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THE RELATION OF BALANCE PERFORMANCE AND BALANCE CONFIDENCE WITH PHYSICAL ACTIVITY IN ELDERLY FALLERS AND NON-FALLERS

INTRODUCTION

Balance is an important issue in aging research since it is undoubtedly linked with motor performance affecting, thus, activities of daily living and consecutively the quality of life in the elderly. Maintenance of good balance ability reduces the chance of a fall which, especially in the elderly, is not only an important predictor of mortality but also a major problem with important negative health and socio-economic consequences. The fear of falling, on the other hand, results in restrictions of physical activity, functional ability, and consequently may lead to reduced quality of life and adverse health consequences [5].

Another psychological variable linked to the fear of falling is balance confidence or falls self-efficacy, which refers to personal beliefs in one's ability to engage in certain activities of daily living without falling or losing balance [8]. Increased balance confidence, which is determined to a great extent by balance performance [2], is associated with lower fear of falling and better functional ability [6].

Physical activity seems to have a positive relation with balance confidence but the outcomes of this relation are not well understood. Some findings suggest that the improvement in balance confidence through an exercise intervention program is only weakly correlated with improved general physical function and not associated with improvements in postural stability [7]. Other findings, however, suggest that balance confidence plays a mediatory role in the effects of fear of falling on functional outcomes [6], and if the exercise program is aimed at the enhancement of balance confidence then the fear of falling is likely to be reduced [4].

Balance confidence and balance performance have been found to be significant predictors of fall status [3]. It is not, known however, if the relationship between

balance confidence, balance performance and habitual physical activity, is different in fallers than in non-fallers. This study aimed to examine the relationship between balance performance, balance confidence and physical activity, which is reflected in the number of steps performed in everyday life, taking into account the fall history of elderly persons.

METHODS

The subjects were 70 community living elderly persons (10 men, 60 women) aged over 60 ($M=71.82$, $SD=6.52$). According to their fall history, they were separated in two groups: fallers ($n=22$, 3 men, 19 women), where participants reported at least one fall during the previous year and non fallers ($n=48$, 7 men, 41 women; Table 1). Informed consent and medical history was obtained from the subjects prior to data collection. All participants had no severe neurological and orthopedic diseases.

Balance confidence was assessed using the 16-item Activities Balance Confidence (ABC) scale [8]. According to this scale, the participants rate their confidence on performing certain activities of everyday life (see Table 3) without compromising their balance. Participants chose their responses from a modified 1-10 continuum (Li et al., 2005) instead of 10-100 continuum used in the original version of the scale. A higher score meant a higher balance confidence.

Balance performance was assessed using the 14-item Berg Balance Scale (BBS) [1]. It is a field test which measures levels of ability in performing tasks involved in everyday activities, such as reaching and picking up objects from the floor. It is scored on a 5-point scale, where 4 means safe and independent performance of the task and 0 means unable to perform.

Physical activity was assessed by calculating the number of steps performed in a week. The number of steps was counted using a Yamax Digiwalker pedometer (Model SW-200, Yamax Corporation, Tokyo, Japan) attached to the subject's clothing at the waist, centered over the dominant foot.

RESULTS

According to one-way analysis of variance, no significant differences between fallers and non-fallers were noted in balance confidence, balance performance and physical activity ($p < 0.05$). As shown in Table 1, the differences between the two groups were small in all three variables.

The relationship between balance confidence, balance performance and physical activity was calculated using Pearson correlation coefficients. Table 2 presents the correlation coefficients between the pedometer score and the BBS and ABC score; Table 3 shows the correlation coefficients of each item of the ABC scale with the pedometer and BBS score. In both Tables results are presented separately for fallers and non-fallers.

