

EFFECTS OF BASE OF SUPPORT AND VISUAL FEEDBACK ON STANDING BALANCE IN SUBJECTS WITH ANKLE SPRAIN

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INTRODUCTION: Ankle sprain is arguably one of the most common injuries in sport and can lead to significant impairment characterized by functional instability of the ankle. Base of support and visual feedback are two of the most important factors influencing the standing balance. Therefore, the purpose of this study was to investigate the effects of base of support and visual feedback on standing balance in subjects with and without ankle sprain.

METHOD: Twelve male subjects participated in this study (mean age: 21 years; mean height: 174 cm; mean weight: 71 kg), including six normal healthy subjects and six subjects with unilateral ankle sprain (grade II) in recent six months. Center of pressure (COP) excursion was measured with a balance plate (DigiMax posturomed). Subjects were asked to perform static standing in 20 sec with four bases of support (BOS), including standing with feet shoulder's width apart (BOS4), standing with closed feet (BOS3), tandem standing (BOS2) and single limb standing (BOS1). Two different visual feedbacks were considered, eyes-open and eyes-closed. The testing order was random for each subject. Two-way ANOVA with repeated measures and contrasts analysis were used for statistical analysis (SPSS, V13.0).

RESULTS: Excursions of COP in different BOSs and visual feedbacks were shown in Table 1. Significant difference on COP excursion in medial-lateral (ML) direction was found in BOS and visual factors in normal and sprain groups (significance in BOS1-BOS4, BOS2-BOS3, BOS2-BOS4 in sprain group; BOS2-BOS3, BOS2-BOS4, BOS3-BOS4 in normal group; $p < .05$). Significant difference on COP excursion in anterior-posterior (AP) direction was found in both factors only in sprain group (significance in BOS2-BOS3, BOS2-BOS4 in sprain group; BOS2-BOS3, BOS2-BOS4, BOS3-BOS4 in normal group; $p < .05$).

Table 1 COP excursion (mm) during static standing

		Eyes-Open				Eyes-Closed			
		BOS4	BOS3	BOS2	BOS1	BOS4	BOS3	BOS2	BOS1
ML	Sprain ^{*^}	10.12	14.25	46.27	94.30	20.28	26.15	230.25	615.42
	Normal ^{*^}	6.62	12.93	29.05	72.55	5.13	16.97	155.92	442.75
AP	Sprain ^{*^}	11.88	19.35	24.07	71.03	22.27	23.75	86.08	395.53
	Normal [*]	14.20	18.20	19.30	52.45	14.25	18.83	52.72	322.13

Significant difference in BOS factor* and visual factor[^] (repeated measure ANOVA, $p < .05$)

DISCUSSION: The COP excursion was increased with the decreasing base of support in normal and sprain groups. The COP excursion was increased in eyes-closed condition. Although there were the same areas of BOS in tandem standing and standing with closed feet, there was a greater COP excursion in tandem position in which ML base is much narrower, indicating postural response is more sensitive to the change of BOS in ML direction rather than in AP direction.

CONCLUSION: The COP excursion in medial-lateral direction is substantially affected by the change of base of support in static standing, no matter whether eyes are open or closed. The COP excursion in anterior-posterior direction was most affected by the changes of base of support and visual feedback in subjects with recent ankle sprain. However, in normal healthy subjects, visual feedback would not be a significant factor affecting the postural response in anterior-posterior direction during static standing.