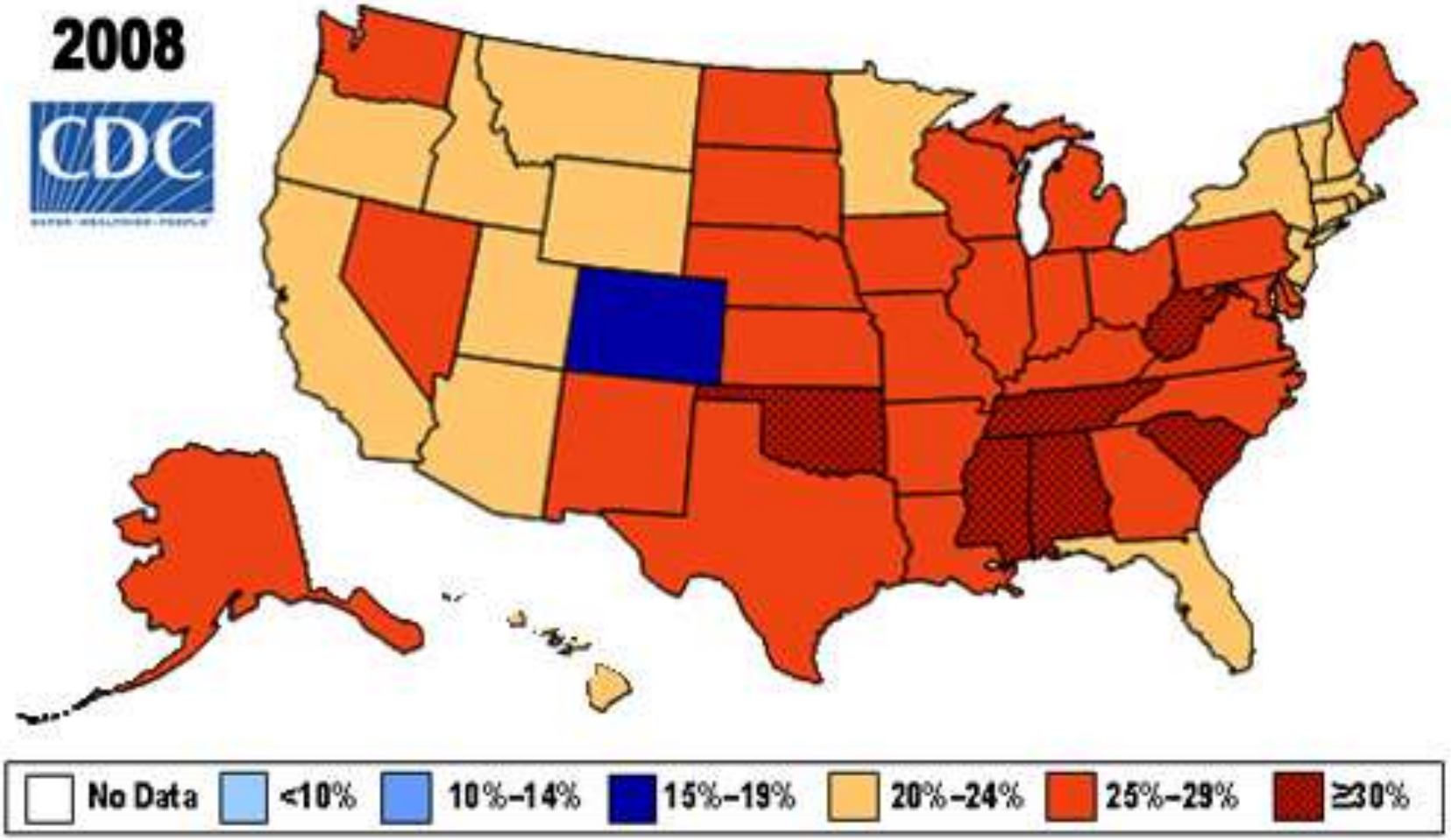
THE EFFECTS OF EXERCISE INDUCED LACTIC ACID ON HUNGER AND SATIETY

SWATHI KATTA
KINESIOLOGY- HEALTH PROMOTION
UNIVERSITY OF WYOMING
LARAMIE, WY

OVERVIEW

- Introduction
- Subject Characteristics
- Research Procedure
- Results
- Discussion
- What I learned

