SCIENTIFIC BRIEF

COMPARISON OF SALIVARY OSMOLARITY TO GOLD-STANDARD HYDRATION MEASURES

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EXECUTIVE SUMMARY

Salivary osmolality (SOSM) provides a rapid, non-invasive approach to assessing changes in hydration status. This scientific brief evaluates the relationship between SOSM and two established measures of acute hydration change: plasma/serum osmolality (POSM), which reflects extracellular fluid concentration, and body mass loss (BML), which is widely used to quantify acute fluid deficit during exercise.

The available evidence demonstrates that SOSM changes systematically with both extracellular fluid concentration and progressive fluid loss. These findings support SOSM as a physiologically relevant hydration marker that can provide rapid, repeatable assessment without the practical limitations associated with blood sampling or repeated body mass measurements.

$R^2 = 0.77$	$R^2 = 0.58$	$P < 0.001$
The SOSM and POSM relationship across six peer-reviewed studies.	The SOSM and BML relationship across 11 peer reviewed studies.	Strong statistical significance across both metrics, compared to SOSM.

Together, these findings support SOSM as a practical field-based marker of acute hydration change. While SOSM does not replace laboratory measures such as POSM in all settings, its non-invasive nature and relationship with established physiological measures provide a strong basis for its use when rapid and repeated hydration assessment is required.

KEY POINT

SOSM tracks the physiological changes associated with acute physical activity-induced dehydration and provides a practical, non-invasive method for assessing hydration status in field-based settings.

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PLASMA OSMOLALITY

Plasma/serum osmolality (POSM) is one of the most accepted laboratory markers of extracellular fluid concentration[1]. During exercise-induced dehydration, particularly in the heat, sweat loss reduces body water and can increase extracellular fluid osmolality[2]. In this context, SOSM appears to respond in the same general direction as POSM: as systemic osmolality rises, saliva also becomes more concentrated.

In a combined dataset from six peer-reviewed studies, the relationship between SOSM and POSM was strong, with $R^2 = 0.77$ (**Fig 1**), meaning that approximately 77% of the variation in SOSM was explained by variation in plasma/serum osmolality across the extracted study timepoints. A key strength of this analysis is that it is not based on a single study or laboratory protocol.

The dataset combines evidence from different participant groups, including healthy adults, endurance-trained individuals, athletes, and underhydrated athletes, using different dehydration models, saliva collection procedures, and osmolality analysis methods. Despite this methodological variation, the strong SOSM-POSM relationship suggests that salivary osmolality provides a meaningful non-invasive indication of changes in extracellular fluid concentration during exercise-induced dehydration.

This does not mean SOSM replaces POSM in all settings, but it supports its use as a practical field-based marker that reflects the same broad physiological shift in body fluid concentration.

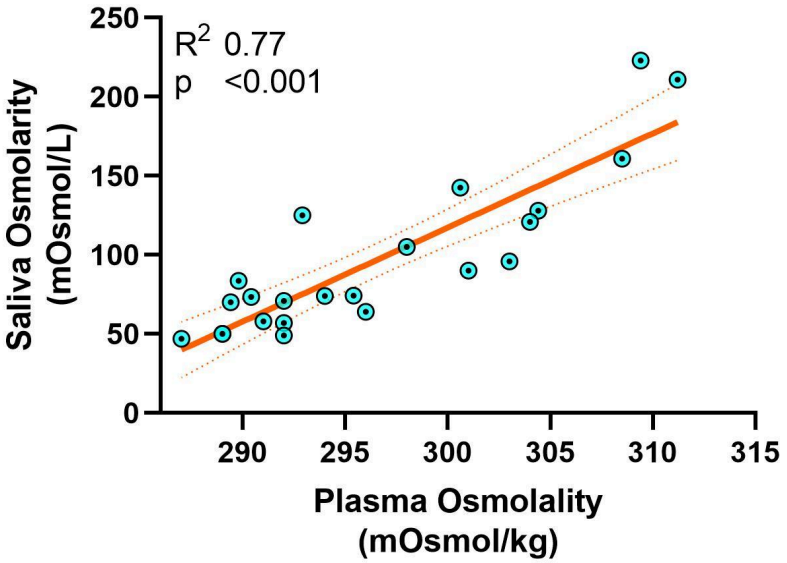

Fig 1. Correlation between plasma and saliva osmolality.

