Postural Sway and Neuropsychological Test Performance following an Acute Bout of Soccer Heading

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Context: The National High School Federation (NHSF) recently reported a gain in soccer participation amongst high school females to over 330,000 players nationwide; pointing to the growing popularity. Soccer is a contact sport and therefore the participants risk injury, including head injuries. Interestingly, the activity most frequently associated with concussions is the act of heading the ball. Alarmingly, females respond differently to concussions when compared to their male counterparts.

Objective: The purpose of this study is to determine if there are any changes in concussion symptoms, neuropsychological test performance, and balance after an acute bout of purposeful soccer heading in players with and without prior history of concussion.

Design: A pretest-posttest groups design. Setting: Soccer heading analysis occurred in a climate-controlled athletic fieldhouse, while balance and neuropsychological testing (NP) took place in an athletic training research laboratory. Patients or Other Participants: A total of 28 elite level female soccer players (age = 19.6 ± 0.96 years, mass = 60.4± 5.3 kg, and height = 163.6 ± 6.4 cm) have participated in this project. Subjects were divided into 4 groups dependent on their concussion history: CONT = no concussion/simulated headers, EXP1 = no concussion/heading, EXP2 = 1-2 concussions/heading, EXP3 = > 3 concussions/heading. Interventions: All subjects completed a baseline Concussion Symptom Checklist (CSC), a computerized neuropsychological test (ImPACT), and a series of balance tests using the Balance Error Scoring System (BESS) prior to performing the first soccer heading session (rotational or linear heading). During this session they performed 15 purposeful “headers” over a 15 minute time frame. Afterwards, the subject repeated the baseline tests described above. Following 7 days, subjects returned for another heading session (rotational or linear heading) utilizing similar test procedures. Group status served as the independent variable, while CSC score, BESS score, and the 5 ImPACT composite scores were the dependent measures.

Results: Interestingly, post-heading CSC scores on Day 1 decreased regardless of group status as reflected in a significant time main effect (pre = 4.0 vs post = 3.8). There were no significant differences in BESS scores pre vs post heading in any of the groups (CONT 12.4±5.1 vs 12.0±7.2 linear & 9.7±5.9 rotational; EXP1 12.0±4.0 vs 13.2±6.1 linear & 17.2±58.7 rotational; EXP2 11.8±6.0 vs 14.2±9.0 linear & 11.2±6.3 rotational; EXP3 15.8±6.3 vs 16.5±7.6 linear & 16.0±7.4 rotational). There were no significant differences pre to post test in the composite scores of the ImPACT test.

Conclusions: Using soccer balls projected at speeds similar to that seen in competitive soccer in a group of highly skilled players does not appear to adversely affect variables commonly measured in head injured subjects. Word Count: 449

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