Trichotomous Habitual Hydration Classification Reveals Distinct Biomarker Patterns During Hydration Intervention

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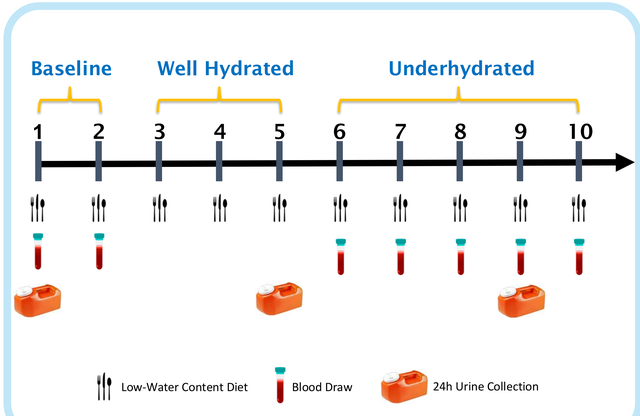
INTRODUCTION

Characterizing health risk profiles requires an in-depth synopsis of habitual health practices complemented by genetic predispositions. Current research characterizes individuals only as well hydrated or underhydrated, limiting the ability to unveil nuances or perhaps, accrued adaptations. We propose that further subdividing individuals by habitual hydration status, such as by 24-hour urine osmolality, reveals a moderately hydrated group with a distinctive and differentiating biomarker profile compared to those who are well- or underhydrated. Comprehensive analyses of the physiological differences between underhydrated, moderately hydrated and well hydrated individuals is warranted to better clarify how fostering ample water intake can potentially promote positive health outcomes.

PURPOSE

We sought to examine patterns of hydration biomarkers during periods of water intake manipulation in those trichotomously classified according to baseline low, moderate, and high 24h urine osmolality (uOsm).

METHODS



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Intervention Protocol:

- Participants: 22(4) years old men (n=14) and women (n=27)
- Participants replicated a low-water content diet throughout the study protocol
- Samples collected included 24-hour urine, fasted morning blood and thirst perception
- Participants followed a hydration intervention as follows:
  - **Days 1&2: Baseline (Habitual hydration)**
  - **Days 3-5: Well Hydrated (35ml·kg^{-1}·d^{-1})**
  - **Days 6-10: Underhydrated (20ml·kg^{-1}·d^{-1})**

Statistics:

- Mixed effects analyses with Tukey post hoc tests determined differences amongst averaged hydration biomarkers across each phase by trichotomous baseline uOsm groupings (alpha = 0.05)

RESULTS

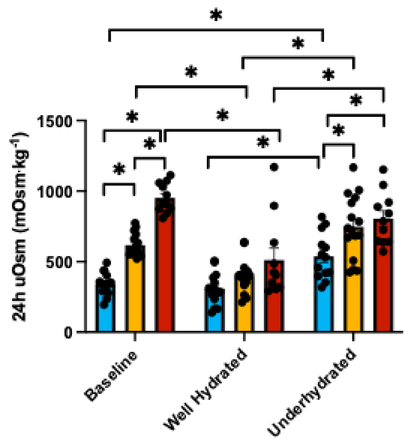


Fig 1: Distinct grouping by uOsm at baseline was not maintained at other hydration phases.
24h urine osmolality (uOsm) was distinctly different among LOW, MOD and HIGH groups at baseline. All groups equalized to match LOW during the well hydrated phase. During the underhydrated phase, LOW was distinct from MOD and HIGH.

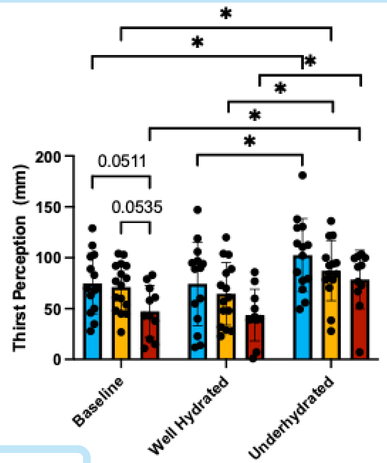
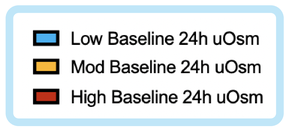


Fig 2: All groups experienced significant changes in perceived thirst across timepoints.
At baseline, groups showed statistically trending separation in thirst. All groups equalized during the well hydrated and underhydrated phases. Within each group, significant differences occurred between timepoints.



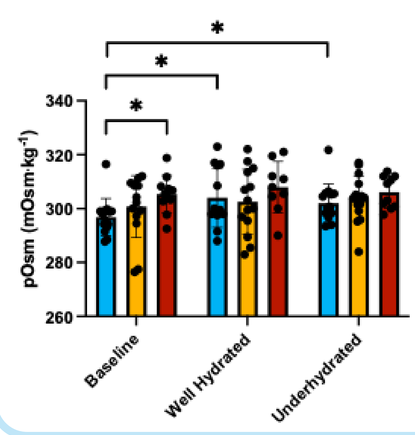


Fig 3: The LOW group exclusively showed differences in pOsm during intervention phases compared to baseline.
At baseline, LOW and HIGH pOsm were significantly different, yet MOD was not differentiated. No other differences were observed during hydration phases. LOW showed differences across all hydration phases.

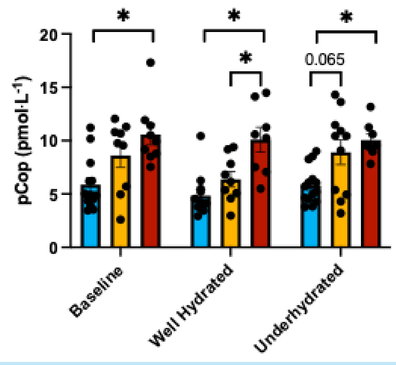


Fig 4: LOW and HIGH groups had significantly different pCop across all hydration phases.
LOW and HIGH pCop were differentiated regardless of hydration phase. MOD showed no notable differences apart from a statistically trending decrease compared to HIGH during the well hydrated phase.

CONCLUSIONS

LOW and HIGH 24-hour urine osmolality groups demonstrated consistent physiological differences at baseline and during dietary water intervention phases. Whereas MOD showed select differences compared to LOW and HIGH at baseline, other measures had unclear patterns with water intake manipulation. Our findings suggest that MOD is a valid characterization of hydration status and is categorically different than LOW and HIGH. Further, these data imply unique physiological handling of changes to daily water intake and might correspond with chronic physiological adaptions to habitual hydration behaviors. Continued research is required to unveil the nuances driving the dynamic responses of the MOD group during hydration intervention.

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