Does Coffee Affect the Validity of an Oral Abbreviated Fat Tolerance Test in Healthy Adults?

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ABSTRACT

Objectives: Postprandial triglycerides (TG), or levels of fat in the blood after a meal, are an independent risk factor for cardiovascular disease (CVD) (1). A clinically feasible test to assess postprandial TG has been developed, known as the Abbreviated Fat Tolerance Test (AFTT) (2), however the impact of coffee consumption prior to an AFTT on postprandial TG is largely unknown. Considering that 50% of Americans consume one cup of coffee before or with breakfast (3), this study aimed to investigate the effect of coffee consumption prior to an AFTT on postprandial TG in order to determine if coffee intake prior to an AFTT affects its validity. Methods: Participants completed 2 randomized AFTTs separated by at least 1 week, but not exceeding 2 weeks. For each AFTT, participants arrived into the laboratory following a 10-hour overnight fast and consumed either 1 cup of water or black coffee. Thirty-minutes later, a baseline blood draw was collected. Immediately following, the participant consumed a standardized high-fat shake, vacated the laboratory, and returned 4 hours later for a follow-up blood draw. Results: Six healthy individuals (3 Women, 3 Men; age 21.3 ± 3.2; BMI 25.9 ± 1.6) completed the present study. Two-way ANOVA of TG revealed a significant overall time effect (p = 0.008), but not time x trial interaction (p = 0.87) or overall trial effect (p = 0.27). Absolute change in TG was not different between trials (p = 0.61). Conclusion: In our small study sample, coffee intake prior to an AFTT did not affect postprandial TG. Therefore, coffee intake prior to an AFTT may not affect the validity of the AFTT. Further research should investigate the effects of coffee consumption prior to an AFTT on the validity of the AFTT in a larger, more diverse study population.

BACKGROUND

- Standard postprandial triglycerides (TG) testing is time-consuming, tedious, and burdensome for the participant. Our laboratory has developed and validated a clinically feasible test for assessing postprandial TG known as the abbreviated fat tolerance test (AFTT) (2).
- For consistency and formulation of AFTT guidelines, it is critical that we determine whether moderate coffee intake prior to the AFTT modifies the postprandial TG response.
- Therefore, the **purpose** of this experiment was to determine the effect of coffee consumption prior to an AFTT on the validity of the AFTT. We **hypothesized** that coffee intake prior to an AFTT would result in a greater postprandial TG response compared to when a person does not consume coffee.

METHODS

We intended to recruit 10 participants (5 women, 5 men). Because of extenuating circumstances associated with the COVID-19 pandemic, 6 participants (3 W, 3 M) completed the present study:

- Age: 18-40 years
- Free of chronic disease or any dietary intolerances
- Not currently taking medications or supplements that alter metabolic outcomes such as TG or medications that alter blood pressure.

AFTT:

- Participants did not partake in planned exercise 2 days prior to each AFTT.
- After consuming a provided snack (200 kcal) the night before each trial, participants completed a 10-hour overnight fast prior to arriving to the laboratory.
- On the morning of each trial, participants consumed either 8 ounces of black coffee or 8 ounces of water 30 minutes prior to their fasting blood draw.
- Participants consumed a high-fat shake containing vegan protein powder, chocolate syrup, and coconut cream (9kcal/kg body mass; 70% fat).
- Participants were instructed to leave the laboratory for 4 hours post-meal consumption, abstaining from planned exercise and the consumption of food/drink other than water. They returned to the laboratory 4 hours post-meal consumption and a follow-up blood draw was collected.

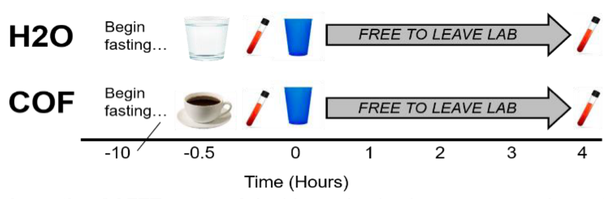

Figure 1. Schematic of AFTT protocol. In this randomized cross-over study, participants consumed 1 cup of water (H2O) or black coffee (COF) 30 minutes prior to the AFTT.

RESULTS

Participant and meal characteristics

	Total	Men	Women
Age	21.3 ± 3.2	23.7 ± 3.1	19.0 ± 0.0
Weight (kg)	74.5 ± 6.6	78.8 ± 6.5	70.1 ± 3.1
Height (cm)	171.7 ± 9.3	180 ± 3.0	163.3 ± 0.6
BMI (kg/m^2)	25.9 ± 1.6	25.0 ± 1.2	26.9 ± 1.6
Systolic BP (mmHg)	114.5 ± 10.7	120.3 ± 8.0	108.7 ± 11.0
Diastolic BP (mmHg)	80.5 ± 12.3	80.7 ± 14.6	80.3 ± 12.9
Fat Mass (%)	24.8 ± 10.3	16.0 ± 5.6	33.7 ± 1.5
Skeletal Muscle Mass (%)	36.0 ± 5.8	41.0 ± 2.6	31.0 ± 0.1
Shake energy (kcal)	670.3 ± 59.4	709.5 ± 58.5	631.2 ± 28.2
Shake protein (g)	16.7 ± 1.5	17.7 ± 1.5	15.8 ± 0.7
Shake carbohydrate (g)	35.2 ± 3.1	37.2 ± 3.1	33.1 ± 1.5
Shake fat (g)	52.2 ± 4.6	55.2 ± 4.5	49.1 ± 2.3

