

Effects of Intermittent Caffeine Ingestion on Aerobic Power During a 16.1K Cycling Time Trial

Brett M. Warner, Lauren E. Clune, Jessica M. Weimert, Reuben J. Pine, Noah T. Smith, Brienne L. Wickenheiser, H. Scott Kieffer, FACSM.
Messiah College, Mechanicsburg, PA

PURPOSE: This study compared the efficacy of two different modes of caffeine administration on cycling performance during a 16.1K time trial (TT). **METHODS:** A randomized, placebo-controlled (PL) double-blind study was used to compare a caffeine bolus administered in a single dose via capsule to an intermittent bolus administered via caffeinated gum. Eight trained cyclists, 6 male, 2 female (Mean \pm SD: 27.8 \pm 11.8 years, 76.7 \pm 13.9 kg, 176.1 \pm 8.2 cm, VO_{2peak} = 47.9 \pm 6.4 ml \cdot kg⁻¹ \cdot min⁻¹) completed one familiarization and three experimental trials. During the first session, the cyclists completed a graded cycling protocol to determine VO_{2peak} and an orientation to the Velotron cycle ergometer. During the experimental trials, the subjects received a dual pill_p-gum_g bolus containing either a placebo (PL) or caffeine (CAF) dose equal to 5 mg \cdot kg⁻¹ of body mass. The pill-gum combination included PL_p-PL_g, PL_p-CAF_g and CAF_p-PL_g. The pill was given 60 minutes prior to the TT and the gum was given in equal doses at 5 minutes prior to the TT and at 8K. Subjects performed the 16.1K TT on a 2% ramped incline with VO₂, RER, HR, Watts, and RPM measured continuously. Data was analyzed using a two-way ANOVA (condition \times time). **RESULTS:** There was no statistical difference in finish time for any condition, PL_p-PL_g = 2387.4 \pm 237.0, PL_p-CAF_g = 2393.5 \pm 194.5 and CAF_p-PL_g = 2410.8 \pm 228.7 s. There were no statistical differences for the main effects of condition for any variable, PL_p-PL_g, PL_p-CAF_g and CAF_p-PL_g for VO₂ (Mean \pm SD: 36.6 \pm 8.0; 36.5 \pm 7.0; 36.6 \pm 8.6 ml \cdot kg⁻¹ \cdot min⁻¹, respectively), Watts (204.9 \pm 33.1; 202.34 \pm 32.9; 200.2 \pm 33.4 W, respectively), or HR (163.4 \pm 20.8; 168.4 \pm 21.7; 163.1 \pm 24.0 bpm, respectively). In addition, there were no significant differences for VO₂, Watts, or HR across the TT; however, significant decreases were found in RER and RPM (Mean RER = -7.1% (P = 0.001); Mean RPM = -4.4% (P = 0.34)). No interaction effects were found. **CONCLUSION:** The present findings indicate 5 mg \cdot kg⁻¹ of caffeine does not improve overall 16.1K TT performance, metabolic response, or cycling efficiency with no statistical difference between a single bolus dose in capsular form or intermittent doses in gum form. RER decreases over distance as the body may increase fat utilization, and RPM decreases over distance as subjects succumb to fatigue.