INTRODUCTION



INTRODUCTION

- Obesity is responsible for 300,000 deaths a year in the US
- The primary cause of obesity is energy imbalance
- Other factors that may cause obesity:
  - behavior
  - environment
  - genetics

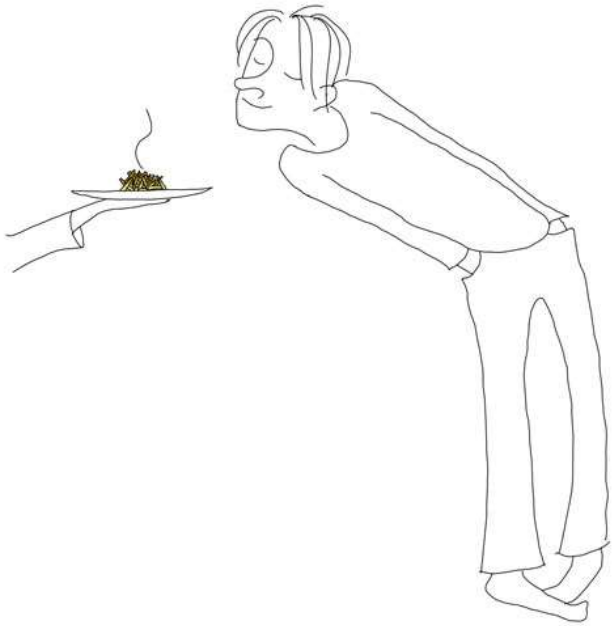
INTRODUCTION

- Effects of obesity:
  - Cancer
  - Heart Disease
  - Diabetes
  - Extensive Breathing Problems
  - Reproductive Problems
  - Limited Mobility
  - Lower Life Expectancy

INTRODUCTION

- Obesity linked with hunger and satiety

INTRODUCTION



Satiety is the desire to eat food.

Hunger is a biological process, regulated by low blood sugar level, empty stomach, etc.

INTRODUCTION

- Understanding hunger and satiety can help with the current obesity epidemic.
- Another aspect to consider is exercise in relation with hunger and satiety.

INTRODUCTION

- Lactic acid plays a vital role in the glycolysis process and is thought to play a role in hunger regulation
- Lactic acid is produced when energy demands are high
- Previous studies in rats suggest that increased lactic acid concentrations have an “anti-obesity” effect by potentially suppressing hunger

INTRODUCTION

- “Lipid profile lowering effect of Soypro fermented with lactic acid bacteria isolated from Kimchi in high-fat diet-induced obese rats” by Kim Ny-Hyung, et.al.
  - Data suggested that lactic acid had an anti-obesity effect in rats

INTRODUCTION

- "Food availability affects orexin A/ hypocretin-1-induced inhibition of pulsatile luteinizing hormone secretion in female *rats*" Miyako Furuta et.al.
  - Data suggested that lactic acid had an inhibitory effect on hunger

INTRODUCTION

- However, the effects of lactic acid on hunger and satiety have not been studied within humans

- Hypothesis
  - Increased concentrations of lactic acid due to exercise will decrease hunger and increase satiety within the female subjects and thereby have an anti-obesity effect

SUBJECT CHARACTERISTICS

- Between the ages of 18-45
- BMI between 18.5-29.9 kg/m^2
- Premenopausal
- Minimal risk for health problems
- 8 runners who run at least 20 miles/week
- 10 walkers who walk at a moderate or brisk pace for at least 3 hrs/week

TEST DAY 1

- Controlled Breakfast
- Pre-blood sample drawn 90 mins after eating
- Exercising (running/walking) for 1 hr (70% VO_2 max) on the treadmill
- Blood drawn at:
  - Baseline
  - 0 mins (post)
  - 30 mins
  - 60 mins
  - 90 mins
  - 120 mins

TEST DAY 1

- Hunger and satiety were assessed using visual analogue scales (VAS)
- Participants asked:

  "How hungry are you?"

