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The Effect of Caffeine Supplementation on Endurance Performance and Heart Rate in the Non-Athlete

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Abstract

Caffeine is one of the most commonly ingested supplements, as it is found in many drinks including coffee, tea, soda, and foods containing cocoa. Previous research indicates that caffeine may act as an ergogenic aid, meaning that it is a supplement that may enhance athletic performance, stamina, or recovery. However, the majority of prior studies have investigated the effects of caffeine on athletes; limited attention has been given to these potential effects in the sedentary population. Therefore, the purpose of this study was to test the effect of caffeine supplementation on exercise endurance and heart rate during running in the non-athlete. A non-athlete was considered to be a person who exercises less than 150 minutes per week. All subjects participated in three trials: a familiarization trial and two experimental trials. Each trial consisted of a fifteen minute run, during which participants were asked to run at maximum effort to complete as many laps of the indoor track as possible. Heart rate was assessed manually and through heart rate monitors before, during, and after each run. Participants were asked to rate exertion using a Rate of Perceived Exertion (RPE) scale at five-minute increments throughout each trial. One hour prior to each experimental trial, participants were administered either five mg/kg body weight of caffeine or a placebo using a double-blind procedure. Participants who received the caffeine in the first trial were then given the placebo for the second trial and vice versa. This study is ongoing, and results will be presented at the Hope College Research Celebration. If caffeine is shown to enhance performance in the non-athlete, this may suggest that caffeine should become a viable supplement to increase the frequency and duration of physical activity in this population.

Introduction

- Non-athletes may be less motivated to exercise, so by finding a supplement that increases their endurance performance, they may be more motivated to do so
- Previous research focuses on the athletic population, and has been found to improve exercise performance in endurance tasks while reducing fatigue (Burke, 2008) as well as to decrease ratings of perceived exertion (Schubert, 2013)
- A previous study conducted by Wallman et al. (2010) concluded that 66% of the runners in their study ran faster after caffeine intake
- However, few studies have been conducted studying heart rate and endurance performance in the non-athletic population
- This study hypothesized that caffeine ingestion (5 mg/kg) prior to exercise would increase endurance performance, allow for more work to be done over a period of time, and increase heart rate levels while doing so.

Purpose

The purpose of the study was to assess the effects of caffeine ingestion (5mg/kg) on heart rate, endurance capacity, and perceived exertion levels during a 15 minute run on an indoor track in the non-athlete.

Methods

Subject Selection:

11 subjects (19-22 yr) were recruited from Hope College. Subjects included four (n=4) males and seven (n=7) females.

Experimental Test:

Timed run (15 minutes) around the Dow Center track.

Experimental Design:

- 3 trials total (Familiarization, Trial 1, Trial 2)
- Double-blind procedure (caffeine or placebo)
- Ingestion of 5 mg/kg of caffeine or placebo 1 hour prior to trials
 - Exception of familiarization
- 15 minute run
- Post Test assessments were recorded
 - total number of laps
 - post test heart rate (manual and monitor)
 - RER scores at 5,10, and 15 min
- Diet on the day of testing was recorded by participants
- 24 hours prior to testing
 - participants abstained from caffeine intake and physical activity

Caffeine or Placebo Ingestion (5 mg/kg)	1 hour rest period	15 minute Run	RER scores at 5, 10, 15 min	Post Test assessments
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Figure 1. Study Design. Participants performed this sequence twice over the course of three weeks.

Results



Figure 2. Number of laps completed during 15 minutes of running on an indoor track for Day 1 and Day 2. *p=.018

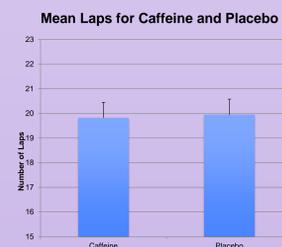


Figure 3. Number of laps for participants who ingested caffeine and placebo 60 minutes prior to 15 minutes of running on an indoor track.

Results

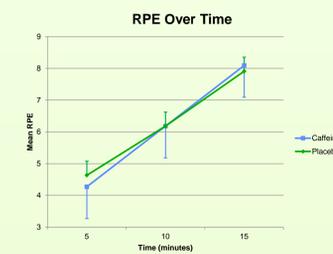


Figure 4. RPE values over time for participants with caffeine and placebo supplementation during 15 minutes of running on an indoor track. Main effect for time, p<0.0001

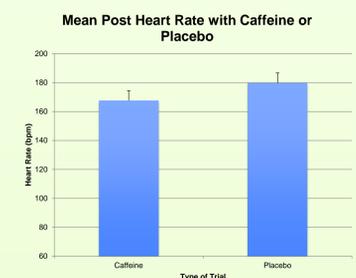


Figure 5. Heart rate values post trial for participants with caffeine compared to placebo following 15 minutes of running on an indoor track.

Conclusion

- No effects of caffeine on endurance performance or heart rate in the non-athlete
- Day 2 had more laps regardless of whether caffeine or placebo was ingested
 - May indicate a learning effect
- RPE increased with time
 - No effect of caffeine associated with RPE
- Post Test heart rate was not different between trials
 - Day 1 vs. Day 2 or Caffeine vs. Placebo

Limitations

- Staggered starts (every 30 seconds)
- Gender Differences
 - Males vs. female effort and competitiveness
 - Motivation
- RPE is a subjective rating
- Learning Curve
 - Not enough familiarization before starting the trials
- Heart Rate
 - Deviations between manual and monitor readings
 - “exact” post trial heart rate

Bibliography

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