Effect of Daily Watermelon Intake on Cardiometabolic and Gut Health in Young Adults with Overweight and Obesity.

Rachel Fine, Amber Annand, Cole Patoine M.S., RD

FSU | FLORIDA STATE UNIVERSITY

FSU UNDERGRADUATE RESEARCH OPPORTUNITY PROGRAM
CENTER FOR UNDERGRADUATE RESEARCH & ACADEMIC ENGAGEMENT

National Watermelon Promotion Board

Introduction

- Obesity is a prevalent issue in the U.S., with over 40% of people over 20 impacted. Although obesity is a multifactorial disease, diet is a critical component.
- Snacks account for approximately 23% of the adult U.S. average daily food intake, with the average person consuming 2 snacks per day (NIH). Most popular snacks are high in calories, sugars, and saturated fats, while lacking in nutrients including fiber, protein, and vitamins. Watermelon serves as a low calorie, nutrient-rich snack alternative to replace these western style snacks that may contribute to obesity.
- The composition of watermelon is over 90% water, making it a low calorie and filling snack. Watermelon is high in lycopene (5-7 mg per 100g), a strong antioxidant that promotes cardiovascular health by reducing inflammation, improving endothelial function, and increasing nitric oxide (NO) production by preventing oxidative damage to BH4 and activating eNOS. It also contains L-citrulline (50-200 mg per 100g), an amino acid that serves as a catalyst to L-arginine, fueling NO synthesis to support improve blood flow and lower blood pressure.
- Together, lycopene and L-citrulline enhance NO production, reduce arterial stiffness, and promote vasodilation, contributing to better vascular health and overall cardiovascular function.
- Yet, this information has not been used in clinical amounts to study the effects of these compounds in fresh watermelon. Therefore, the objective of the current study is to evaluate the effect of daily fresh watermelon consumption for 6-weeks on endothelial function and arterial stiffness in young adults with overweight and obesity.

Methods

- This randomized clinical trial serves as a feasibility trial, in which 9 participants (aged 18-30, BMI 25-39.9) were randomly assigned to one of two groups. One group consumed 2.5 cups of fresh watermelon daily, while the other group consumed an isocaloric control snack (Belvita breakfast sandwich and 12 ounces of water).
- Both groups followed their assigned diet for six weeks. Data was collected at baseline and endpoint visits. Primary outcome variables are endothelial function with flow-mediated dilation measures how blood vessels expand (dilate) when blood flow increases, arterial stiffness with pulse-wave analysis and velocity which measures the speed at which the pulse travels through the arteries, and 12-hour ambulatory blood pressure.
  Secondary outcome variables include dietary intake records, anthropometrics, gut-transit time (as measured by blue-dye capsules) and questionnaires to assess anxiety, stress, sleep quality, gastrointestinal symptoms and physical activity level.

