THE EFFECTS OF DEHYDRATION ON SYMPTOMATOLOGY, NEUROPSYCHOLOGICAL PERFORMANCE, AND POSTURAL STABILITY


Objective: Dehydration is common to athletic performance. There is speculation that dehydration may confound standardized measures commonly used in the assessment of concussion. Our objective was to better understand how dehydration influences neuropsychological performance, postural stability measures, and the self-report of signs and symptoms, often assessed in athletes following a suspected concussion.

Design and Setting: Subjects participated in two counterbalanced sessions (euhydrated and dehydrated) separated by at least seven days. Subjects were dehydrated using a 15-hour fluid restriction model and a 45-minute exercise task. All testing took place in a sports medicine research laboratory where regular assessments of concussed athletes are performed. Subjects: Twenty-four healthy, male recreational athletes (age = 21.92±2.95 years, height = 1.80±0.06m, body mass = 80.70±10.76kg).

Measurements: The Standardized Assessment of Concussion (SAC) and Automated Neuropsychological Assessment Metrics (ANAM) were used to test mental status and neuropsychological performance. The NeuroCom Sensory Organization Test (SOT) and Balance Error Scoring System (BESS) were used to assess postural stability. The 18-symptom Graded Symptom Checklist was used to assess both the presence and severity of self-reported symptoms. Urine specific gravity and body mass measures were collected prior to and following the fluid restriction to determine hydration status. Statistical analyses compared the outcome measures between test conditions using paired samples t-tests. An a priori alpha level of 0.05 was used for all of the analyses; however, we applied a more conservative cutoff alpha level of 0.025 when analyzing individual symptom severity.

Results: We observed a higher number of self-reported symptoms and severity of symptoms in the dehydrated condition when compared to the euhydrated condition (p<0.001). Individual symptom differences (p<0.005) included the following: feeling slowed down, fatigue/drowsiness, difficulty concentrating, headache, and dizziness. The dehydrated condition had significant deterioration in visual memory (p=0.044) as well as a subjective measure of fatigue (p<0.001) as assessed by ANAM. No significant differences on the SAC, BESS, composite SOT, and composite ANAM scores were observed between conditions.

Conclusions: Our results suggest that moderate dehydration significantly influences symptoms commonly reported with concussion. Dehydration does not affect neuropsychological and postural stability objective testing measures for concussion. It is obvious from our results that self-reported symptoms alone may not isolate concussive injuries. Our study advocates that certified athletic trainers should incorporate the use of neuropsychological testing, brief mental status examinations, and postural stability assessments, when assessing a dehydrated athlete that has potentially sustained a concussion.

Keywords: Hydration, balance, neurocognitive, symptom, concussion

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