

4-13-2018

# Effect of Acute Ingestion of a Cup of Coffee on 5-Km Running Performance in Collegiate Cross- Country Athletes

Rachael Webb

Alison Rich

Hayden Smith

Sarah Spencer

Mallory Beswick

Follow this and additional works at: [https://digitalcommons.hope.edu/curcp\\_17](https://digitalcommons.hope.edu/curcp_17)

 Part of the [Kinesiology Commons](#)

---

## Recommended Citation

**Repository citation:** Webb, Rachael; Rich, Alison; Smith, Hayden; Spencer, Sarah; and Beswick, Mallory, "Effect of Acute Ingestion of a Cup of Coffee on 5-Km Running Performance in Collegiate Cross- Country Athletes" (2018). *17th Annual Celebration of Undergraduate Research and Creative Performance (2018)*. Paper 11.  
[https://digitalcommons.hope.edu/curcp\\_17/11](https://digitalcommons.hope.edu/curcp_17/11)  
April 13, 2018. Copyright © 2018 Hope College, Holland, Michigan.

This Poster is brought to you for free and open access by the Celebration of Undergraduate Research and Creative Performance at Digital Commons @ Hope College. It has been accepted for inclusion in 17th Annual Celebration of Undergraduate Research and Creative Performance (2018) by an authorized administrator of Digital Commons @ Hope College. For more information, please contact [digitalcommons@hope.edu](mailto:digitalcommons@hope.edu).

# Effect of Acute Ingestion of a Cup of Coffee on 5-Km Running Performance in Collegiate Cross-Country Athletes

Mallory Beswick, Alison Rich, Hayden Smith, Sarah Spencer, and Rachael Webb

Faculty Mentor: Maureen Dunn

Kinesiology, Hope College

## Abstract

Previous research has shown that various forms of caffeine can enhance exercise performance in many activities. However, the vast majority of prior studies have examined effects of caffeine in pill form, rather than from a cup of coffee. Specifically, the effect of a low dosage of caffeinated coffee on 5-km running performance has not yet been studied in depth. Therefore, the purpose of this study was to determine the effect of ingestion of twelve ounces of caffeinated coffee on 5-km performance in Hope College male and female cross-country runners. Ten participants were brought in for a familiarization trial, which included taking baseline measurements and a 2-km timed treadmill run after drinking twelve ounces of water. Following familiarization, participants were divided into two groups matched for best 5-km time, and a double-blind crossover design was used. All participants abstained from caffeine for at least 12 hours before each trial. One group consumed 12 ounces of caffeinated coffee before the 5-km treadmill time trial the first week, while the other group consumed 12 ounces of decaffeinated coffee before the trial. The following week, the groups consumed the alternate treatment. At the completion of each kilometer, time, HR, and RPE were recorded. Trials occurred seven days apart on the same day of the week, at the same time of day, and diet and physical activity were mimicked before each trial. It was hypothesized that the 5-km completion time after caffeinated coffee consumption would be significantly faster than when decaffeinated coffee was consumed. Significant results would allow for the recommendation of caffeinated coffee consumption before cross-country races for college-aged runners.



Researcher obtaining a rating of perceived exertion from a participant during a trial

Participant completing a 5-Km time trial

## Background

- Numerous studies have been completed that report the ergogenic effects of caffeine ingestion in powder form on endurance exercise (Beaumont and James, 2017).
- Caffeine elicits its ergogenic effects through various processes including the stimulation and alteration of the central nervous system (Higgins et al., 2016).
- Coffee is an easily available and commonly consumed beverage that contains a significant amount of natural caffeine; however, there is less evidence of the ergogenic potential of caffeine when consumed through coffee (Church et al., 2015).
- It has been established that the ingestion of both high and low dosages of caffeine could improve endurance performance (Spriet, 2014).
- Multiple studies have assessed the effectiveness of a caffeine-containing energy drink on improving athletic performance (DeL Coso et al., 2012).
  - These findings suggest that consuming a caffeinated beverage like coffee may also lead to improved 5-km performances in sport in both males and females alike.
- Based on the results suggesting that high dosages of caffeine in capsules and coffee improve endurance running and cycling performance (Spriet, 2014) and low dosages of caffeine in capsules, caffeinated energy drinks, and coffee improve sport performance and running speed in some individuals (Wickham and Spriet, 2018), we hypothesized that the acute ingestion of caffeine found in 12 ounces of coffee would improve 5-km running performance in collegiate cross-country runners.