  "How satisfied are you?"
- Example of VAS

0mm ---------- 100mm

(Not at all Hungry) (Never Been Hungrier)

0mm ---------- 100mm

(I'm completely empty) (I cannot eat another bite)

TESTING DAY 2

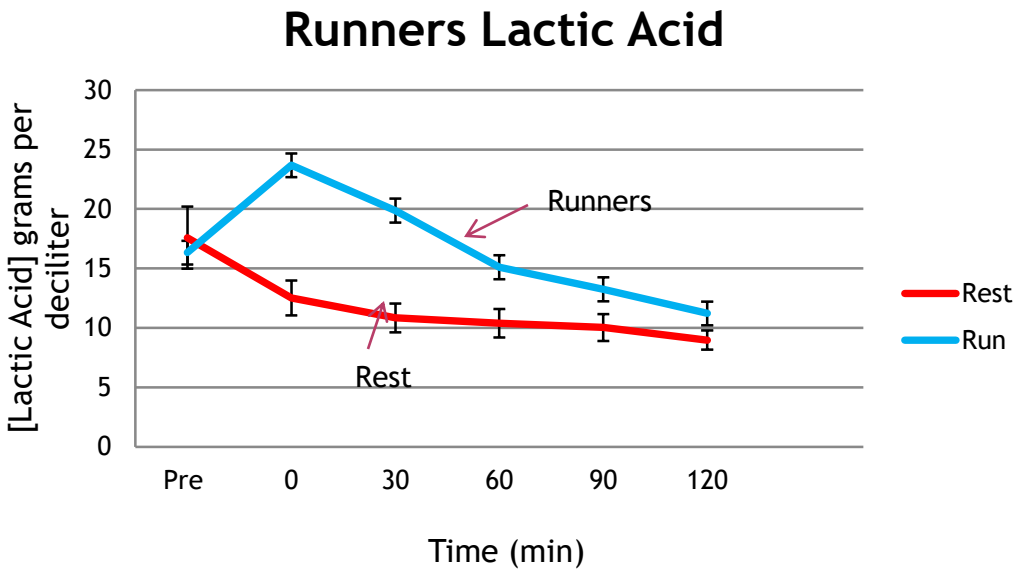
- Controlled Breakfast
- Pre-blood sample drawn 90 mins after eating
- Rest (laying down) for 1 hr
- Blood drawn at:
  - Baseline
  - 0 mins(post)
  - 30 mins
  - 60 mins
  - 90 mins
  - 120 mins
- Hunger and satiety assessed using visual analogue scales (VAS)

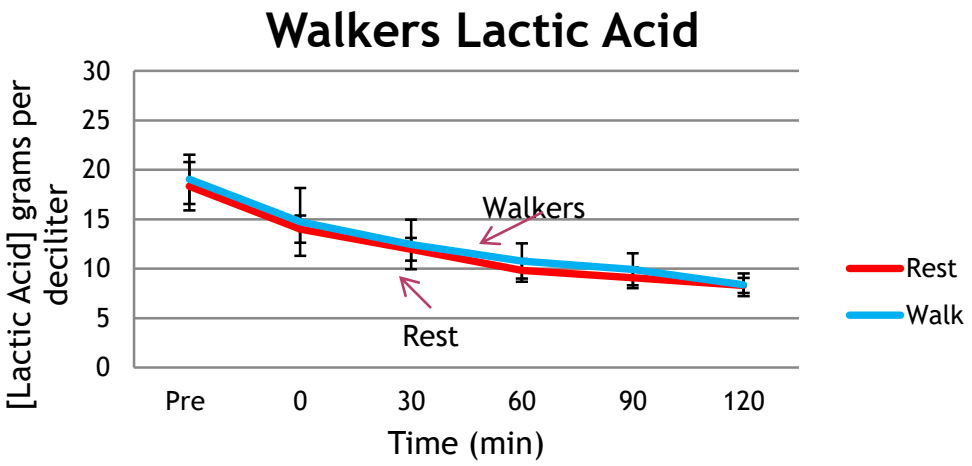
STATISTICAL APPROACH

- Repeated measures Analysis of Variance (ANOVA) testing for a time by treatment (exercise vs. rest) effect.
  - Group (runners vs. walkers) entered as between subject factor

