

INTRODUCTION

Impaired postural control is a cardinal symptom following concussion and is commonly assessed with the Balance Error Scoring System (BESS) [1]. The BESS scores typically return to baseline within 3-5 days; however, a practice effect could limit the interpretation of the results [2]. Gait termination (GT) is a dynamic tool that has successfully identified post-concussion postural control impairments that linger beyond traditional measures of recovery [3]. Therefore, the purpose of this study is to compare post-concussion GT performance on the day BESS score achieved baseline values to healthy baseline performance.

METHODS

Fifteen NCAA Division I student-athletes (8 females; 7 males; height= 175.6 ± 8.4 cm, weight= 84.7 ± 21.2 kg, age= 19.0 ± 1.3 years) with diagnosed sport-related concussions completed five planned GT trials during pre-season baseline testing (BL) and the day BESS scores returned to baseline (BESS Day).

All planned GT trials were conducted using a GAITRite portable walkway system and four 400mm x 600mm force plates. The participants walked down the GAITRite at a self-selected speed before performing the penultimate and termination steps of planned GT on the force plates. (Figure 1)

The dependent variables included center of pressure (COP) displacement, COP velocity, and gait velocity. The COP displacements and velocities were calculated in both the mediolateral (ML) and anteroposterior (AP) directions on the force plate during the three phases of planned GT COP (S1, S2, S3), which correspond to the braking, transitional, and stabilization phases. [4] The GAITRite recorded the gait velocities during each trial. The data were compared using a two-sample t-test, and the significance level was set at p= 0.05.

RESULTS AND DISCUSSION

The mean time for the BESS score to return to baseline was 3.1 ± 1.7 days. There was no difference in gait velocity between baseline and BESS day (BL: 1.45 ± 0.19 m/s, BESS Day: 1.39 ± 0.19 m/s, p= 0.652). There was a significant difference in the COP displacement during S1AP (BL: 59.5 ± 10.9 cm, BESS Day: 47.0 ± 25.7 cm, p <0.001) and S2AP (BL: 9.0 ± 6.7 cm, BESS Day: 19.5 ± 19.0 cm, p< 0.001). There were also significant differences in the S2AP velocity (BL: 199.2 ± 171.5 cm/s, BESS Day: 422.6 ± 429.2 cm/s, p <0.001) and S3AP velocity (BL: 39.6 ± 21.7 cm/s, BESS Day: 54.5 ± 62.2 cm/s, p= 0.049). There were no significant differences found in the ML displacements or velocities.

On the day BESS score returned to baseline, an altered movement strategy was identified during planned GT. These results were independent of gait velocity, suggesting residual impairments in postural control.

CONCLUSIONS

Following concussion, marked alterations are present in the phases of COP during planned GT. The decreased S1 and increased S2 (Figure 2), which are typically associated with a worsened postural control, allude to a conservative motor control approach to GT. Clinicians should consider the potential for these lingering deficits despite apparent recovery on the BESS test.

REFERENCES


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