## Purpose

The purpose of this study was to evaluate the effect of twelve ounces of Starbucks House Blend caffeinated coffee (150 mg caffeine/12 ounces), compared to twelve ounces of Starbucks House Blend decaffeinated coffee (15 mg caffeine/12 ounces), on running performance in a 5-km time trial test in male and female collegiate cross-country runners.

## Methods

### Participants:

- 9 male and female subjects (ages 19-23) were recruited via email from the Hope College cross country team roster
- Exclusion factors: injury, health risk that prevents them from completing a 5-Km trial, allergy or intolerance to coffee, or habitually consumes over 30 ounces of coffee per day

Table 1. Participant demographics.

Gender	Height (cm)	Weight (kg)	Age (years)
<b>Females (n=3)</b>	158.27 ± 10.16	56.27 ± 3.83	19.67 ± 1.15
<b>Males (n=5)</b>	183.14 ± 6.96	72.5 ± 5.31	20 ± 0.71

### Experimental Design:

#### Week 1: Pre testing.

- All participants completed self-selected warm-up and 2-Km familiarization run.
- Age, gender, height, weight, resting heart rate, exercise heart rate, RPE, resting blood pressure were measured and recorded.

#### Week 2: Testing

- Participants were matched based on best 5-Km time.
  - Group A: 12 oz. of caffeinated coffee
  - Group B: 12 oz. of decaffeinated coffee
- 1 hour wait and warm-up period followed the 15 minutes of coffee consumption.
- Participants ran 5-Km trial.
- HR, RPE, and split time recorded at the completion of each kilometer. Time to completion was recorded.

#### Week 3: Testing

- Participants remained in same groups
  - Group A: 12 oz. of decaffeinated coffee
  - Group B: 12 oz. of caffeinated coffee
- 1 hour wait and warm-up period followed the 15 minutes of coffee consumption.
- Participants ran 5-Km trial.
- HR, RPE, and split time recorded at the completion of each kilometer. Time to completion was recorded.

