



Effects Of Caffeine On Blood Lactate During Submaximal Exercise In Women

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Abstract

INTRODUCTION: Blood Lactate ([La⁻]) is the buildup of the byproduct lactic acid (LA) in the blood. LA is present at rest, but is increased during exercise. The rate of clearance of LA is an indication of fitness levels. Research shows that a pre-exercise caffeine supplementation further increases the accumulation of blood lactate.

PURPOSE: The specific purpose of this research study was to ask the question does a pre-exercise caffeine supplement increase heart rate, blood pressure, distance traveled and post-exercise blood lactate levels during a submaximal exercise bout while decreasing the overall rate of perceived exertion in a moderately trained individual.

METHODS: Five women (W; age 23.2 ± 2.168) of good physical condition, volunteered to participate in this study. Each subject had their body fat measured with a bioelectrical impedance analysis machine (BIA) and their resting values were obtained including height (cm), weight (kg), heart rate (HR) and blood pressure (BP). Resting blood lactate (mmol/L) was taken 30 minutes prior to exercise. Each subject was given either a NoDoz pill (200 mg of caffeine) or a Tylenol pill which contained zero caffeine. Each subject then performed a 30 minute submaximal aerobic bout on a cycle ergometer. During each test, heart rate, blood pressure, and rate of perceived exertion (RPE) were recorded every 10 minutes until the conclusion of exercise bout. As soon as exercise was terminated, a final blood lactate was acquired.

RESULTS: The percent body fat of the five women tested was 24.36 ± 0.05%, height was 167.13 ± 11.4 cm, and weight was 65.71 ± 5.2 kg. The resting heart rate of the control group (P) was 84.8 ± 5.0 bpm compared to 83.6 ± 12.8 bpm in the experimental group (E) which was not significantly different (p > 0.05). Resting blood lactate was 1.7 ± 0.5 mmol/L (P) compared to that of 1.24 ± 0.5 mmol/L (E) which also was not a significant difference (p > 0.05). The maximal values: HR (146 ± 14.6 bpm (P); 155.2 ± 17.5 bpm (E)); RPE (14.2 ± 1.8 (P); 13.8 ± 1.6 (E)); and blood lactate (5.66 ± 1.6 mmol/L (P); 6.36 ± 1.3 mmol/L (E)) were not significantly different (p > 0.05). The overall total distance traveled was 12.4 ± 0.9 km (P) and 12.7 ± 0.8 km (E) which also was not significantly different (p > 0.05).

CONCLUSION: The results of this study indicate that a pre-exercise caffeine supplement did not improve performance during submaximal workloads while decreasing the overall RPE. Furthermore, the overall blood lactate production was higher after receiving the caffeine supplement compared to receiving a placebo. However, these results were not significant. The results may be attributed to each subject's age and fitness levels.

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Methods

- Five women participants, ages 18-30 years old, volunteered for the study. All participants were considered to be in a healthy condition who could finish a 30-minute submaximal exercise bout on a cycle ergometer.
- Two pre-exercise supplements pills, NoDoz and Tylenol, were used for this study. The purpose of the NoDoz supplement was to provide 200 mg of caffeine to boost performance during exercise. The Tylenol contained no caffeine and acted as a placebo.
- Height, weight, body fat percentage, resting heart rate, resting blood pressure, and resting blood lactate were taken prior to administering supplementation. After subject took their designated supplement, a period of 30 minutes was taken before exercise was started so each supplement had time to reach full effect.
- The control group ingested the Tylenol pill containing no caffeine and the experimental group ingested the caffeine supplement containing 200 mg of caffeine.

Methods (cont'd)

- Each participant completed a total of two sessions in which they either ingested a caffeine supplement or a placebo pill. The following session, each participant ingested to opposing pill.
- Heart rate, rate of perceived exertion, and blood pressure were measured every 10 mins during exercise until completion of the 30 minute bout.
- Upon completion of exercise, a final blood lactate was taken from each subject and total distance traveled was recorded.
- The results of the from both sessions were compared for both experimental and control groups.