Table 1. Participant and meal characteristics. Participant characteristics represent values averaged across participants. Meal characteristics represent data for the high-fat shake averaged across participants. Data are presented as mean ± SD. TG, triglycerides; BMI, body mass index; BP, blood pressure.

Overall, coffee consumption prior to an AFTT did not affect postprandial TG.

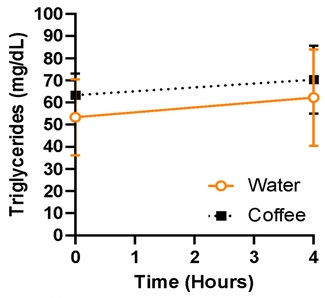

Figure 2. Postprandial TG responses. Postprandial TG responses in the 2 meal trials at baseline and 4 hours post-meal consumption. There were no significant differences at baseline or post-meal. Error bars indicate SD.

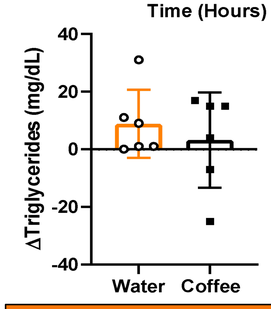

Figure 3. Absolute change in TG from baseline. Absolute change in TG from baseline in the 2 meal trials. Error bars indicate SD. Individual participant responses are represented by open circles (H20) or closed squares (COF). There were no significant differences between trials.

Metabolic outcomes did not differ across meal trials.

	Water	Coffee	P-value
Glucose (mg/dL)	87.7 ± 4.7	88.7 ± 6.9	0.77
Total Cholesterol (mg/dL)	160.5 ± 64.2	160.2 ± 29.5	0.99
HDL-Cholesterol (mg/dL)	64.3 ± 15.0	57.8 ± 13.6	0.10

Table 2. Fasting metabolic outcomes. Metabolic outcomes represent fasting data for each meal trial averaged across participants. Data are presented as mean ± SD.

Individual postprandial TG responses for each meal trial for all participants.

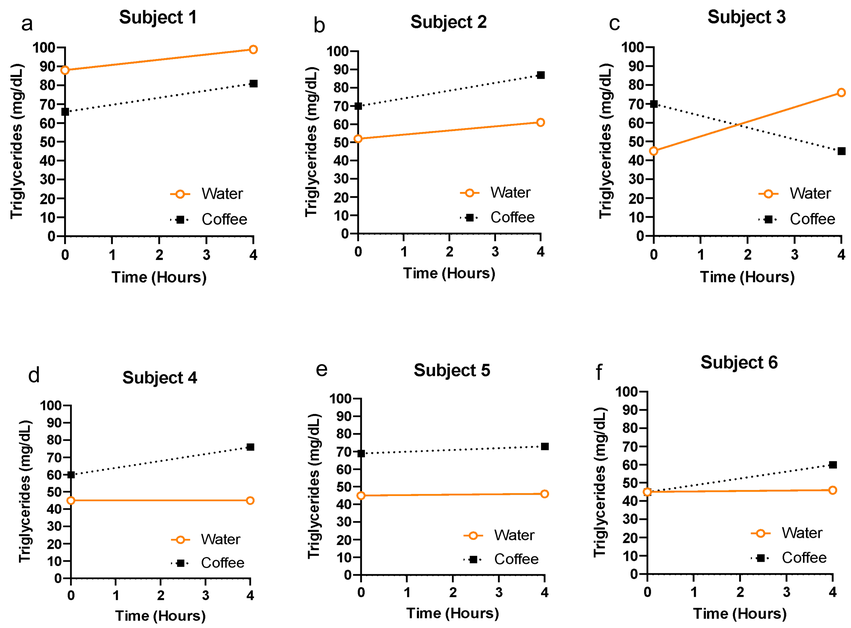

Figure 4. Postprandial TG responses. Postprandial TG responses for each meal trial at baseline and 4 hours post-meal consumption for all participants (panels a-f).

CONCLUSIONS

- In our small sample, consumption of coffee prior to the AFTT did not affect the postprandial TG response.
- Therefore, the validity of the AFTT is preserved regardless of prior coffee consumption.
- In order to employ these findings in the clinical setting, further research should be conducted in a larger sample size to determine the effect of coffee consumption prior to an AFTT on postprandial TG.

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