The Effects of Caffeine Ingestion on Sodium-Aided Hyperhydration

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ABSTRACT

Sodium-aided hyperhydration has been shown to reduce rates of dehydration, improve performance, and alleviate markers of physical stress during endurance exercise in the heat. Caffeine use as an ergogenic and through casual consumption of foods is common among endurance athletes; but caffeine can have diuretic effects and its use prior to exercise may compromise hydration status and exercise performance by promoting fluid excretion. PURPOSE: To investigate the effects of caffeine consumption on sodium-aided hyperhydration. METHODS: Fifteen well-hydrated male subjects (21 ± 2 yr, 176 ± 6 cm, 80.2 ± 10.1 kg) who were free from known renal, digestive, and cardiovascular disease underwent five hyperhydration strategies. Each strategy began with a complete bladder void from which urine specific gravity was measured. The bladder void was followed immediately by ingestion of 20 mL $H_2O \cdot kg\ bm^{-1}$ combined with either no treatment (NT), placebo (P), 5 mg caffeine $\cdot$ kg bm^{-1} (Caf), 110 mg NaCl $\cdot$ kg bm^{-1} (Na), or 5 mg caffeine $\cdot$ kg bm^{-1} plus 110 mg NaCl $\cdot$ kg bm^{-1} (CafNa) administered in a randomized, double-blind, crossover manner. Subjects then rested quietly for two hours, performing a bladder void every 15 minutes. Total urine production during the two hour collection periods for each strategy were compared using repeated measures ANOVA with Sidak *post hoc* analyses. Levels of significance were set *a priori* at $P < 0.05$. RESULTS: Urine specific gravity measured before each strategy (1.006 ±0.003) did not differ significantly between treatments or subjects and indicated that subjects were well and similarly hydrated at the beginning of each hyperhydration strategy. Total urine productions as a percentage of fluid consumed were 103% (NT), 102% (P), 116% (Caf), 68% (Na), and 85% (CafNa). No significant difference was detected between NT and P ($P = 1.00$); however, significant differences were detected between all of the other comparisons ($P = 0.025$ - < 0.001). CONSLUSIONS: The results confirmed that hyperhydration can be attained when water consumption is accompanied by sodium ingestion but is not achieved when pure water is consumed without sodium. The current results also suggest that consumption of 5 mg caffeine $\cdot$ kg bm^{-1} with 20 mL $H_2O \cdot kg\ bm^{-1}$ prevents hyperhydration and that co-consuming 5 mg caffeine $\cdot$ kg bm^{-1} plus 110 mg NaCl $\cdot$ kg bm^{-1} with 20 mL $H_2O \cdot kg\ bm^{-1}$ promotes hyperhydration. However, the hyperhydration attained from the CafNa strategy is significantly less than hyperhydration levels achieved from consuming the sodium and water doses without caffeine.