Results

Table 1: Subject Data

Subjects	Mean	SD	Max	Min
Height (cm)	167.1	± 11.4	182.88	157.48
Weight (kg)	65.7	± 5.2	70	58.06
Age (years)	23.2	± 2.2	26	20
Body Fat Percentage	24.26%	± 0.04	28.90%	18%
Fat-Free Mass (lbs)	49.6	± 1.8	51.94	47.61
Fat Mass (lbs)	16.1	± 3.9	19.7	10.45
Resting Heart Rate (bpm)	76.5	± 9.1	94	62
Pre-exercise Blood Lactate (mmol/L)	1.5	± 0.5	2.4	0.8

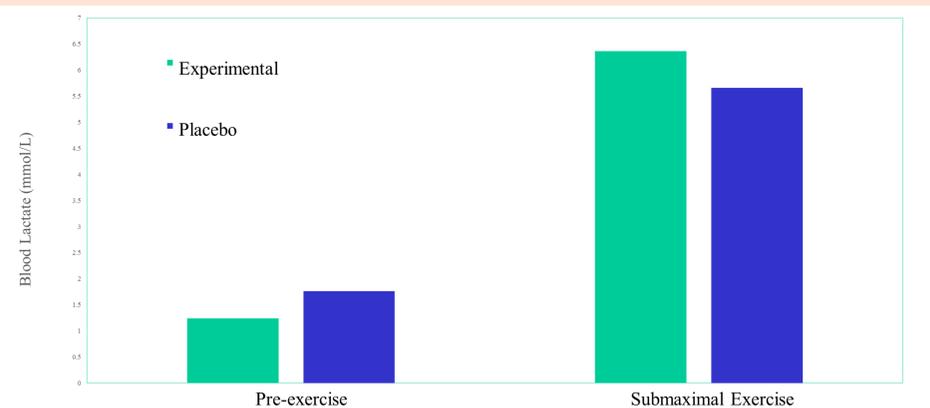


Figure 1: Comparing Resting Blood Lactate Levels To Blood Lactate Levels After 30 Minutes of Submaximal Exercise

Results (cont'd)

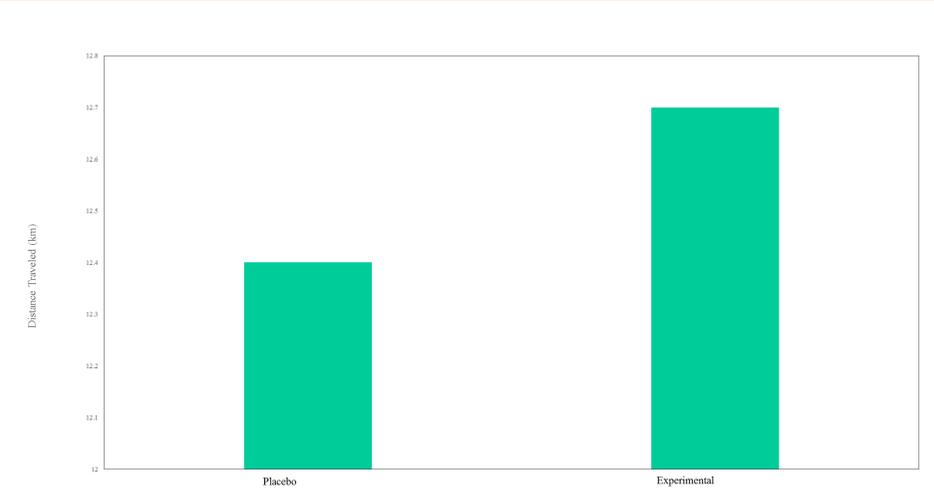


Figure 2: Total Distance Traveled

Discussion/Conclusions

- A dependent t-test analysis using repeated measures indicated that there was no significant change in comparison to both group's blood lactate after 30 minutes of submaximal aerobic exercise.
- Overall, the pre-exercise blood lactate was slightly higher in the control group, however, the post-exercise blood lactate was higher in the experimental group given that fact that the overall RPE was decreased for those exercising with the caffeine supplement compared to the placebo supplement.
- Heart rate was higher in the experimental group at the minutes 10, 20, and 30.
- Rate of perceived exertion was slightly higher in the experimental group at minute 10, but was lower at minutes 20 and 30 compared to the control group.
- Total distance traveled was slightly higher in experimental group compared to control group.
- Systolic blood pressure was also higher at minutes 10, 20, and 30 in experimental group compared to control group.
- As predicted, total distance traveled, heart rate, systolic blood pressure, and post-exercise blood lactate levels were higher while rate of perceived exertion was lower in experimental group, t-test analysis showed no significant difference in comparison of both groups.