Table 1. Means and Standard Deviations for the number of steps performed in a week (physical activity) and the total scores in Berg Balance (BBS) and Balance Confidence Scales (ABC) for fallers (n=22) and non-fallers (n=48)

	age		Physical activity		BBS		ABC	
	M	SD	M	SD	M	SD	M	SD
fallers	73.36	5.67	38628.55	19104.02	50.49	7.18	7.21	1.91
non-fallers	71.11	6.80	36662.36	18871.32	52.08	3.23	7.46	1.58

Table 2. Correlations between the number of steps performed in a week (physical activity) and the total scores in Berg Balance Test and Balance Confidence Scale for fallers (n=22) and non-fallers (n=48) respectively

	Physical activity		Balance test	
	fallers	non-fallers	fallers	non-fallers
Balance confidence	0.32	0.28	0.58**	0.44**
Balance test	0.16	0.37**	–	–

** $p < 0.01$

Table 3. Means and Standard Deviations for the score in each item of the Balance Confidence Scale for fallers and non-fallers and the corresponding correlations with the number of steps performed in a week (physical activity), and the score in Berg Balance scale (BBS)

ABC scale items	fallers				non-fallers			
	M	SD	r steps	r BBS	M	SD	r steps	r BBS
1. Walk around the house	7.86	2.32	0.31	0.11	8.35	1.96	0.22	0.31*
2. Up and down the stairs	7.14	2.21	0.28	0.24	7.35	2.26	0.23	0.40**
3. Pick up a slipper from the floor	7.73	2.14	0.40	0.51*	8.50	1.775	0.32*	0.43**
4. Reach at eye level	8.73	1.67	0.34	0.65**	8.94	1.343	0.12	0.19
5. Reach on tiptoes	7.05	2.97	0.04	0.67**	6.98	2.38	0.15	0.44**
6. Stand on chair to reach	6.64	3.60	0.25	0.53*	6.10	3.40	0.35*	0.48**
7. Sweep the floor	8.36	2.28	0.11	0.46*	7.96	2.46	0.34*	0.27
8. Walk outside to a nearby car	8.68	2.06	0.40	0.80**	9.17	1.63	0.18	0.25
9. Get in/out of car	7.50	2.43	0.20	0.65**	7.77	2.38	0.24	0.16
10. Walk across the parking lot	8.00	2.25	0.19	0.70**	8.13	2.03	0.11	0.27
11. Up and down the ramp	7.82	2.11	0.35	0.70**	7.40	2.40	0.14	0.27
12. Walk in a crowded mal	7.91	2.07	0.25	0.22	8.17	1.91	0.16	0.25
13. Walk in crowd/bumped	7.68	2.06	0.28	0.04	7.69	1.96	0.15	0.20
14. Escalator holding rail	6.23	3.19	0.19	0.33	7.69	2.59	0.01	0.19
15. Escalator not holding rail	4.77	3.42	0.20	0.33	5.17	3.23	0.13	0.23
16. Walk on icy sidewalks	3.32	2.38	0.40	0.26	4.06	2.67	0.22	0.48**

* p<0.05, ** p<0.01

DISCUSSION

The findings of the present study provide evidence that the relationship between balance confidence, balance performance and physical activity is differentiated according to the fall status of the elderly, but these differences are limited and specific. The total score of the balance confidence test (ABC) shows significant correlations with the balance performance test (BBS) in both groups, a finding which supports the notion that balance performance alone is a strong determinant of balance confidence in community-dwelling elderly people [2]. Remarkable differences between the two groups were found, however, in the correlation coefficients between certain ABC items and the total score of balance test. In the group of non-fallers, the correlations were low mainly regarding indoor activities, while in the group of fallers high correlations were noted not only in items regarding indoor activities imposing increased demands for balance, but mainly in items regarding transportation.

Physical activity was significantly correlated with balance performance, but not with balance confidence, and only in the group of non-fallers. The correlations of the ABC items with the number of steps performed in a week were non-significant in the group of fallers, while in the group of non-fallers significant correlations were

noted only in a few items more common in every day life and imposing more demands on balance.

The significant association of physical activity, reflected in the amount of walking every day, with balance performance found in this study, enhances the value of walking as a good type of exercise for the elderly non-fallers. The lack of association between physical activity and balance confidence, which is in accordance with other findings in the literature [7], indicates that physical activity interventions alone might not be sufficient for fall prevention. The remarkable differences in the correlations of the ABC scale items with balance performance between fallers and non-fallers, however, underlines the need for future research on the perceived functional and balance ability of the elderly and the factors related to balance and falls.

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