All (n = 646)	High BBS (n = 573)	Low BBS (n = 73)	All (n = 1,318)	High BBS (n = 1,201)	Low BBS (n = 117)
Age	71.9±0.17 (60-99)	72.4±0.29 (60-99)	72.2±0.31 (60-99)	72.8±0.94 (60-93)	72.0±0.21 (60-98)	72.1±0.22 (60-98)	70.8±0.78 (60-95)
Weight	58.3±0.26 (29-160)	61.2±0.43 (33-105)	61.5±0.45 (33-105)	62.3±1.44 (35-92)	56.7±0.33* (29-160)	56.9±0.35* (29-150)	55.4±1.07* (29-88)
Height	157.0±0.19 (130-182)	164.2±0.27 (139-182)	164.1±0.28 (139-180)	163.3±0.75 (145-175)	153.7±0.18* (130-175)	153.7±0.19* (130-175)	153.4±0.60* (130-170)
BMI	23.8±0.10 (12.0-43.7)	22.7±0.15 (12.0-43.7)	22.8±0.16 (12.0-43.7)	23.5±0.50 (15.6-35.5)	23.9±0.14* (12.9-43.9)	24.0±0.15* (12.9-43.9)	23.5±0.43 (13.3-38.6)
DDA	25.5±0.14 (0-30)	25.1±0.26 (0-30)	26.6±0.20 (0-30)	15.6±1.05 (0-30)	25.6±0.17 (0-30)	26.9±0.13 (0-30)	15.5±0.80 (0-30)
ADA	23.0±0.17 (0-60)	23.3±0.31 (0-60)	22.0±0.20 (0-46)	35.5±1.53 (0-60)	22.8±0.20 (0-60)	21.6±0.14 (0-46)	35.3±1.04 (15-60)
BBS	46.9±0.29 (0-56)	46.4±0.53 (0-56)	50.5±0.28 (27-56)	11.6±1.09 (0-26)	47.8±0.34 (0-56)	51.0±0.18 (29-56)	12.5±0.95 (0-28)

* $p<0.05$ significant difference from elderly men

except in the low BBS group (Table 1). The high BBS group showed a gender difference, while the low BBS demonstrated no sex difference in items of the BBS. Elderly women with high BBS scores showed significantly better transfer (p = 0.005), standing with eyes closed (p = 0.014), and standing with feet together tasks (p = 0,035) than the men.

As shown in Table 2, elderly men in the high BBS group showed significantly negative correlations between age-weight (p = 0.0001), age-height (p = 0.004), and age-BMI (p = 0.0001), while those in the low BBS group demonstrated significantly negative correlations between weight-DDA (p = 0.022), weight-BBS (p = 0.013), BMI-DDA (p = 0.004), and BMI-BBS (p = 0.011), but significantly positive associations between weight-ADA (p = 0.014) and BMI-ADA (p = 0.016). Elderly women in the high BBS group showed significantly negative relationships between age-weight (p = 0.0001), age-height (p = 0.0001), age-BMI (p = 0.0001), age-DDA (p = 0.034) and height-ADA (p = 0.025), while those in the low BBS group demonstrated significantly negative correlations between age-weight (p = 0.016) and age-BMI (p = 0.048). For all groups, significantly negative correlations (p = 0.0001) between ADA-DDA, and ADA-BBS were presented, while positive correlations (p = 0.0001) between DDA-BBS were found.