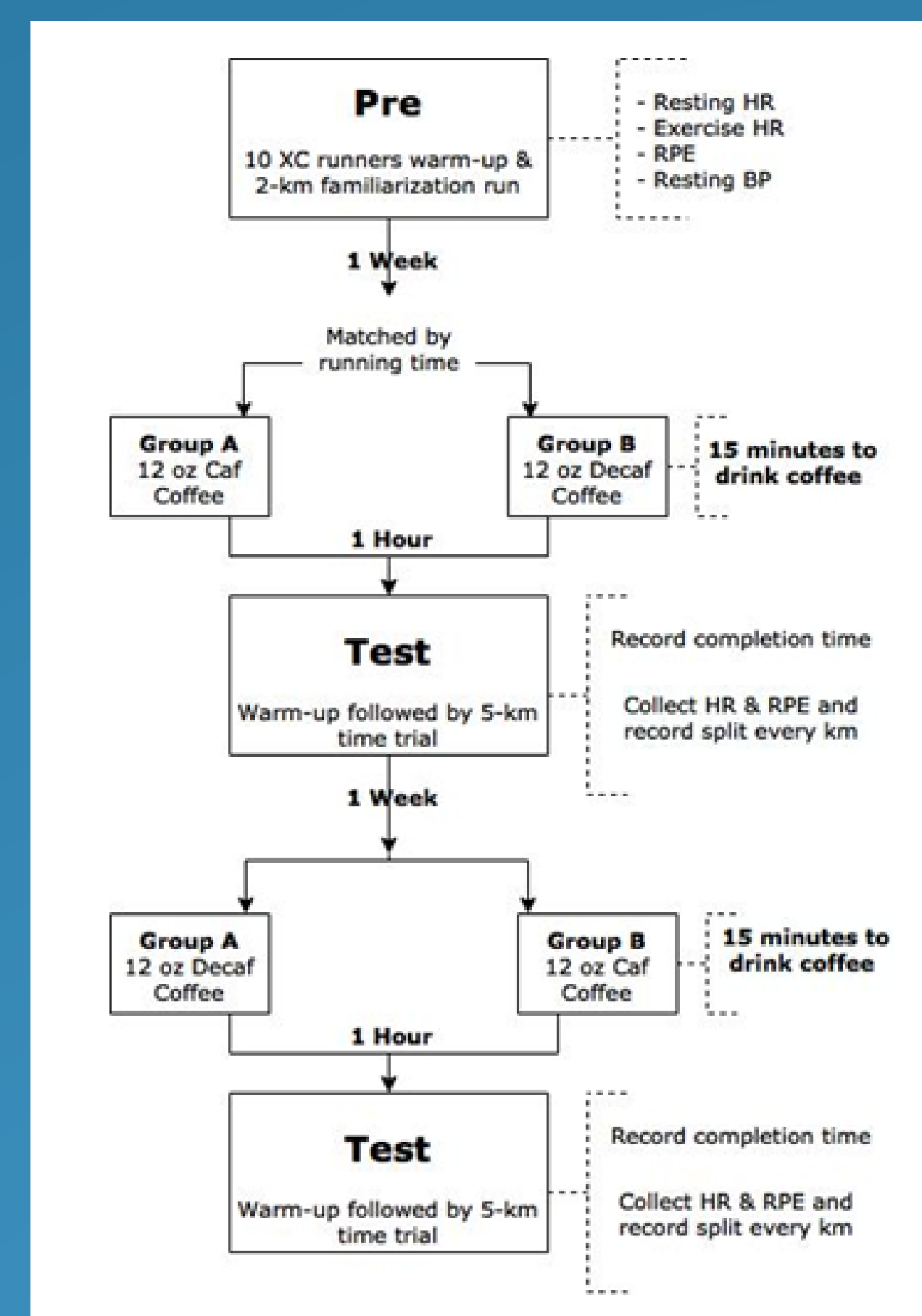


Figure 1. Study Design.

