Effect of Coffee on Caloric Expenditure in College-Aged Adults during Moderate Exercise

Nicole Gutzman, Maggie Meitzen, Tiffany Moy, and Casey Wick
Faculty Advisor: Sue Lynn Myhre, PhD
Department of Kinesiology, University of Wisconsin-Eau Claire, Eau Claire, WI

ABSTRACT

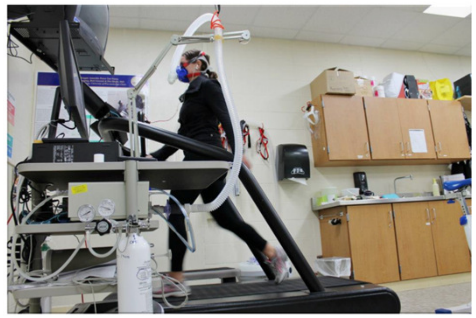
Purpose: The purpose of this study was to measure the effects on caloric expenditure of consuming caffeinated and decaffeinated coffee prior to an exercise session. Since coffee is a widely consumed beverage, the implications of consuming it prior to exercise would be beneficial knowledge to the active adult population.
Methods: Participants completed three training sessions: 1) a controlled moderate walk with no coffee consumed 2) consumption of caffeinated coffee and walking 3) consumption of decaffeinated coffee and walking. The participants abstained from coffee and caffeine for 24 hours prior. Caffeine prescription was based on body weight, calculating 2 mg/kg of caffeine for each subject. Post-consumption, participants relaxed for 45 minutes to allow the coffee to digest. After resting, we equipped the participant with metabolic measurement equipment. Then participants walked at a rate of perceived exertion (RPE) of 5-6 for 35 total minutes on a treadmill.
Results: A one-way repeated measures ANOVA showed no significant differences between the 3 trials (P = .98).
Conclusion: Moderate doses of caffeinated and decaffeinated coffee neither decreased nor increased caloric expenditure during exercise. The implications of our findings suggest that individual variability and chemical composition of coffee may have contributed to the lack of evidence supporting our hypothesis.

BACKGROUND

- Coffee has been commonly used as a surrogate for caffeine in performance studies; yet, the effects of coffee alone on exercise performance and caloric expenditure have not been well-established.
- Aside from caffeine, coffee contains several hundred other substances besides caffeine that cause independent responses. *Corti et al* found that both caffeinated and decaffeinated coffee increase muscle sympathetic nerve activity and blood pressure, thus supporting that other components of coffee alone are in effect.
- Literature investigating diet pills containing caffeine have reported that caffeine increases resting metabolic rate (RMR) by 4-5% over 2.5 hours at 100 mg dose (~1-2 cups). Those studies further suggest that caffeine at this moderate dose can have a significant influence on energy balance and promotes thermogenesis
- A moderate dose of caffeine or coffee show enhancing effects on physical performance by increased VO_2 consumption and altered source of energy by releasing glucose and lipid oxidation in blood circulation.
- The ergogenic effects of caffeine on performance have been well researched in athletics and the general population [1, 9-12]. Studies also show that caffeine increases exercise performance by enhancing fat oxidation and sparing glycogen.
- Caffeine also may work within active muscle to create a more advantageous intracellular ionic environment which could aid each motor unit's force production .

EXPERIMENTAL AIM AND HYPOTHESIS

The aim of the present study was to determine if coffee effects caloric expenditure in college-aged adults during a moderate exercise session. The main hypothesis was that caloric expenditure will be different between the control, caffeinated, and decaffeinated exercise sessions.



METHODS

Participants

- Seventeen Caucasian college-aged adults (12 female, 5 male) between the ages of 18-23 years participated in the study.
- Volunteers were recruited from the University of Wisconsin-Eau Claire and surrounding community by personal contact and flyers.
- All participants provided written informed consent according to the guidelines of the University of Wisconsin – Eau Claire.

STATISTICAL ANALYSIS

To compare the caloric expenditure between the control, caffeinated, and decaffeinated testing sessions a 1 way repeated measures ANOVA was conducted. Data are presented as mean ± SD. Statistical analyses were performed using SPSS software version 17.0 (SPSS Inc). Statistical significance was set at $P<0.05$.

RESULTS

I. Subject Characteristics

	Total	Female	Male
Participants	17	12	5
Age (years)	20.88 ± 2.88	20.75 ± 2.25	21.20 ± 3.20
Height (cm)	168.40 ± 14.60	165.50 ± 10.50	175.80 ± 8.80
Weight (kg)	65.76 ± 37.24	60.55 ± 15.95	78.28 ± 24.72
Coffee Intake (cups/wk)	6.41 ± 13.59	6.17 ± 13.83	7.00 ± 7.00
Caffeine Intake (cups/wk)	2.6 ± 2.4	0.33 ± 1.67	1.80 ± 3.20

II. Average Caloric Expenditure

	Mean	Standard Deviation	N
Control	188.71	± 42.97	17
Caffeinated	189.00	± 45.12	17
Decaffeinated	189.71	± 48.29	17

SUMMARY AND CONCLUSIONS

- Our study demonstrated that are *no significant differences* in caloric expenditure between control, caffeinated, and decaffeinated exercise sessions in college-aged adults.
- To our knowledge, the present study is one of the first to demonstrate the effects of coffee on caloric expenditure during exercise. Our study is important because coffee is a widely used stimulant with limited research on its effect on exercise.
- A possible reason no significant differences in caloric expenditure were seen between exercise sessions may be due to the low prescribed caffeine content (2 mg/kg) and short exercise session. Therefore, future research is required using a higher prescribed caffeine content (3-6 mg/kg) and a longer exercise duration.
- Individual variation could be another explanation for differences seen in caloric expenditure. Habitual and non-habitual users may elicit different physiological responses and may be more sensitive to specific components than others.
- We conclude that further research should be conducted on coffee's effect on caloric expenditure during exercise.

ACKNOWLEDGMENTS

We would like to thank all of the participants for volunteering in our study. We would also like to recognize Dr. Sue Lynn Myhre, Dr. Donald L. Bredle and the Department of Kinesiology at the University of Wisconsin-Eau Claire for the use of equipment and for providing valuable advice. This study was funded by an Office of Research and Sponsored Programs Small Research Grant.