EFFECT OF HYDRATION STATUS ON NEUROCOGNITIVE TEST RESULTS
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BACKGROUND AND PURPOSE
• The human body is much less capable of adapting to fluid loss than food restriction1
• Research findings have demonstrated that neurocognitive abilities decrease with increasing dehydration2-3
• When acute exercise dehydration is evaluated, there is a negative effect on neurocognitive ability2
• There is a paucity of research regarding the isolated effect of fluid restriction on neurocognitive performance
• There is debate regarding:
  • The specific components of neurocognition that are negatively affected by dehydration
  • The degree of dehydration at which an adverse effect on neurocognitive function becomes apparent4-5
• Neurocognitive assessment methods and induced level of dehydration have been inconsistent among studies6
• ImPACT™ is a widely used neurocognitive test battery that was designed for concussion management
• No studies have examined the effects of dehydration on ImPACT™ test battery performance
• The purpose of this study was to quantify the effect of mild to moderate dehydration, brought on by controlled fluid restriction and exercise, on neurocognitive test scores of male college students using the ImPACT™ test battery

SUBJECT CHARACTERISTICS
• Participants were 17 male college students:
  • Age: 22 2 years; Height: 147 38 cm; Body mass: 85.1 15.6 kg
  • Exclusion criteria included the following:
    • Participation in an intercollegiate sport (within the past 12 months)
    • Attempting to gain or lose weight, or taking supplements to facilitate weight alteration goals
    • A condition/disease that has symptoms which are exacerbated by dehydration

METHODS
• Three-day baseline hydrated body mass was assessed using a standard scale (Tanita, Arlington Heights, IL)
• Hydration status for baseline body mass was confirmed using urine color (Uric) and urine specific gravity (USG)
• Following Day 3, subjects were randomly assigned to be hydrated or dehydrated for Day 4 neurocognitive testing
  • For hydrated trial: subjects instructed to continue fluid intake for maintenance of hydrated status
  • For dehydrated trial: subjects instructed to restrict fluids for 20 hours preceding testing
• Participants were also instructed to limit high water-content foods, such as fruits and vegetables
• Subjects completed an 110-minute cardiovascular workout on each day preceding trials
• Subjects were instructed to avoid consumption of alcohol or caffeine throughout the 4-day period
• 24-hour diet logs submitted to document consistency of kilocalorie and carbohydrate consumption on Day 3
• Dependent tests performed to confirm intake consistency between trials (P > .05)
• ImPACT™ testing was performed on Day 4 at the same time of day as baseline assessments
• Day 4 hydration assessment included Uric, USG, and urine osmolality (Advanced Instruments, Norwood, MA)
• Neurocognitive assessment was conducted only if subject was within goal range of hydration status
• Dehydrated: 1.5% to 2.5% loss of body mass
• Hydrated: -1.0% to +1.0% of baseline body mass
• Pre-post symptom scores were compared using the Wilcoxon Signed Rank test (Sign. Level: α = .05)

RESULTS
• There was a significant difference in body mass between hydrated and dehydrated trials (P < .001)
• Dehydrated USG (1.027 0.007) was elevated when compared to hydrated USG (1.009 0.008, P < .001)
• Dehydrated body mass was 1.88% (0.09%); 142.4 mosm/L (P < .001)
• Diet log analysis demonstrated no significant trial differences in kilocalorie or carbohydrate consumption (P ≥ .122)
• ImPACT™ symptom scores (α = .05)

CONCLUSIONS
• At modest levels of dehydration (1.88% body mass loss), we identified neurocognitive deficits in college-aged males
  • Deficits would alter clinical decision-making when utilizing the ImPACT™ test battery
  • Dehydration and traumatic brain injury produce similar and overlapping symptoms
  • Adequate hydration is important for maintenance of neurocognitive performance and should not be neglected

REFERENCES

Figure 1. Data collection sequence
Figure 2. Change in body mass between trials (P < .05)
Figure 3. Change in urine osmolality between trials (P < .05)