Relationships between Morning and Afternoon WUT (Weight, Urine Color, and Thirst) Criteria and Hydration Markers

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ABSTRACT

A Venn diagram decision tool consisting of weight, urine color, and thirst (WUT) is suggested to measure hydration status. The WUT Venn diagram has been used as a practical hydration status assessment tool; however, this relationship has only been investigated using a first-morning urine sample. **PURPOSE**: To investigate relationships between morning and afternoon WUT criteria, blood and urine markers. **METHODS**: Eight men (age: 21 ± 3; mass: 76.3 ± 15.6 kg) and five women (age: 22 ± 2; mass: 60.5 ± 13.6 kg) completed the study. Body mass, urine color, urine specific gravity (USG), urine osmolality (U_{OSM}), thirst level, and plasma osmolality (P_{OSM}) were collected as a first-morning and afternoon spot urine (2:00-4:00 CST) for 3 consecutive days in a free-living situation and 3 consecutive days in a euhydrated state. Body mass loss >1%, urine color >5, and thirst level ≥5 were used as dehydration thresholds. The number of markers that indicated dehydration levels were counted and categorized into either 3, 2, 1, or 0 WUT markers indicating dehydration (defined by either USG, U_{OSM}, or P_{OSM}). One-way ANOVA with Tukey pairwise comparisons were used to assess differences in USG, U_{OSM}, and P_{OSM} between different numbers of WUT markers. Receiver operating characteristics analysis was performed to calculate the predictive value of 0, 1, 2, or 3 hydration markers in detecting a dehydrated or euhydrated state. **RESULTS**: Morning and afternoon 1, 2, and 3 WUT markers were not significantly different (*ps* > .05) for USG and P_{OSM}. Morning and afternoon 0, 2, and 3 WUT markers were not significantly different for U_{OSM}. Morning and afternoon 3 WUT resulted in a specificity of 0.984 and 1.000, 0.984 and 1.000, and 0.956 and 0.981 for USG > 1.020, U_{OSM} > 700mOsm, and P_{OSM} > 290mOsm, respectively. Meeting at 2 WUT for morning and afternoon resulted in a specificity of 0.820 and 0.985, and 0.806 and 0.984 for USG and U_{OSM}, respectively. Meeting at 1 WUT for morning and afternoon resulted in a sensitivity of 1.000 and 0.813 for U_{OSM}. **CONCLUSION**: These results suggest that when 2 or 3 WUT markers are met, urine and blood hydration markers indicate dehydration, and when 1 WUT marker is met, U_{OSM} indicates not dehydrated. The WUT Venn diagram can assess hydration status when an afternoon spot urine sample is used.