## Results

Comparison of Total Time Trial Between Caffeinated and Decaffeinated Coffee

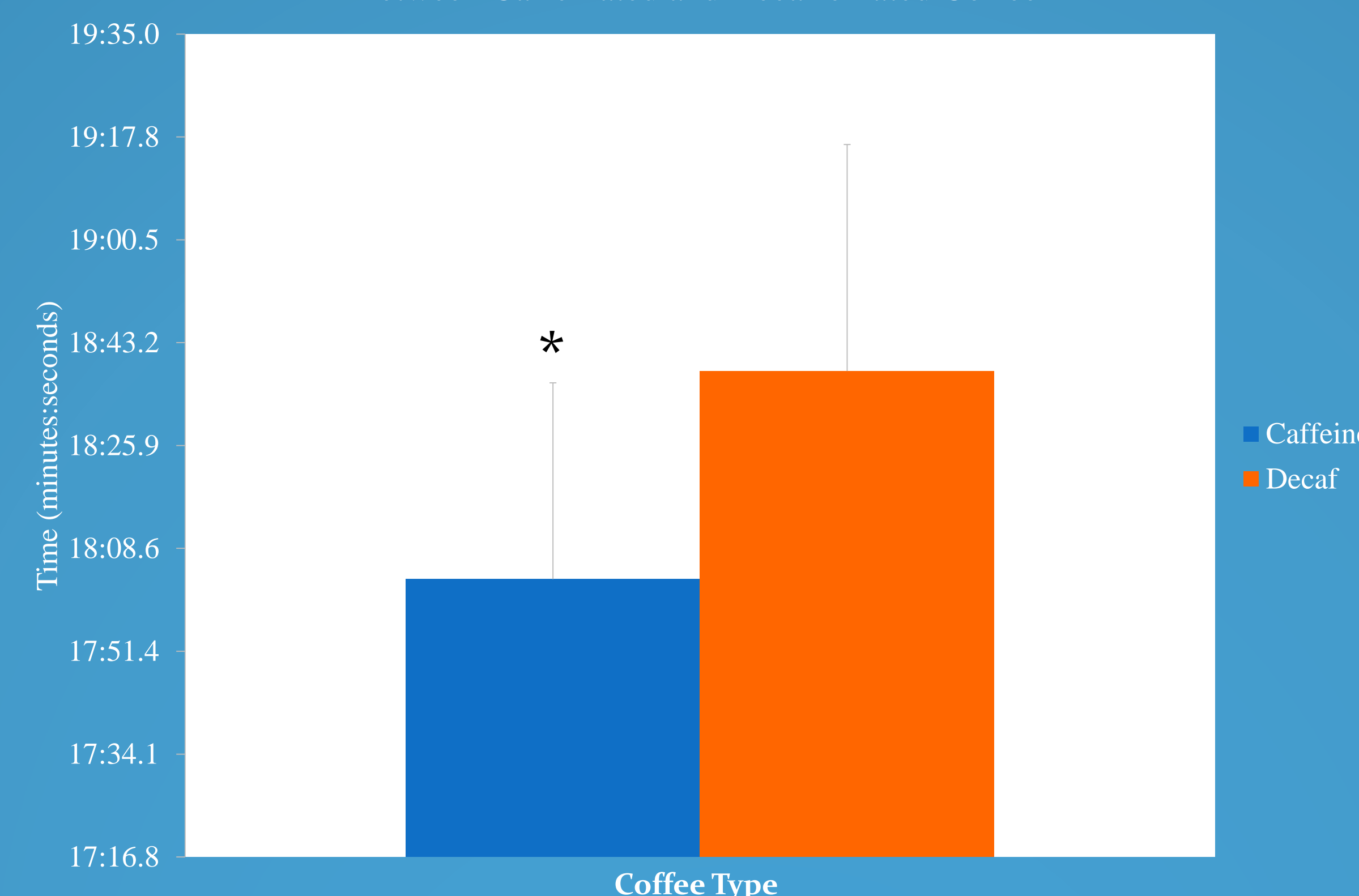


Figure 2. This graph displays the significant difference in time to completion between caffeinated coffee and decaffeinated coffee trials. \*, p=0.002

