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Baseline Concussion Testing in Middle and High School Athletes

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<u>**Abstract:**</u>

Introduction: The purpose of this project was to identify baseline/normative postural sway data in middle and high school aged athletes that are involved in club or school sports. More specifically, middle and high school athletes' sway scores were compared by gender and by sport to determine differences. In addition sway measures during the concussion balance test (COBALT) were compared to postural stability during computerized dynamic posturography (CDP). These computerized measures have not previously been implemented in any of the central valley middle or high school sports programs. Sport related concussions continue to be of concern and often go unreported especially in middle and high school athletic programs. This data will be helpful for optimizing sports performance in these athletes, identifying high risk sports, as well as better predict when an athlete can safely return to play following a concussion.

Methods: 69 subjects (40 female and 29 male) aged 11-18 (mean 16 years + 2.3 sd) were tested on conditions 3, 4, 7, and 8 on the COBALT and CDP including all 6 conditions of the Sensory Organization Test (SOT). Only 54 subjects completed the SOT, whereas 69 completed the COBALT. Only those sports that had more than 10 subjects were used for analysis. These included football (N=22), soccer (N=20), rugby (N=12) and cheer (N=11). Univariate analysis was performed to compare middle and high school age groups and gender. An ANOVA was performed to compare sports. If significance was found, a post hoc test was performed to determine where the differences were. For all analyses significance was at p<.05.

Results: There were no differences in any of the sway score outcomes when comparing junior high (11-14 years old, N=21) and high school (15-18 years old, N=42) age groups with the exception of Condition 3 on the COBALT with high school subjects performing better (.38 + .14 deg/sec vs .49 + .16 deg/sec, respectively). There was a significant difference between males and females in the majority of sway scores on both the COBALT and the SOT with males performing poorer than females. Males also had longer latencies during the Motor Control Test (MCT) for both forward and backward perturbations. Subjects that played football scored poorest for Conditions 4 and 8 on the COBALT and SOT 4, 5, and 6. However, when gender was controlled using an ANCOVA, only COBALT 8 was significant between sports with higher sway scores for football (1.40 +.27 deg/sec), followed by soccer (1.08 + .25 deg/sec), cheer (1.07 + .20 deg/sec) and rugby (1.04 + .21).

Conclusion: Results indicate there may be differences in sway scores on both the COBALT and SOT between males and females in athletes aged 11-18 years with males showing less postural stability. Sway scores were also poorer in football players as compared to soccer, rugby and cheer for Conditions 4, 7, and 8 on the COBALT and SOT 4, 5, 6 and MCT scores. However, all football players in this study were male. When gender was controlled, only sway scores during Condition 8 (Visual Motion Sensitivity) on the COBALT were significantly higher for football, followed by soccer, cheer and rugby. Condition 8 on the COBALT, may prove to be a more sensitive baseline measure for determining return to play decisions. However, more research is needed. The data presented from this study is the beginning of the development of a comprehensive interprofessional concussion management program at Fresno State.