RESULTS

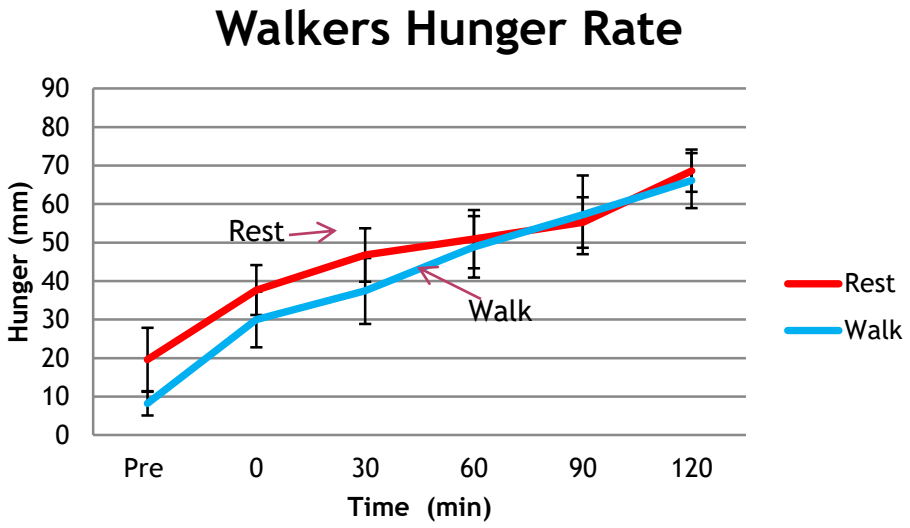
Time effect, p<0.01
Treatment effect, P=0.03
No interaction or main effect for group





