

Baseline Concussion Testing in High Performance Athletes

Researcher(s):

Jennifer Adame Walker, D.P.T, P.T., O.C.S., P.M.A.-C.P.T., Assistant Professor
Department of Physical Therapy, Fresno State

Peggy Trueblood, Ph.D., P.T., Professor
Department of Physical Therapy, Fresno State

Brenna Hughes, S.L.P., Speech-Language Pathologist, Team Leader
Acute Care Rehabilitation, Community Regional Medical Center

Yalda Fernandez-Mendoza, S.P.T.
Department of Physical Therapy, Fresno State

Nicolas Oifah, S.P.T.
Department of Physical Therapy, Fresno State

Abstract

Introduction: The purpose of this project was to collect and analyze baseline postural sway data in high performance athletes including those participating in college club sports as well as NCAA and semi-professional leagues. With the increased media coverage of concussion and CTE (chronic traumatic encephalitis), it is necessary to determine best practices for concussion management and rehabilitation. Traditionally, baseline testing has relied solely on neurocognitive testing for post-injury comparison. However, this gives only a limited representation of neurologic function. With the inclusion of vestibular and visual acuity testing at baseline, a more comprehensive representation of neurologic function is presented. The inclusion of COBALT (concussion balance testing) in baseline performance provides that additional information and should help to guide a safe return to play and return to learn protocol for each individual athlete.

Methods: 151 subjects aged 13-25 were recruited from the Central Valley. 99 subjects were female with 52 males. The average age was 19 years +/- 2.55 years. Each subject was tested on conditions 3, 4, 7 and 8 on the COBALT. Condition 3 is a head shake with eyes closed to stimulate the vestibular system and condition 7 is the same test on a compliant surface (foam). Condition 4 is a test of visual motion sensitivity with condition 8 testing the same on a compliant surface. Baseline sway scores, indicating postural control, were collected for each athlete and the aggregate of the data base was analyzed using SPSS. A Pearson's Correlation test was used to determine correlation between history of previous concussion and average scores for each condition. A one-way analysis of variance (ANOVA) was used to analyze the relationship between sport and average sway scores for each condition. If the p-value was determined to be significant a post hoc test was conducted in order to determine the group with the difference using the Bonferroni method to determine statistical difference. The p value was set at $p < .05$ for statistical significance for all analyses.

Results: There were no significant differences between the top five sports represented in this sample (football, rugby, soccer, cheer, rodeo) for Condition 3 of the COBALT using an ANOVA. There were

statistically significant differences between sports for Conditions 4,7, and 8. Condition 4 had significance between football and rugby ($p < .001$), football and cheer ($p < .001$), and between football and rodeo ($p < .001$). With mean sway scores for football 1.29 ± 0.44 , rugby 0.77 ± 0.16 , cheer 0.79 ± 0.25 , and rodeo 0.95 ± 0.38 . Condition 7 had significance between football and rugby ($p = .003$), football and cheer ($p = .004$), and between football and rodeo ($p = .001$). With mean sway scores for football 1.11 ± 0.35 , rugby 1.44 ± 0.44 , cheer 1.42 ± 0.39 , and rodeo 1.48 ± 0.40 . Condition 8 had significance between football and soccer ($p < .001$), football and rugby ($p < .001$), football and cheer ($p < .001$), and between football and rodeo ($p < .001$). With mean sway score for football 1.38 ± 0.27 , soccer 1.04 ± 0.21 , rugby 0.97 ± 0.21 , and rodeo 1.01 ± 0.22 . Additional testing indicated correlation between each condition and previous history of concussion determine r values as follows for conditions 3,4,7 and 8 respectively: $r = 0.06$, $r = -0.02$, $r = 0.01$, and $r = -0.25$. All correlations presented as very weak.

Conclusion: These results show a significant difference in sway scores under the various conditions between the sports analyzed. Football players appear to have increased sway scores, indicating less postural control, than rugby players, cheerleaders and rodeo participants. The correlation testing indicates a very weak correlation between sway score and sustaining a concussion in the past. These findings are encouraging as we would hope there would be no lasting deficits for a player who has sustained a concussion. While this is promising, more research is needed to determine the reliability and validity of the COBALT and its effectiveness in providing not only baseline information, but post injury information as well. The ability to compare post injury results to baseline information under a number of domains will allow medical staff to determine rehabilitation and RTP/RTL plans for athletes who sustain a concussion. This project is the beginning of development of a comprehensive concussion management center at Fresno State.