THE EFFECTS OF CARBOHYDRATE AND CAFFEINE BEVERAGES ON HYDRATION STATUS FOLLOWING VOLUNTARY FLUID RESTRICTION

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Recommended post-exercise rehydration beverages should be consumed within 2 hr, contain carbohydrate and electrolytes and be equivalent to 150% of body mass (BM) lost by exercise or dehydration (Casa et al., 2000). Physiological responses and subjective feelings following 37hr of voluntary fluid restriction have been investigated (Shirreffs et al., 2004), but not restoration of hydration status following induced hypohydration. The aim of this study was to investigate the physiological responses to hypohydration and rehydration in rested individuals using commercially available beverages.

Following ethics approval 10 healthy males (age 27+/-3yr, mass 84+/-12kg) completed 3 drinks trials, each involving 3 separate visits over a 30hr period. During the first visit for each fluid restriction (FR) trial; baseline blood (plasma osmolality and volume, serum [Na+] and [K+]), urine (osmolality, specific gravity, volume and [Na+] and [K+]) and bioimpedance data were measured following an overnight fast and BM was recorded. Following a standard breakfast subjects voluntarily fluid restricted for 30 hr. Following 24 and 30 hr of FR all baseline variables were reassessed. Rehydration trials investigated three drinks; Lucozade Sport, Red Bull diluted 60:40 with water (isoRB) or water at a volume equivalent to 150% BM loss ingested over 30min, the caffeine load during the isoRB trial was 3mg.kg-1 BM. Post-fluid hydration status was monitored for 120min. A two-way repeated measured ANOVA with post-hoc Bonferroni tests quantified differences across treatments, $P<0.05$ inferred statistical significance.

Following mild hypohydration (BM loss=-1.7%) hydration status was restored similarly during all trials. Following 24 and 30hr of FR serum [K+], urinary [Na+], [K+], osmolality and specific gravity were significantly increased compared to baseline. No significant differences were recorded in bio-impedance data, plasma osmolality or volume, or urine data across trials 2hr post-ingestion. Significantly higher urine flow rates (ml.hr-1) were recorded following isoRB (467+/-48) compared to water (296+/-39), however, no significant difference in percent fluid retention was noted comparing these trials (46+/-6 vs 58+/-5% for isoRB and water). In conclusion, caffeine ingestion (isoRB) did not negatively affect hydration status in mildly hypohydrated subjects. Armstrong (2005) reported that moderate caffeine ingestion did not induce detrimental fluid-electrolyte imbalances in active individuals. Bio-impedance data appeared to be minimally affected by the small changes in hydration status induced. Armstrong et al. (1998) reported that urine specific gravity and osmolality were valid makers of hydration status and were not compromised by marked dehydration; similar observations were reported in this study.

Casa et al. (2000) J Ath Train 35, 212-224
Shirreffs et al. (2004) Brit J Nutr 91, 951-958
Armstrong (2005) Nutr Reviews 63, S40-54
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