POSTURAL SWAY ON COMPLIANT SURFACE IN DIFFERENT AGE GROUPS

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INTRODUCTION

Posture depends on the integration of afferent flow from different sensory modalities (such as visual, vestibular, proprioceptive and haptic). During standing on a compliant surface the need to process the proprioceptive information is enhanced while haptic information from sole is compromised. Several cross-sectional studies demonstrated that older adults showed increased sway compared to young ones specially in more demanding conditions such as diminished base of support, altered visual input or during perturbations. Recently, interest in different supporting surfaces has increased. The purpose of this study was to investigate the centre of pressure (CoP) sway on compliant surface for four different age groups.

METHODS

104 of subjects were divided in four functional groups (Table 1), young college students, middle aged subjects, elderly community dwelling subjects and elderly nursing home residents. A force platform (Kistler 9286AA) was used for recordings during 60 seconds of quiet barefoot standing with feet close together. All participants were tested in two conditions with eyes opened on a firm surface (FS) and compliant surface (CS), which was a 7 cm thick Airex® mat.

RESULTS AND DISCUSSION

The results (averages and standard deviations) for the four age groups are shown in the Table 1. Different surface conditions within a given age group show statistically significant different sway areas ($p< 0.001$). The antero-posterior path length and sway area of CoP increased with age in both surface conditions. The older groups as compared to younger one demonstrated significantly larger sway areas and antero-posterior path lengths, in FS and CS conditions ($p<0.05$). The results cluster into two groups: young and middle aged subjects form one cluster and both elderly groups the other.

Mean velocity proved to be a reliable parameter. Therefore we analyzed difference between the supporting surfaces and age groups. On the compliant surface the increase of mean sway velocity was significantly larger in the older groups (Fig. 1) as compared to younger ones ($p<0,01$). The ratios of mean velocities between CS and FS was significantly different between the four age groups ($p<0.01$) and ranged from 2.0 in younger group to 2.6 in older one.

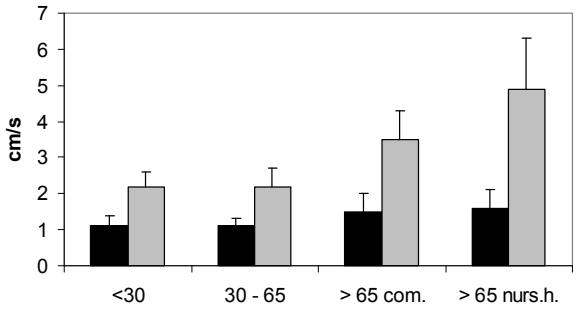

Figure 1: Mean velocity of CoP during stance on a firm surface (black) and a compliant surface (gray) for the different age groups (com .- community dwelling; nurs. h. – nursing home residents).

CONCLUSIONS

Sway of CoP on the compliant surface was the largest in the older group of nursing home residents. Beside age, frailty seems to be a contributing factor to increased sway. The increased mean velocity of CoP requires better motor control which is not to be expected in elderly population, especially subjects living in the nursing home. Therefore standing or walking on a compliant surface is a potential risk factor for falls. The so called proprioceptive training using compliant surfaces has been proposed to increase balance skills in different populations however its significance in elderly population needs to be further investigated.

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Table 1: Antero-posterior (A-P) paths and sway areas as measured on firm surface (FS) and compliant surface (CS) for different age groups. (* significant difference as compared to the youngest group).

	Age group			
	< 30	**30 – 64**	**65 – 90 (community)**	**65 – 90 (nursing home)**
No.of subjects (age years)	50 (21.3 ± 1.6)	26 (37.2 ± 10.2)	17 (72.3 ±7.4)	10 (80.4 ± 7.7)
A-P path FS (cm)	35.9 ± 9.3	35.4 ± 7.8	50.9 ± 20.3*	59.5 ± 20.7*
A-P path CS (cm)	79.3 ± 17.0	73.2 ± 15.6	117.8 ±29.*1	120.3 ± 49.8*
Sway area FS (cm^2)	4.9 ± 2.9	4.8 ± 2.0	6.3 ± 3.5	8.2 ± 5.5 *
Sway area CS (cm^2)	11.9 ± 3.5	12.5 ± 3.4	20.6 ± 4.8*	29.6 ± 11.9*