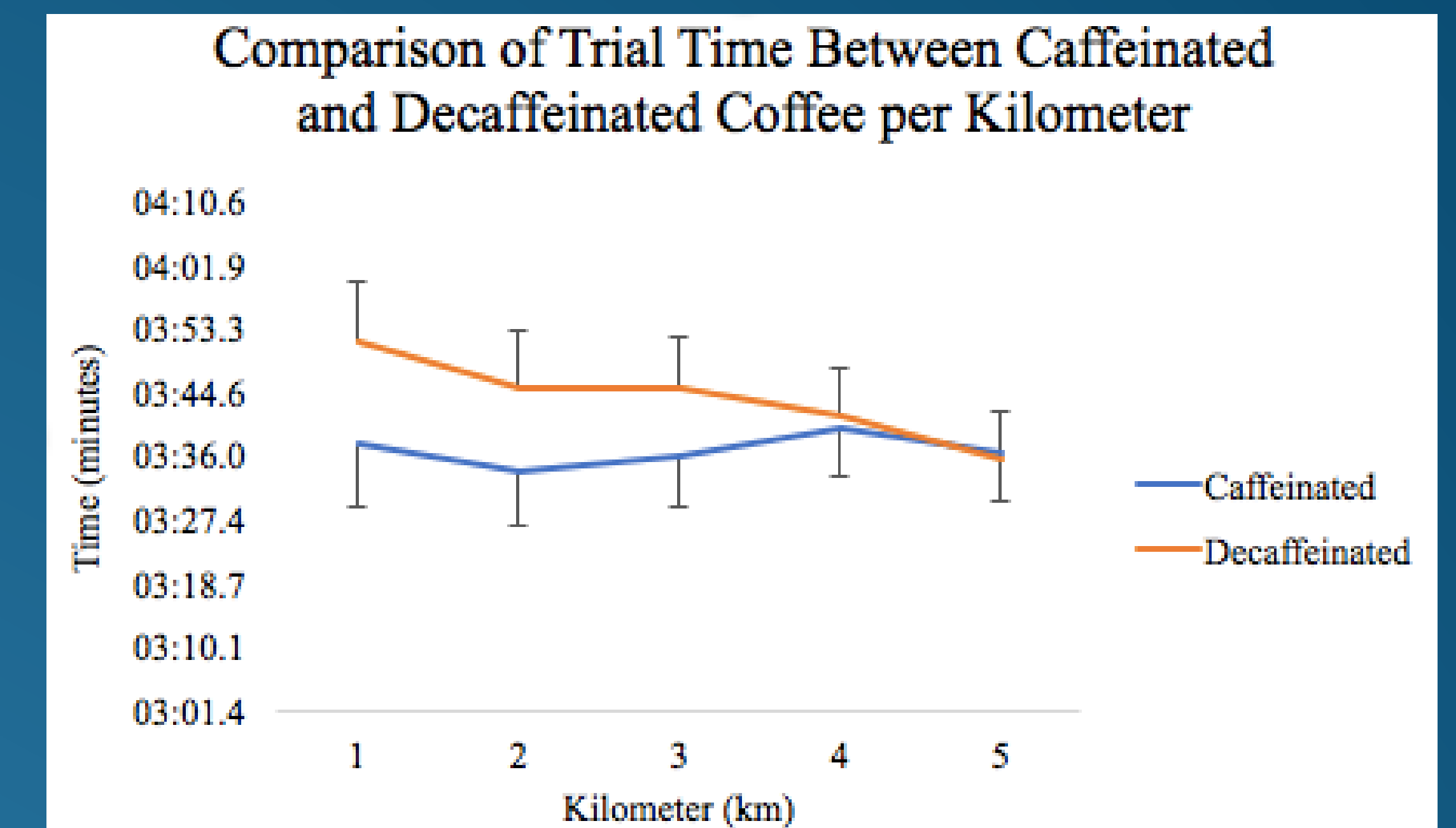


Figure 3. Kilometers 1, 2, and 3 display a significant decrease in time to completion with caffeinated coffee compared to decaffeinated coffee (interaction p=0.046).

