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 16.1K 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±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-p-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 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 x time). RESULTS: There was no statistical difference in finish time for any condition, PL_p-PL_g = 2387.4±237.0, PL_p-CAF_g = 2393.5±194.5 and CAF_p-PL_g = 2410.8±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±SD: 36.6±8.0; 36.5±7.0; 36.6±8.6 ml·kg⁻¹·min⁻¹, respectively), Watts (204.9±33.1; 202.3±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 decreases in 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 16.1K 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.
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Abstract

Purpose

The purpose of this study was to compare the efficacy of two different modes of caffeine administration on cycling performance during a 16.1K continuous cycle test (CT) and to determine whether caffeine ingestion in the form of pre-exercise coffee ingestion (CE) or in the form of pre-exercise tablet ingestion (CT) would be effective in improving performance when caffeine is ingested before exercise.

Methods

Eight trained cyclists, 5 male, 3 female (41.1 ± 12.8 yrs, 71.3 ± 10.3 kg, VO2 peak 51.4 ± 7.3 mL/kg/min) participated in the study. They were assigned to two random groups: the CE group who ingested coffee 24 h prior to exercise and the CT group who ingested caffeine as a single dose 30 min prior to exercise. Baseline VO2 max, VO2 peak, anaerobic threshold, and lactate threshold were measured in both groups.

Results

There were no significant differences for the main effects of condition (24 h vs. 30 min) or time (pre-test vs. post-test) on VO2, anaerobic threshold, lactate threshold, or L:V power at any time.

Conclusions

High caffeine content can be used as an alternative for drug testing. Individual performance can be improved with caffeine ingestion before exercise. Further study is needed to determine the optimal timing of caffeine ingestion for peak performance.