Discussion

The present study found, overall, heavier and taller features but lower BMI in elderly men than women. No gender difference in balance ability in community-living elders was demonstrated. Balance in both sexes decreased with increasing difficulty and decreasing ability in performing activities. Age, weight, height, and BMI did not relate to difficulty and ability in doing activities, and balance in elderly men with low risk of falling. However, weight and BMI correlated to those elderly men with a high risk of falling. For elderly women, age was related to difficulty in performing activities,

Table 2. Association between age, weight, height, body mass index (BMI), difficulty performing activity in the past 30 days (DDA), ability in performing activity of daily living (ADA) and Berg Balance Scale (BBS) scores in elderly men and women with high and low BBS

	Group	Weight	Height	BMI	DDA	ADA	BBS
Age	Men, high BBS	-0.255*	-0.119*	-0.215*	-0.007	-0.013	0.009
	Men, low BBS	-0.085	-0.240	0.024	-0.158	0.009	-0.126
	Women, high BBS	-0.357*	-0.199*	-0.314*	-0.060*	0.038	-0.02
	Women, low BBS	-0.277*	-0.023	-0.191*	-0.003	-0.046	-0.051
Weight	Men, high BBS				0.043	0.026	-0.052
	Men, low BBS				-0.281*	0.300*	-0.301*
	Women, high BBS				0.043	-0.036	0.053
	Women, low BBS				-0.021	0.100	-0.036
Height	Men, high BBS				0.082	0.039	0.043
	Men, low BBS				0.127	0.064	0.001
	Women, high BBS				0.024	-0.067*	0.006
	Women, low BBS				-0.161	0.087	-0.055
BMI	Men, high BBS				0.011	0.009	-0.080
	Men, low BBS				-0.350*	0.295*	-0.311*
	Women, high BBS				0.032	-0.002	-0.048
	Women, low BBS				0.078	0.037	0.052
DDA	Men, high BBS					-0.365*	0.499*
	Men, low BBS					-0.683*	0.596*
	Women, high BBS					-0.403*	0.049*
	Women, low BBS					-0.743*	0.520*
ADA	Men, high BBS						-0.379*
	Men, low BBS						-0.600*
	Women, high BBS						-0.374*
	Women, low BBS						-0.524*

*p<0.05 significant correlation between variables

height was related to ability in performing activities in the group with a low risk of falling, while no association among an individual's characteristics and difficulty and ability in performing activities and balance was found in elderly women who had a high risk of falling.

The community-living elderly who participated in this study may be at risk for falling according to their balance score. The average BBS score was 46.9 (men 46.4, women 47.8), which is close to the fall risk score of 45 for general elderly[13] or 47 found in elderly Thai[14]. In the present study, elderly participants, both male and female, could be divided into two groups according to the average BBS score that were non-outliers and outliers[12]. The non-outliers comprised the group having lower risk of falling, while the outliers comprised the group with a higher risk of falling. Our finding found no gender difference in balance, in contrast to a previous study in Thailand[4]. Participants in the present study were community-dwelling elderly people in Bangkok and two provinces in the central part of Thailand, whereas those in the previous study[4] were people living only in Bangkok. The inconsistent result cannot assume gender constitutes a fall risk factor in elderly Thai populations. Specifying communities, societies or areas for further investigation is suggested.

Even though the elderly men and women were similar regarding balance, the women with lower risk of falling were better in transfer, standing with eyes closed, and standing with feet together than the men. A study of Turkish elderly aged 50-75 years showed better balance in sitting-to-standing in the men than women[3]. A determinant of disability incidence in men, not in the women, is the five-time sitting-to-standing task[15]. Thus, further investigation in balance tasks between men and women is suggested.

In our elderly population, the older the age, the less the weight, height, and BMI. Interestingly, age was not related to the balance, similar to one report[13], but different from another[16]. Difficulty in performing activities and ability in performing living activities were associated with balance in the elderly. An example is the elderly subject with diabetes mellitus exhibiting gait deterioration and then increased risk of falling[17,18]. The present finding demonstrated that the elderly who had better balance had better ability in performing living activities. The elderly should perform living activities as much as possible to maintain the balance.

The elderly men showed high risk of falling, increased difficulty and decreased ability in performing activities with increasing weight and BMI. Elderly men with high risk of falling should control their body weight to maintain ability performing living activity. For elderly women, those with low risk of falling, had increased difficulty and decreased ability in performing activities with advancing age and declining height. Elderly women with better balance should perform exercise to maintain their height and delay physical deterioration with advanced age to maintain their ability in performing living activities. Future studies should investigate techniques to sustain height in elderly women as long as possible to maintain balance. From the present results, weight and BMI seemed crucial characteristics in elderly men, while age and height appeared to be an important feature in elderly women.