Figure 1. Flow Diagram for Selection and Allocation of Participants

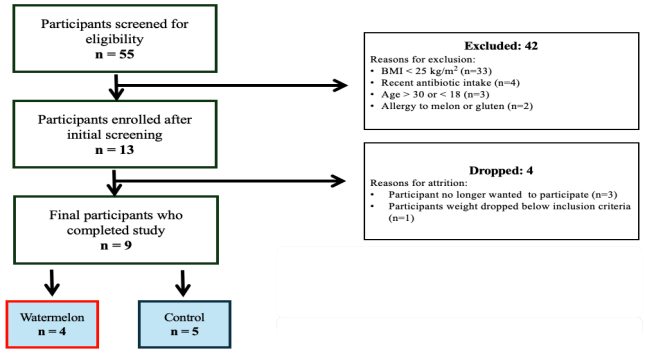


Figure 2. Study Design

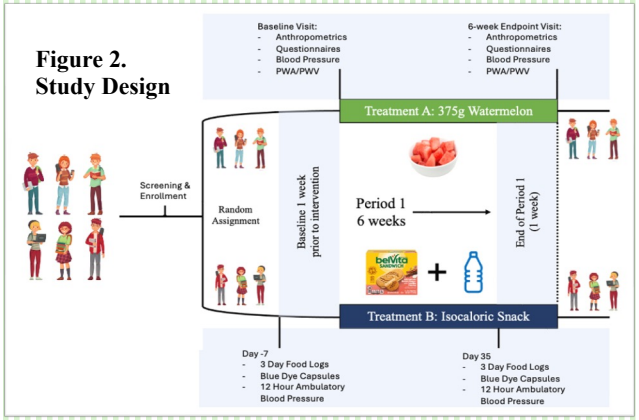


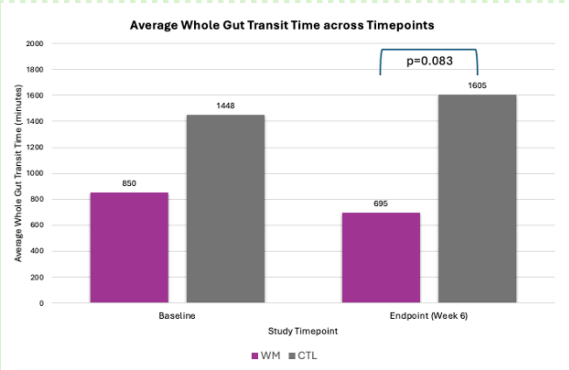
Figure 3. Nutrient comparison between intervention and control

WM	CTL
Calories: 115	Calories: 115
Fiber: 1.5g	Fiber: 1.5g
Water: 337-345g	Water: 340g ~ 12oz
Fat: 0.5g	Fat: 4.5g
Vitamin C: 30.75mg	Vitamin C: 0mg
Lycopene: 17, 225mcg	Lycopene: 0mg
Citrulline: 625mg	Citrulline: 0mg

Table 1. Demographic Characteristics of Participants (n=9)

Variable	WM Group (n = 4)	CTL Group (n = 5)
Age (years)	19.75 ± 2.87	19.20 ± 1.64
Sex, n (%)		
Male	2 (50.0)	3 (60.0)
Female	2 (50.0)	2 (40.0)
Race, n (%)		
White	3 (75.0)	3 (60.0)
Black	0 (0.0)	2 (40.0)
Hispanic	1 (25.0)	0 (0.0)
BMI (kg/m^2)	32.88 ± 1.24	29.11 ± 4.35
Education, n (%)		
Some College	3 (75.0)	4 (80.0)
PhD	1 (25.0)	1 (20.0)

Figure 4. Comparison of Gut Transit Time between groups at baseline and endpoint (n=9)



Discussion

- Daily watermelon consumption did show significant improvement in average gut transit time. This decrease in gut transit time implies that the watermelon group had healthier and more consistent bowel movements. This is due to watermelons being high in water content and containing fiber. The daily consumption of watermelon showed no significant improvement in the participants blood pressure, bodyfat percentage and body weight.
- The study had a small sample population due to strict inclusion criteria. Reasons for exclusion include recent antibiotic intake, not meeting the BMI < 25 requirement, not within the designated age range Since the study is modeled as a crossover study, the 9 participants are currently completing the other half of study, testing the other group they were not formally apart of.
- We conclude that the discrepancies of the data regarding BMI and body fat percentage relate to the food intake of the participants outside of the food supplied to them, which we have yet to review. The participants were given weekly food logs to track the percentage of adherence and the breakdown of their meals 3 days/week.

Conclusion

Overall, eating low calorie foods with high nutritional density such as watermelon can improve the gut transit time in individuals. This implies that participants who ate watermelon daily had more frequent and healthier bowel movements, likely due to its high-water content and fiber content. However, this study showed no significant changes in blood pressure or body weight between groups. Some limitations of the study are confounding variables such as personal diet, recall bias (in food logs) and inaccuracy of the body fat percentage machine. Future research with a larger sample size and more accurate measurements could potentially further these findings.

Resources

- Naz A, Butt MS, Sultan MT, Qayyum MM, Niaz RS. Watermelon lycopene and allied health claims. EXCLI J. 2014;13:650-660. Published 2014 Jun 3.
- Enriquez, J. P., & Gollub, E. (2023). Snacking Consumption among Adults in the United States: A Scoping Review. Nutrients, 15(7), 1596.
- Fulgoni K, Fulgoni VL 3rd. Watermelon Intake Is Associated with Increased Nutrient Intake and Higher Diet Quality in Adults and Children, NHANES 2003-2018. *Nutrients*. 2022;14(22):4883. Published 2022 Nov 18. doi:10.3390/nu14224883