RESULTS

Time effect, $p<0.01$
No interaction or main effect for treatment or group



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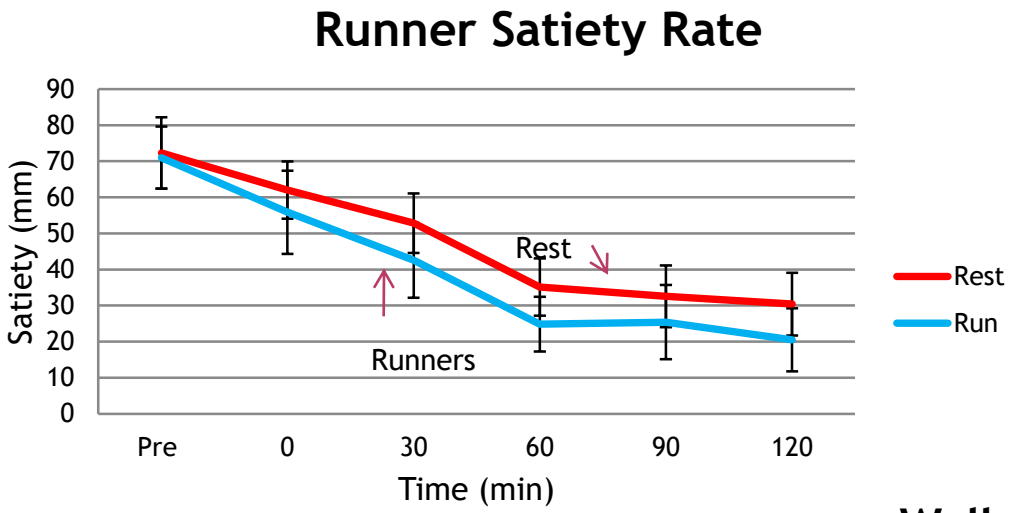
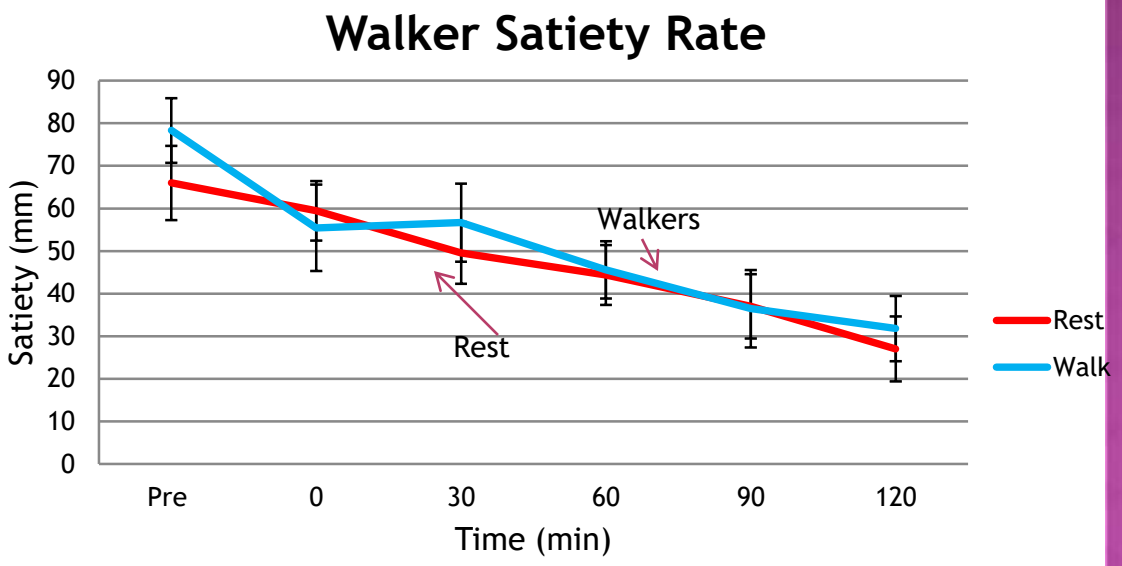
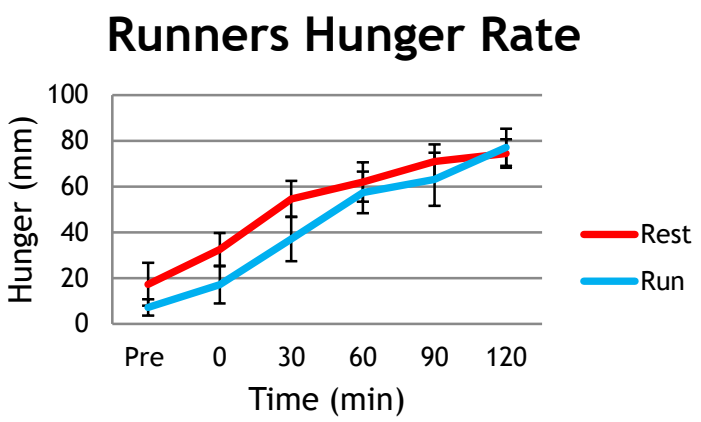
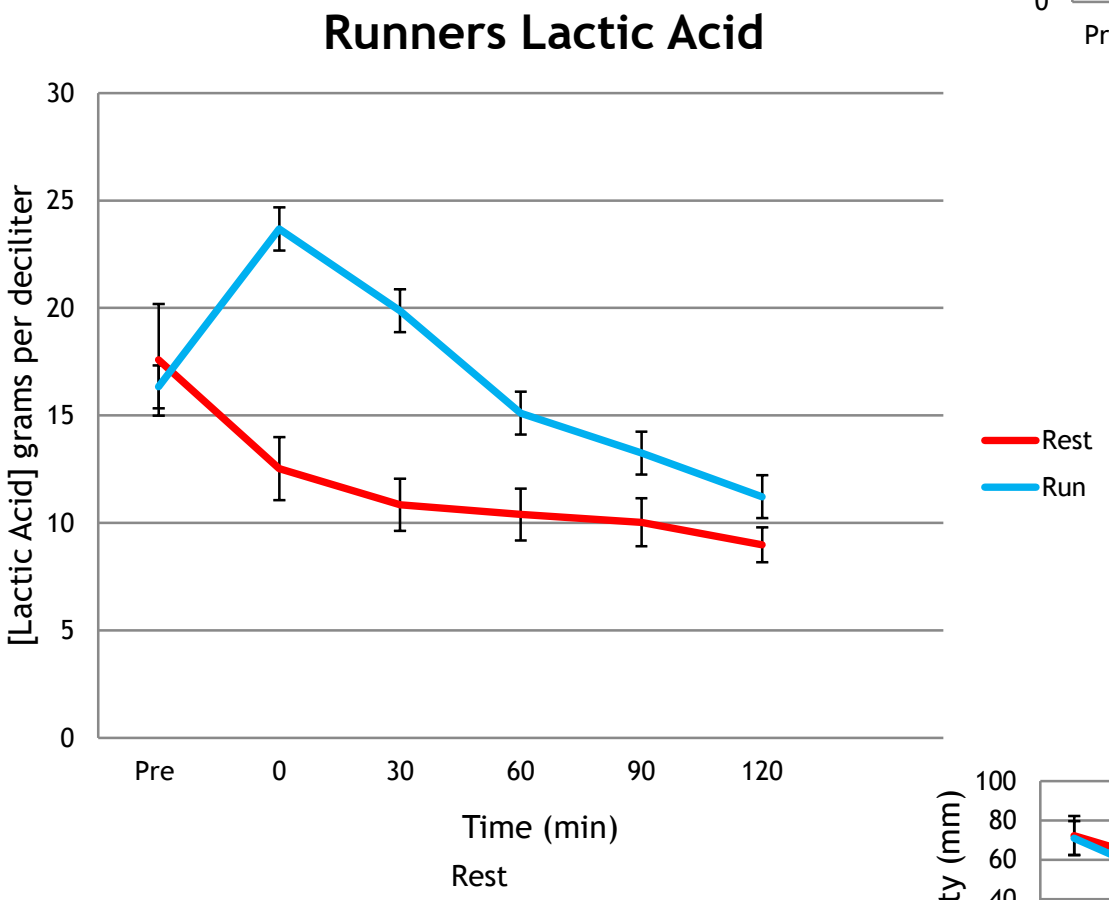
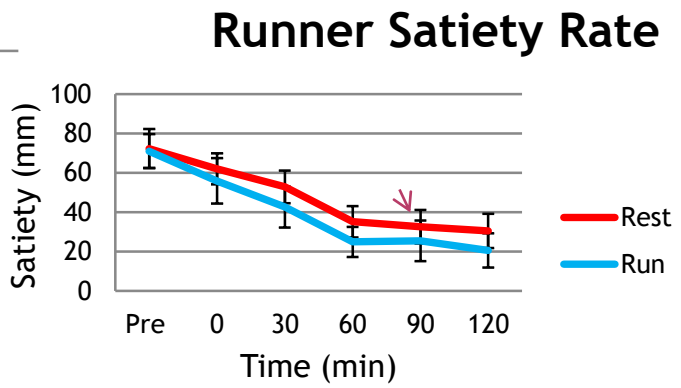




