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

PURPOSE: This study compared the efficacy of two different modes of caffeine administration on cycling performance during a 16.1 kilometer 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 cafffeinated gum. Eight trained cyclists, 6 male, 2 female (mean ± SD: 27.8 ± 11.8 years, 76.7 ± 13.9 kg, 176.1 ± 8.2 cm, VO2peak = 47.9 ± 6.4 ml·kg⁻¹·min⁻¹) completed one familiarization and three experimental trials. During the first session, the cyclists completed a graded cycling protocol to determine VO2peak and an orientation to the Velotron cycle ergometer. During the experimental trials, the subjects received a dual pill-gum bolus containing either a placebo (PL) or caffeine (CAF) dose equal to 5 mg·kg⁻¹ of body mass. The pill-gum combination included PLₚ-PLₔ, PLₚ-CAFₔ and CAFₚ-PLₔ. 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 x time). RESULTS: There was no statistical difference in finish time for any condition, PLₚ-PLₔ = 2387.4 ± 237.0, PLₚ-CAFₔ = 2393.5 ± 194.5 and CAFₚ-PLₔ = 2410.8 ± 228.7 s. There were no statistical differences for the main effects of condition for any variable, PLₚ-PLₔ, PLₚ-CAFₔ and CAFₚ-PLₔ for VO2 (Mean ± SD: 36.6 ± 8.0; 36.5 ± 7.0; 36.6 ± 8.6 ml·kg⁻¹·min⁻¹, respectively), watts (204.9 ± 33.1; 202.34 ± 32.9; 200.2 ± 33.4 W, respectively), or HR (163.4 ± 20.8; 168.4 ± 21.7; 163.1 ± 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·kg⁻¹ of caffeine does not improve overall 16.1 K 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.