ASSESSMENT OF POSTURAL CONTROL IN VARIOUS AUDITORY SURROUNDINGS IN SIGHTED AND BLIND PEOPLE

François Prince1, Nicolas Termoz1,2, Mélanie Gauthier1 and Luc Martin2

1L.P.L., Centre de réadaptation Marie Enfant, Hôpital Sainte Justine, Montréal, Québec, Canada
2Laboratoire S.P.M., U.F.R.A.P.S., Université Joseph Fourier, Grenoble, France, nicolas.termoz@ujf-grenoble.fr

INTRODUCTION

Postural balance is an active process related to the integration of multisensory inputs by the central nervous system. Although numerous studies investigated the role of vision, proprioception and vestibular inputs on these mechanisms, few of them have analysed the contribution of audition on postural control. Particularly, mechanisms involving the influence of the auditory surroundings on postural activity are still unclear. The aim of this study is to assess the influence of three different auditory surroundings analysing the centre of mass (COM) displacements during quiet standing in congenitally blind people, and in children, adults and elderly population.

METHODS

Postural sway behaviour was assessed using an AMTI platform (20Hz) during 120 s of quiet standing in four groups: 19 children (12.3 yrs ± 2.4), 20 adults (31.5 yrs ± 8.7), 20 elderly subjects (69.0 yrs ± 6.4) and 5 blind adults (40.3 yrs ± 5.4). The COM displacements were calculated from the second integral of the force plate data (King and Zatsiorsky, 1997). The sway parameters investigated were mean area, RMS value, range of displacements, mean velocity and mean power frequency (MPF) of the COM along the anterior-posterior (AP) axis. The range, RMS and area values were expressed with respect to foot size to allow inter-subject comparisons. Three auditory surroundings were assessed: natural soundproof, anechoic and general ambient white noise rooms. To determine the effects of the different auditory environments as well as directly compare the groups, we conducted a 3 X 4 ANOVA. The significant level was set at p<0.05.

RESULTS AND DISCUSSION

The decrease in ambient noise seems to perturb the body balance. The main result of this study is certainly that audition would be involved to a considerable degree in postural regulation processes. For each group, the velocity and the MPF along the AP axis were largely greater in the anechoic environment than in the two other conditions (Fig 1, A). Moreover, range of COM displacements was also increased in the anechoic condition compared to the two others (Fig 1, B). These results are not in accordance with the study of Raper and Soames (1991) which allocated a destabilising effect to auditory fields. The total lack of auditory cues increases the sway behaviour even in the presence of visual feedback.

SUMMARY

The aim of this study was to assess the effects of three auditory environments on sway behaviour in different age groups and in blind people. The results confirm that auditory cues are involved in the postural regulation processes.

REFERENCES