The effects of Celsius Fitness Drinks ® on Heart Rate Recovery After Cardiovascular Exercise

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ABSTRACT

INTRODUCTION: Studies have shown that caffeine increases heart rate (HR) and improves exercise performance. **PURPOSE:** The purpose of this study was to investigate the effects of caffeine on heart rate recovery (HRR) after a bout of cardiovascular exercise, with and without the consumption of Celsius ® Fitness Drinks. It was expected that the trial with caffeine would correlate to a longer HRR. **METHODS:** A total of 40 CLU students were invited to participate in the study (males and females, ages 18-23 years old), but due to several factors, 23 successfully completed the study. The same group of participants completed 2 different trials, with and without caffeine. For each trial, participants collected their RHR, performed a 10-minute warm-up on a treadmill, followed by a 15-minute run at their own vigorous intensity, immediately collected their after-exercise HR, then collected their HRs in 10-minute intervals until RHR was achieved again. For the second trial, participants were asked to consume 3.3 mg of caffeine per kg of body weight, 15 minutes before their warm-up. Data was analyzed using the Wilcoxon Signed Rank Test, using SPSS Mac version 27. **RESULTS:** There was a small difference in HRR, but there was no statistical difference between the trials using caffeine versus no caffeine (p=0.582). **DISCUSSION and CONCLUSION:** While there was no significant difference in HRR, there was still a small increase with caffeine. Studies have shown that caffeine increases HR during exercise and enhances performance, which means this topic should be further studied.

INTRODUCTION

While there are several well-known drugs that are prevalent these days, caffeine is “one of the most widely consumed” drugs for adolescents (Geethavani). The consumption of caffeine by adolescents has physiological effects on the body. The prominent effects of caffeine usage are increases in heart rate (HR), heart rate variability (HRV), and blood pressure (Yeragani). Caffeine “has been demonstrated to be effective in enhancing lipolysis, fat oxidation, and reducing glycogen breakdown,” which correlates to why adolescents consume caffeine prior to exercising (Hoffman). Since these benefits of caffeine enhance the body, caffeinated products are becoming more prevalent in the fitness and nutrition industries. Caffeine use prior or during exercise has become a very popular stimulant to adolescents, as it has been shown to enhance their performance, endurance, and cognitive function. Popular energy drinks that have been favored and highly consumed by adolescents are the Celsius ® Fitness Drinks. Roberts et al. conducted a study on the consumption of Celsius ® drinks, which concluded that this caffeinated product helped to increase energy expenditure, lipolysis, and decreased body composition in college-aged students (Roberts). There is a lack of information on the effect of caffeine on HR, specifically HR recovery. While literature shows that caffeine increases HR, it’s important to study how long these HR’s will stay elevated. This research will educate adolescents on the effects of caffeine consumption and how long it affects your heart rate post-exercise.

PURPOSE

The aim of this study is to investigate the effects of caffeine on HR recovery after a bout of cardiovascular exercise. This study will explore the time it takes for each participant's AEHR to return to their original RHR, with and without the consumption of Celsius ® Fitness Drinks.

HYPOTHESIS

Since studies have shown that caffeine greatly increases HR, it is expected that the trial with caffeine consumption will be directly correlated to a longer amount of recovery time for RHR to be obtained.

METHODS

Participants

- 40 college students (male and female) from CLU were recruited
- Due to various reasons, 23 completed the study (between the ages of 18-23 y/o)
- Each participant consented to the study and showed approved healthiness through filling out a 2020 PAR-Q+ form.

Anthropometrics

- Height (cm) and weight (kg) measurements were taken in triplicate and averaged, in order to calculate the amount of caffeine consumption (3.3 mg caffeine/kg) for each participant
- Heart rates were measured (bpm) using Garmin Vivosmart wrist monitors

Data Collection

- Two trials were conducted with the same participants, one with the consumption of caffeine and one without
- Participants performed a 10-minute warm-up, followed by a 15-minute jog/run at their own vigorous intensity
- RHR was collected prior to CV exercise, AEHR immediately following exercise, and HRs in 10-minute increments, until their original RHR is achieved again
- A maximum of 6 HRs were collected (trial ends at 60 minutes of post-exercise observation)
- For the second trial, participants were given 3.3 mg/kg of Celsius Fitness Drinks ® 15 minutes prior to warming up for exercise

Statistical Analyses

- Paired- T-Test (Wilcoxon signed rank test) was used to analyze the two variables on SPSS version 27, significance level p<0.05

RESULTS

Table 1. Descriptive Statistics of Participant Characteristics
Note * = Non-parametric data

Descriptive Statistics

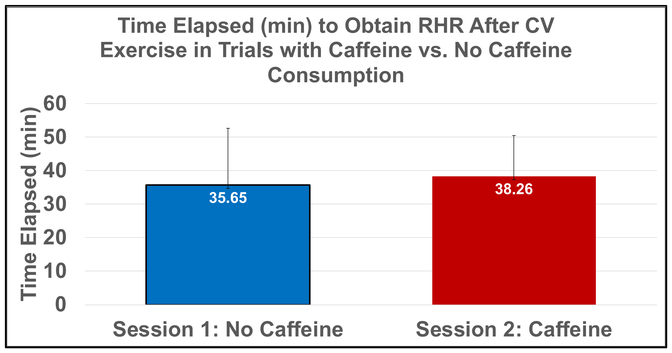
	N	Mean	Std. Deviation
Height (cm)	23	169.8188	10.93505
Weight (kg)	23	68.2978	10.82016
* Session 1 No Caffeine Time Elapsed (minutes)	23	35.65	17.010
* Session 2 Caffeine Time Elapsed (minutes)	23	38.26	12.304

Table 2. Statistics of the Wilcoxon Signed Rank Test Between the Caffeine and No Caffeine Trials

Related-Samples Wilcoxon Signed Rank Test Summary

Total N	23
Test Statistic	98.000
Standard Error	22.699
Standardized Test Statistic	.551
Asymptotic Sig.(2-sided test)	.582

Figure 1. Mean Differences and Standard Deviations Between the Time Elapsed (min.) in Caffeine vs. No Caffeine Trials



CONCLUSION

There was a minor increase in elapsed time during the caffeine trial, compared to no caffeine. However, there was no statistical difference between the two variables (p=0.582). Since caffeine is heavily used by adolescents prior to exercise, future research still needs to be conducted.