



# THE EFFECTS OF CAFFEINE ON MAXIMAL EXERCISE

Authors: Amber D. Rey and Brenda Romero, KINE 4400

Sponsor: Judy R. Wilson, Ph.D.; B. Heddins, M.S.

Cardiovascular Research Laboratory, The University of Texas at Arlington, Arlington, TX;



## Introduction

- ❖ Caffeine is classified as an ergogenic and central nervous system stimulant. Research shows that there are benefits of consuming caffeine. These include increased mental alertness, decreased fatigue and increased delay to the onset of fatigue, decreased reaction time and increased use of muscle triglycerides.
- ❖ Research has also shown that ingesting caffeine prior to exercise significantly elevates plasma levels of free fatty acids (FFA) and glycerol. It is known that the accumulation of FFA reduces the rate of glycolysis via the inhibition of phosphofructokinase. Therefore, ingestion of caffeine is expected to alter carbohydrate metabolism and the rate of lactate production.

## Purpose

- ❖ The purpose of this study was to evaluate whether the maximal oxygen consumption (VO<sub>2</sub> max) values of men were affected by caffeine.

## Methods

- ❖ Five men (age 20.8 ± 1.84 yrs; height 71.8 ± 1.52 in; weight 190 ± 33.12 lbs; BMI 26.3 ± 4.08) from the University of Texas at Arlington, volunteered to participate in this maximal exercise study. Each subject took a survey on how often they exercise and how much caffeine they regularly intake. Each subject took either the placebo (Tylenol) or the caffeine pill (NoDoz) on two different days. Each subject performed the Bruce protocol, a graded exercise test on the treadmill with increasing speed and elevation until exhaustion, on both days. During each test, heart rate (HR), rate of perceived exertion (RPE), time to exhaustion were recorded along with collection of expired gases to calculate VO<sub>2</sub> max. The level of significance was set at  $p \leq 0.05$ .

## Methods (cont'd)

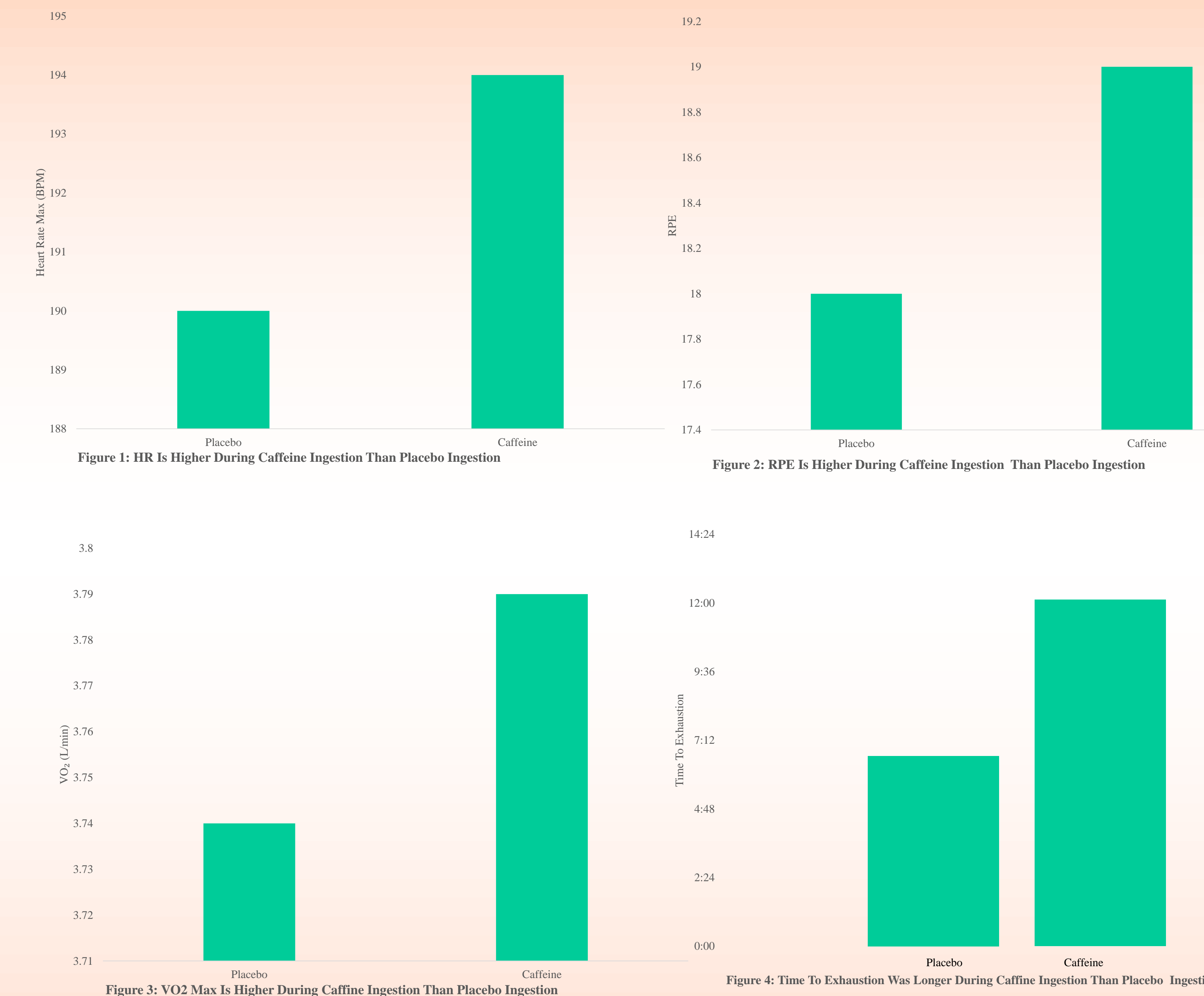
Table 1.

	Mean	SD	Max	Min
Age (yrs.)	21	± 1.84	24	18
Height (in.)	71.8	± 1.52	74	68
Weight (lbs.)	190.6	± 33.12	270	148
Body Mass Index	26.3	± 4.08	36.5	21.1

## Results

- ❖ The values for caffeine (C) and placebo (P) : RPE (C: 18.6 ± 0.88; P: 18.2 ± 0.96); VO<sub>2</sub>max (C: 3.79 ± 0.55 L/min; P: 3.74 ± 0.52 L/min); and time to exhaustion (C: 12:07 ± 0.06 min; P: 6:39 ± 4.50 min) were not statistically significant between caffeine and placebo ingestion ( $p > 0.05$ ). However, there was a statistically significant difference ( $p = 0.02$ ) between the two exercise tests, caffeine and placebo, for HR max (C: 194 ± 2.56 bpm; P: 190 ± 2.48 bpm).

## Results (cont'd)



## Conclusions

- ❖ The results of this study indicate that caffeine has an effect on HR max during maximal exercise, but none of the other variables measured.
- ❖ These HR max differences may be attributed to caffeine being an ergogenic aid and central nervous system stimulant.
- ❖ Caffeine in high doses has the potential to raise the blood level of epinephrine which increases the contractility of the heart which in return increases the heart rate.