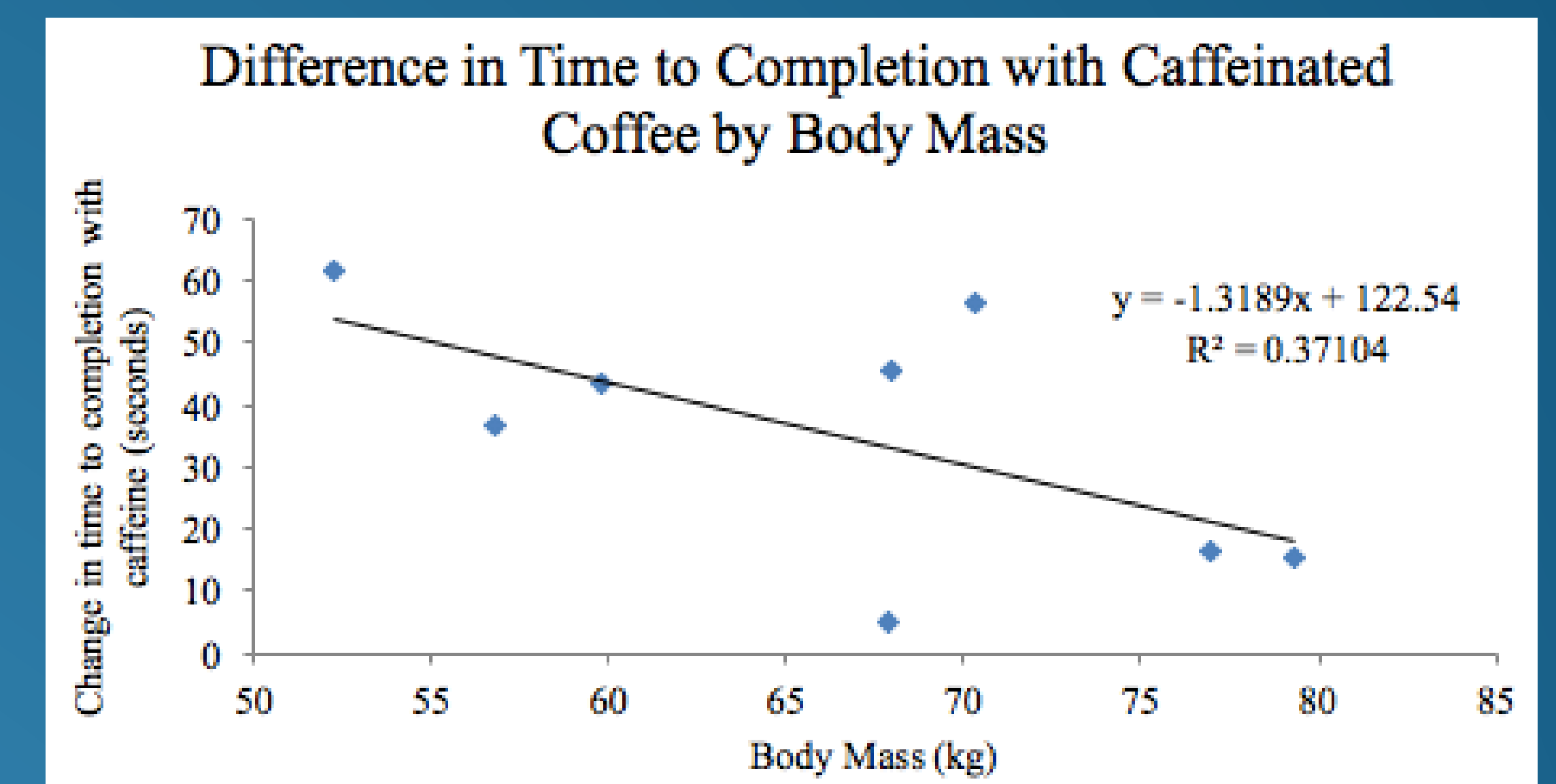


Figure 4. Change in completion time between trials (decaffeinated total time – caffeinated time) decreased as body mass increased ( $r = -0.609$ ).