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BODY MASS LOSS

Body mass loss (BML) is one of the most practical ways to quantify acute exercise-induced dehydration, particularly when fluid loss occurs over a short period of exercise[1]. A 2% BML threshold is commonly used in sport and exercise settings because it is often considered the point at which dehydration may begin to meaningfully affect performance, thermoregulation, and physiological strain[3].

In a combined analysis with data from 11 peer-reviewed studies, SOSM showed a clear positive relationship with BML, with $R^2 = 0.58$ (**Fig 2**). This means that approximately 58% of the variation in SOSM was explained by the degree of body mass loss across the extracted study timepoints. In simple terms, as participants lost more body mass through exercise, heat exposure, or fluid restriction, their saliva generally became more concentrated.

A strength of this analysis is that the relationship was observed across a broad range of study designs and participant characteristics. The dataset included males and females, different body sizes, athletic and active populations, different exercise modes, and a wide range of exercise durations and intensities. Despite differences in sample characteristics, saliva collection methods, exercise protocols, and analysis equipment, the overall pattern was consistent: greater BML was associated with higher SOSM.

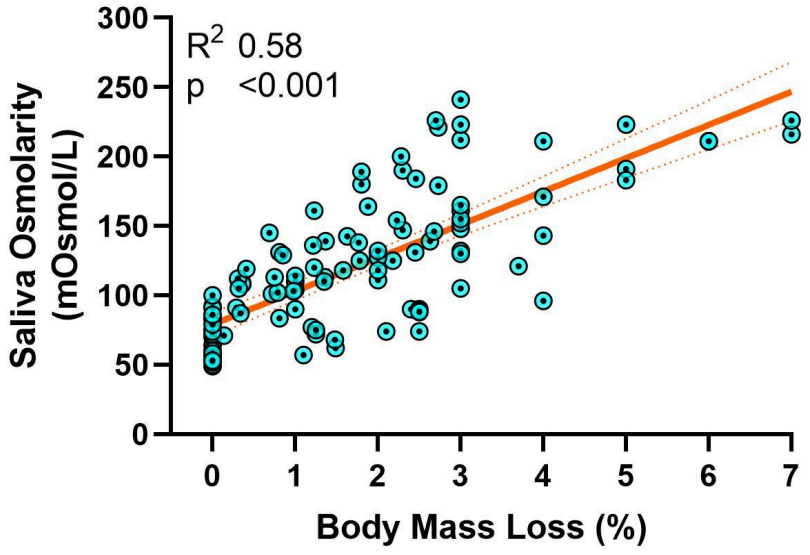

Fig 2. Correlation between body mass loss and saliva osmolarity.

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CONCLUSIONS & REFERENCES

Overall, the evidence supports SOSM as a practical, non-invasive marker of acute hydration change. Across the studies included in this analysis, SOSM showed a strong relationship with plasma/serum osmolality (**R^2 = 0.77, p < 0.001; Fig 1)** and a moderate-to-strong relationship with body mass loss (**R^2 = 0.58, p < 0.001; Fig 2**). For context, studies comparing urine specific gravity (USG) with POSM have generally reported weak-to-moderate relationships.

During progressive acute dehydration, USG was only moderately and nonsignificantly associated with POSM (r = 0.46, p > 0.10)[4], while first-morning USG showed a weak-to-moderate association with concurrent morning POSM in free-living young adults (r = 0.39, p = 0.002)[5].

Taken together, these data indicate that as dehydration develops, saliva generally becomes more concentrated in parallel with increases in extracellular fluid concentration and progressive fluid loss. The relationship with POSM is particularly important because POSM reflects changes in extracellular fluid concentration, which is a key physiological feature of exercise-induced dehydration. The relationship with BML is also practically meaningful, as body mass loss is widely used in sport to estimate fluid deficit, with ~2% BML often used as a threshold where dehydration may begin to affect performance, thermoregulation, and physiological strain.

References

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