RESULTS


Runners Hunger Rate
Hunger (mm)
100
80
60
40
20
0
Pre
0
30
60
90
120
Time (min)
Rest
Run


Runners Lactic Acid
[Lactic Acid] grams per deciliter
30
25
20
15
10
5
0
Pre
0
30
60
90
120
Time (min)
Rest
Run

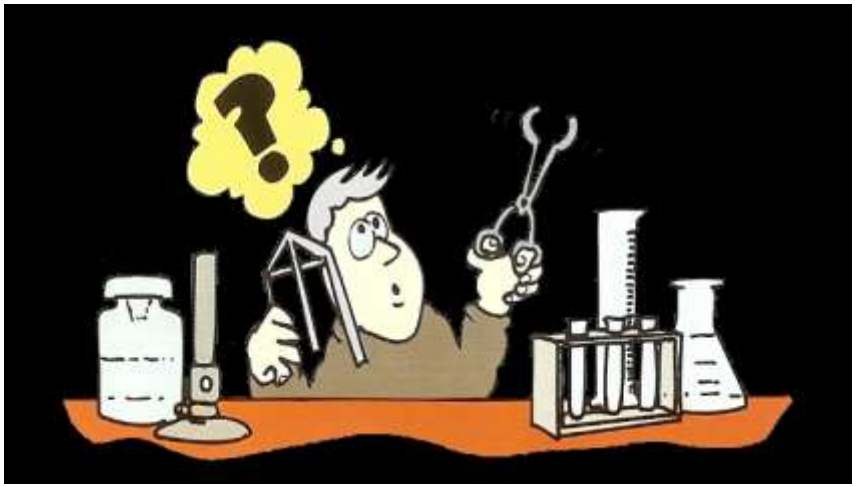

Runner Satiety Rate
Satiety (mm)
100
80
60
40
20
0
Pre
0
30
60
90
120
Time (min)
Rest
Run

DISCUSSION

- Lactic acid concentrations increased with exercise
- Hunger rates and satiety ratings were not different in response to exercise compared to rest
- Results did support our hypothesis, but further data is needed

WHAT I LEARNED

- I learned in-depth about the research process
- Lactic acid does not appear to play a role in hunger and satiety
- Further studies needed to understand the effect of lactic acid



ACKNOWLEDGEMENTS

- UW EPSCoR Undergraduate Freshmen Fellowship
- Dr. Enette Larson Meyer - Department of Family and Consumer Sciences
- Sonnie Palmer
- Melissa Mortenson and Tanya Holliday
- Dr. Shane Broughton - Department of Family and Consumer Sciences
- Barbara Kissack - UW EPSCoR program
- Richard Matlock - UW EPSCoR program

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Questions are guaranteed in life; Answers aren't.