Conclusion

Generally, elderly men and women living in community were similar regarding balance. For the elderly with low risk of falling, the women were better in transfer, standing with eyes closed and standing with feet together tasks than the men. Age and height were important factors related to difficulty and ability in performing living activities in the women. Weight and BMI were crucial characteristics in difficulty and ability in performing living activities and balance in elderly men with high risk of falling. Further investigation regarding gender differences in balance is still required.

What is already known on this topic?

In Thailand, it has been reported that gender was a fall risk factor in the elderly. Nevertheless, worldwide, sex seems to constitute a controversial factor for fall risk in the elderly. No gender difference was found in balance performance when height and body characteristics were considered.

What this study adds?

The present study demonstrated, overall, that sex was not a significant factor regarding difficulty and ability in performing activities and balance in the elderly living in community. However, body features in each sex seem important. Weight and BMI appeared significant in elderly men with high risk of falling, whereas age and height seemed important in elderly women with low risk of falling, consequently affecting balance.

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Potential conflicts of interest

None.

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น้ำหนักและดัชนีมวลกายในผู้ชาย อายุและความสูงในผู้หญิง สัมพันธ์กับความยากลำบากและความสามารถในการทำกิจกรรมในผู้สูงอายุไทยอาศัยในชุมชน

วิมลวรรณ เหียงแก้ว, มัณฑนา วงศ์ศิรินวรัตน์, ภครตี ชัยวัฒน์

วัตถุประสงค์: *เปรียบเทียบความยากลำบาก ระหว่างผู้สูงอายุเพศชายและหญิงอาศัยในชุมชน ในการทำกิจกรรม (DDA) ความสามารถในการทำกิจกรรมชีวิตประจำวัน (ADA) และการทรงตัว และสืบค้นความสัมพันธ์ท่ามกลางสิ่งเหล่านี้กับอายุ น้ำหนัก ความสูง และดัชนีมวลกาย (BMI)*

วัสดุและวิธีการ: *ผู้เข้าร่วมศึกษา 1,964 ราย (ผู้ชาย 646 ราย, ผู้หญิง 1,318 ราย) อายุ 60 ปีขึ้นไป รายงานอายุ น้ำหนัก ส่วนสูง DDA ADA และทดสอบการทรงตัวเบิร์ก (BBS) ผู้สูงอายุชายและหญิง แบ่งเป็นกลุ่มคะแนน BBS ต่ำและสูง (จุดตัดคะแนน BBS; ผู้ชาย = 26, ผู้หญิง = 28.5) ระหว่างเพศการทดสอบ Mann-Whitney U ใช้เปรียบเทียบอายุ น้ำหนัก ส่วนสูง BMI DDA ADA และ BBS ความสัมพันธ์ระหว่างตัวแปรทดสอบด้วย Spearman rank correlation*

ผลการศึกษา: *BBS ต่ำแสดงความเสี่ยงล้มสูงและ BBS สูงแสดงความเสี่ยงล้มต่ำ ไม่พบความแตกต่างระหว่างเพศใน DDA ADA และ BBS น้ำหนักและ BMI สัมพันธ์กับ DDA ADA และ BBS ในผู้สูงอายุชายที่เสี่ยงล้มสูง ขณะที่อายุและความสูงสัมพันธ์กับ DDA ADA ตามลำดับในผู้สูงอายุหญิงเสี่ยงล้มต่ำ*

สรุป: *ผู้สูงอายุชายและหญิงที่อาศัยในชุมชนมีความเหมือนในความสามารถการทำกิจกรรมและการทรงตัว น้ำหนักและ BMI ปรากฏว่าสำคัญในผู้สูงอายุชายขณะที่อายุและความสูงดูเหมือนสำคัญในผู้หญิง*