Abstracts From the Second Annual Medicine & Science in Ultra-Endurance Sports Conference, June 2015, Olympic Valley, CA

The Influence of Hydration on Thermoregulation During a 161-km Ultramarathon

Taylor R. Valentino, MS¹; Kristin J. Stuempfle, PhD²; Marialice Kern, PhD¹; Martin D. Hoffman, MD³

¹San Francisco State University, ²Gettysburg College, ³University of California Davis Medical Center and Sacramento VA Medical Center

Objective.—It is commonly advised that individuals should avoid losing >2% of their body weight during exercise because dehydration can ultimately lead to hyperthermia, which will impair performance. However, body weight losses of ≥3% appear to be well tolerated in those participating in prolonged endurance exercise. This study sought to determine the relationship between hydration status and thermoregulation of runners participating in a hot ultramarathon and to assess whether a weight loss of >2% body weight leads to elevations in core temperature.

Methods.—Thirty runners of the 2014 161-km Western States Endurance Run agreed to take part in the study. Body weight and core temperature were measured at the start, at 3 locations during the race, and at the finish.

Results.—Of the 30 starting participants, 20 finished the race. Ambient temperature at data collection sites ranged from 17°C to 39°C, and the highest core temperature recorded was 39.4°C. Core temperature did not significantly differ during the race ($P = .77$) and was not correlated with body weight change ($P = .19$) or finish time ($P = .11$). However, body weight change was directly associated with finish time ($r = .60$, $P = .006$), such that the fastest runners had the greatest loss in body weight (~3.5–4.0%). Neither core temperature nor percent body weight change differed between race finishers and non-finishers ($P = .63$ and $.17$, respectively).

Conclusions.—While participating in endurance exercise up to 30 hours in hot conditions, runners can tolerate weight losses of >3% body weight without significant rises in core temperature. Therefore, since body weight losses of >3% were not associated with a rise in core temperature, an emphasis on fluid replacement for weight losses of this magnitude during prolonged exercise is not justified as a preventative measure for heat-related illnesses.

Supported by the Western States Endurance Run Foundation.

Weight Change and Hydration Status During a 161-km Ultramarathon

Karin D. VanBaak, MD¹; Jack Spittler, MD¹; Bjorn Irion, MD²; Martin D. Hoffman, MD³; Morteza Khodaei, MD, MPH¹

¹University of Colorado, Denver CO, ²Texas A&M University, ³University of California Davis Medical Center and Sacramento VA Medical Center

Objective.—Weight loss during ultramarathon competition is often considered a useful predictor of performance, hydration status, and hyponatremia. The validity of this assumption has not been well studied. This study was designed to examine the correlation between weight change and performance, urinalysis, and serum sodium in a 161-km ultramarathon.

Methods.—Runners were weighed at prerace check-in, at the halfway point, and at the finish line. Height was self-reported at prerace check-in. Willing finishers underwent urinalysis and provided a blood sample for serum sodium analysis.

Results.—Out of 672 runners who started the race, 351 (52%) successfully completed the race under the 30-hour cut-off time. Weight was measured on 658, 518, and 344 runners at prerace, halfway, and finish line, respectively. Urinalysis

(dipstick) was done on 70 runners (51 finishers), and blood samples were obtained from 84 runners (66 finishers). Mean ($\pm$ SD) weight and BMI (body mass index) were 73.1 ± 10.3 kg and 23.3 ± 2.3 kg/m², respectively. Mean weight change for runners was $-2.1 \pm 2.1\%$ and $-0.84 \pm 2.3\%$ of their prerace weight at midpoint and finish line, respectively. Based on linear regression analysis, there was a significant correlation between percentage weight change from prerace to finish line and finish time ($P = .016$, $r^2 = .02$). There was no statistically significant relationship between weight loss and urine specific gravity ($P = .124$, $r^2 = .05$), or between weight loss and serum sodium concentration ($P = .183$, $r^2 = .03$).

Conclusions.—Significant weight fluctuation is common during ultramarathons. Our data show that weight change may be a weak predictor of race performance and that faster finish times tend to occur with more weight loss. Weight change is not a useful predictor of urine specific gravity, nor is it useful as a predictor of serum sodium. More study is needed to determine if weight change during an ultramarathon is correlated with adverse patient outcomes.

Funded in part by the ACSM Clinical Sports Medicine Endowment Grant.

Hydration Guidelines During Exercise: What Message Is the Public Receiving?

R. Tyler Hamilton, MS¹; Theodore L. Bross, BS²; Martin D. Hoffman, MD³

¹Palm Beach Atlantic University, ²Boonshoft School of Medicine, Wright State University, ³University of California Davis Medical Center and Sacramento VA Medical Center

Objective.—To assess the quality of information currently available to the public about hydration needs during exercise.

Methods.—Internet searches were conducted using the terms “hydration,” “hydration guidelines,” “drinking fluids,” and “drinking guidelines” with “and exercise.” From the first 50 websites for each search phrase, duplicates were removed, yielding 145 unique websites. Websites were then categorized and examined for specific information and recommendations.

Results.—Overall correct endorsement of current knowledge was as follows (reported as percent endorsing the concept relative to the number of sites addressing the issue): some weight loss should be expected during exercise (67.6% of 102), fluid consumption during exercise should be based on thirst (9.4% of 106), electrolyte intake is not necessary during exercise (12.5% of 112), dehydration is not generally a cause of heat illness (6.9% of 58) or muscle cramping (2.3% of 43), exercise-associated muscle cramping is not generally related to electrolyte loss (6.7% of 15), and overhydration is a risk for hyponatremia (98.5% of 65). There were 7.1% (of 70 websites addressing the issue) indicating that any weight loss during exercise should be avoided. Comparison of website information from those in the categories of medical or scientific organization (15.9%), academic institution (9.0%), peer-reviewed publication (8.3%), and medical professional individual or facility (8.3%) with those in the categories of media (19.3%), sports organization or coach (9.7%), sports drink or electrolyte replacement manufacturer (3.4%), and other (26.2%) revealed no differences ($P = .38$ to 1.0) in the frequency of endorsement of the criteria referred to above.

Conclusions.—Misinformation about hydration needs during exercise continues to be widely spread on the Internet. In general, those websites that should be most trusted by the public appear to be no better than other websites at providing accurate information, and the potential risk of hyponatremia is not often raised.