



▲ Seniors training on the Lappset Motor Track.  
SOT-test measurements by EquiTest. ▶

## EXERCISING SENIOR CITIZENS' BALANCE AND MOTOR COORDINATION

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### INTRODUCTION

Physical performance is the ability to move, which enables a person to conduct his or her everyday activities. As age advances, physical performance weakens due not only to biological ageing but also due to a person's adjustment to a lower level of activity. Managing independently is made difficult by weakening agility, speed of movement, coordination, and balance. To control balance is not the most simply duty for man. Along to Barin you have to control over 200 levels of freedom in your joint and lever system with over 700 muscles (Era 1997, 55). Changes in the regulation of balance, posture and movement are extremely individual. Moving in a slow and feeble manner visibly weakens motor coordination. (Salmelin 2001, 299; Spirduso 1995, 179). Function of balance training for senior citizens is not so clear as for example strength training, though man have got good results with specific balance training and muscular strength training (Heikkinen 2002; Era 1997, 59). It takes more time to train motor skills for senior citizens than adolescents, but at the same time it can have positive effects for senior citizens whole body control (Ruuskanen 1997, 151). Falling is by the major cause of accidental death in the aged. As many as around 41% of aged people restrict their mobility for fear of falling, which prevents exercising the balancing systems. Therefore, the fear of falling itself can increase the risk of falling. Balance exercise can be used to reduce the risk of falling and achieve savings in medical and rehabilitation costs. (Era 1997, Spirduso 1995, 168).

### METHODS

The aim of the study was to assess the trainability and the training methods of balance and motor skills of the elderly people (n= 40, age 65 – 83 years). The subjects carried a out guided exercise programme in two groups for 90 minutes once a week from early September 2003 to late March 2004. The number of training sessions was 21 for each group. The training methods included motor and balance training, as well as strenght and flexibility training with moveable balancing objects during the whole programme and training in the playground environment built by Lappset Group Ltd from December 2003 until the end of the programme. The programme was designed and instructed by two Sports Instructors (AMK).

The initial measurements of the test subjects were made in September 2003, the intermediate measurements in December 2003 and the final measurements in April 2004. The measurements of the control group (n= 12, age 65 – 80 years) were made in December 2003 and in April 2004. The measurements included:

- height, weight
- body composition (Inbody)
- the Sensory Organisation Test (SOT, EquiTest)
- hand compression force (Newtest)
- a 10-metre walk using a photocell
- standing with one leg
- square jumping with one leg
- the estimation of the subjects' own balance skills with a subjective scale from 0-10
- the time of the Lappset Motor Track
- score from a functional balance test (scale 5=best – 15=weakest) and the time taken for the test. The functional balance test includes getting up from a chair – tandem walking forwards for 3 metres – turning through the right – tandem walking back – turning through the left, and sitting back in the chair.

The measurements were fed into the SPSS application and the Pearson correlation coefficient and the Student t-test were used as the statistical methods.

### RESULTS

The results showed the statistically significant ( $p < .05$ ) improvements in postural body sway (composite value) of SOT, vestibular (table 1) and visual values of SOT and the time and the score of the functional balance test. The hand compression forces worsened especially during the winter. There weren't any significant changes in the body composition, height or weight of the test subjects during the programme. The time of the Lappset Motor Track was improved in test and control groups, although there weren't significant differences in the magnitude of the improvements between the groups. The gender differences were clear in the tests demanding strength and balance; the test improvements of the female participants were significantly greater in 10-metre walk, composite value of SOT and the time of the Lappset Motor Track than those of the men.

When comparing the results of all the motor and balance tests with each other, the most surprising finding was the strong correlation in performance time on the Lappset Motor Track between the power, balance and functional tests (table 2). According to the interviews with the subjects, the most important factor explaining the meaning of this kind of physical training is the social aspect of the training; it's much more fun and effective to train together with other people.

Table 1. The comparison of the changes in the test results of initial, intermediate and final measurements in vestibular equilibrium scores (SOT-test) in test group.

	Mean	SD	t	df	Sig. (2-tailed)
Pair 1	<b>vestibular scores (SOT):</b>				
	initial measurement - intermediate measurement	-6,4413	20,8161	-1,957	39
Pair 2	<b>vestibular scores (SOT):</b>				
	intermediate measurement - final measurement	-7,5342	13,4971	-3,441	37
Pair 3	<b>vestibular scores (SOT):</b>				
	initial measurement - final measurement	-14,3303	19,5043	-4,529	37

Table 2. Correlations with Lappset Motor Track Time, hand compression force, functional tests and balance tests in final measurements.

	Motor Track Time
hand compression force (right):	
final measurement	-.609 <sup>(**)</sup>
10 meter walk (time):	
final measurement	.611 <sup>(**)</sup>
functional balance test (time):	
final measurement	.305 <sup>(*)</sup>
functional balance test (scores): final measurement	.608 <sup>(**)</sup>
composite equilibrium scores (SOT):	
final measurement	-.572 <sup>(**)</sup>
somato-sensory scores (SOT):	
final measurement	-.337 <sup>(*)</sup>
visual scores (SOT):	
final measurement	-.549 <sup>(**)</sup>
vestibular scores (SOT):	
final measurement	-.516 <sup>(**)</sup>
one leg standing (right):	
final measurement	-.538 <sup>(**)</sup>
the estimation of the subjects' own balance skills:	
final measurement	-.292

\*\* Correlation is significant at the 0.01 level (2-tailed).  
\* Correlation is significant at the 0.05 level (2-tailed).

### DISCUSSION/CONCLUSIONS

The results of the measurements are encouraging from the perspective of balance and physical performance in the aged. Balance exercise when linked with muscle fitness and motor skill exercises would appear to produce the desired result and to slow down the inevitable deterioration in the physical performance of the body. Improving confidence in mobility is witnessed by the improvement in the results in the functional balance test and in the increased speed in walking. The SOT indicates balance developed most of all in the vestibular system, the weakening of which is a large problem in the aged that results in very real problems in achieving and maintaining balance. The improvement in the personal assessment of balance among the test subjects also supports the above-mentioned results. What is the reason for worsening of hand compression specially during winter time? We have made same kind of a finding with children; the levels of isometric maximum forces for hand compression and leg extensors were higher in autumn than in next spring (Hämäläinen & Pahtaja 2003). Is the reason higher level of activity in summer time, differences in hormone levels due to enormous amount of sunlight in summer time or mental differences due to changes of sun light in summer and winter time? The most surprising finding is the strong correlation in performance time on the motor coordination track between the power, balance, and functional tests. A motor coordination track with versatile and different functions and requiring motor coordination and functional balance may indeed in the future serve as a so-called test field for the characteristics in question and above all, as an exercise field where the aged can exercise and maintain their physical performance. The use of motor track as motor test and exercise field should be study closer.

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