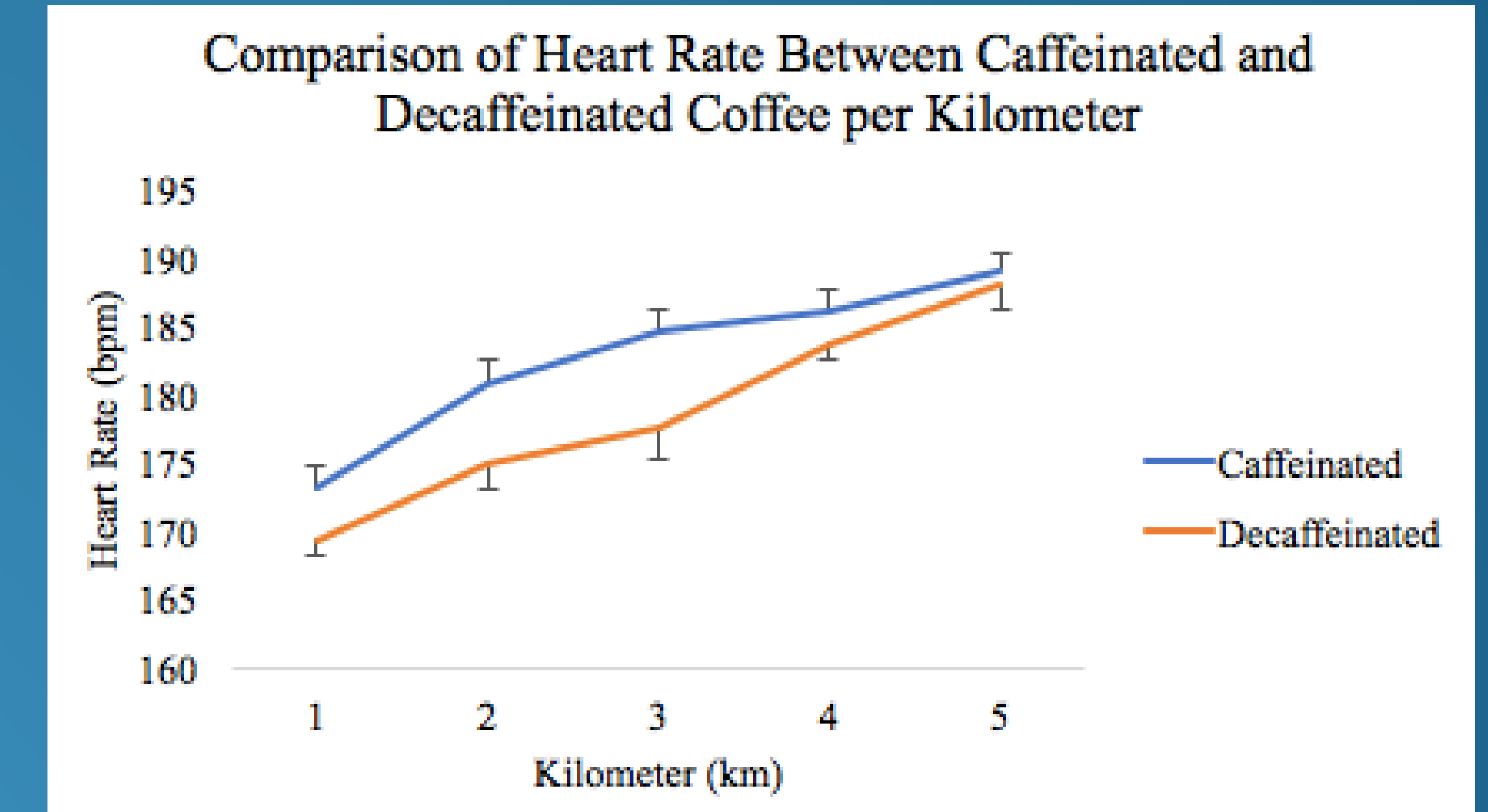


Figure 5. Heart rate increased over time and was higher for caffeinated coffee trials compared to decaffeinated trial. Main effect for time ( $p < 0.001$ ), main effect for trial ( $p = 0.014$ )

## Conclusions

- Caffeinated coffee significantly decreased the total time to complete a 5-Km time trial compared to decaffeinated coffee by an average of 34.95 seconds ( $p = 0.002$ ).
- There was a significant decrease in time per kilometer for the first 3-Km
- There was a slight negative correlation between the difference in time trials and body weight ( $r = -0.609$ ).
- The results suggest a trend for a greater decrease in completion time of the 5-Km trial for participants with lower body mass following consumption of caffeinated coffee.

### Limitations

- Number of participants
- Level of effort from participants
- Inconsistency in current training schedule, diet, and sleep patterns
- Environment differences between trials
- Experimenter encouragement differences between trials
- Prior coffee consumption habits

### Implications

- This study provides further insight on the possibility of coffee as an ergogenic aid
- Elite cross-country runners searching for a means to improve race completion time and physiological function should consider ingesting coffee prior to competition.
- Further research should be done looking into the effect of low doses of caffeine consumption via coffee on performance with a larger sample to confirm results.