Hunger regulation before and after a bout of exercise

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INTRODUCTION

- Obesity is an epidemic in the United States (Kim, et. al., 2016).
- Research suggests exercise aids in preventing risk factors that lead to obesity (Cercato, Fonseca, 2019 and Blundell, et. al., 2015).
- Exercise affects appetite regulation, but few studies have explored the effect of exercise on energy intake (Schoeller, et. Al, 1997).

OBJECTIVES

- Compare appetite level changes pre- and post-exercise bout using a Visual Analog Scale (VAS)
- Compare energy intake (food consumption) pre- and post-exercise bout using two 24-hour food recalls

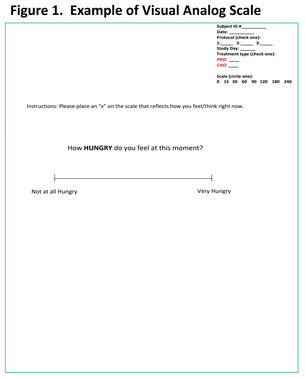
HYPOTHESES

Appetite levels will be lower post exercise, and participants will have a lower calorie intake the day after a workout than the day before. This could be due to the acute effect of their bodies being able to process energy intake after the workout more efficiently.

METHODS

- **Participants**:
  - Participated in the Exercise is Medicine (EIM) procedures.
  - Qualified under the Exercise is Medicine criteria
  - Ages 18-25.
- **Measures**:
  - *Appetite*. Visual Analog Scales (VAS) measured appetite.
    - Scale for each of the following items: subjective hunger, subjective satiety, how strong their desire to eat is, how much food they feel they could eat, craving for something salty, craving for something sweet, and desire for a snack
    - VAS on paper, used a 10 mm scale, one for each of the items listed above (Crowder,et. al., 2015).
  - *24-hr recall*. A 24-hour food recall measured calorie and macronutrient intake
    - Performed once prior to any physical assessments and again 24 hours after
  - *Exercise*. Exercise is Medicine fitness assessments according to Exercise is Medicine protocol and standards
- **Procedures**:
  - Before the EIM fitness test, participants completed a visual analog scale (VAS)
  - 24-hour food recall, a cognitive exam, a DXA scan, and other measures were taken by other supplemental studies
    - Period of inactivity= non-exercised bout.
  - Another VAS, and then proceeded to the EIM fitness assessment
    - Fitness assessment= the exercise bout.
    - Included a hand grip dynamometer strength test, a sit and reach flexibility test, a push up muscular endurance test, and Bruce Protocol VO2 max treadmill test
    - Total time= 45 minutes to complete
    - Participants asked to perform at maximum effort
  - A final VAS was completed
  - A total of three VAS's were taken for each participant
  - A second 24-hour food recall taken the day after over the phone
- **Statistical Analysis**: Data was analyzed by comparing:
  - Pre non-exercise to post-non-exercise to pre-exercise to post-exercise appetite levels and cravings
  - Calorie intake before and after the day of the assessment
  - Calorie intake in non-exercised vs. exercised post assessment.

Figure 1. Example of Visual Analog Scale



RESULTS

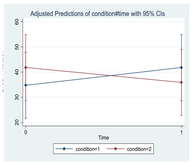
Table 1: Sample Descriptives

	Men	Women	P-value comparing
Age (years)	21.7	21.4	.450
%fat from DXA (percentage)	18.5	35.6	<.001
Protein (grams)	134.2	96.5	.164
Carbs (grams)	286.3	247.7	.553
Fat (grams)	91.8	90.2	.922
Calories (kcal)	2628.6	2185.9	.298
VO2 Measure (mLO2/kg)	41.4	36.8	.034
Muscular Strength (kg)	96.4	56.7	<.001
Muscular Endurance (# push-ups)	35.6	19.5	.002
Flexibility (centimeters)	28.9	37.2	.015

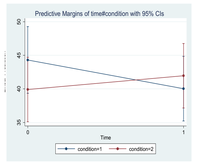
- Twenty-three participants
  - 12 female (average age= 21.4)
  - 11 male (Average age= 21.7)
- Changed between conditions
  - Hunger (p=0.034),
  - Desire for food (p=0.034),
  - Perception of food quantity (0.005), and
  - Salty food desire (p=0.008)
- Showed no statistical significance
  - Fullness (p=0.197),
  - Sweet food desire (p=0.548)
  - Snack desire (p=0.134)
- Average calorie intake (showed no statistical significance (p=0.161))
  - Prior to exercise= 2,397.7 kcal
  - After the exercise= 1.973.4 kcal.

Figure 2. Graphs indicating the change of each scale between the two conditions for all participants.

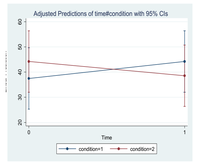
Hunger



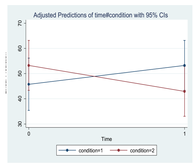
Fullness



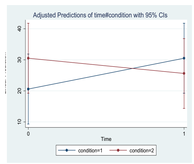
Desire to Eat



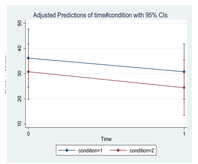
Quantity of Food



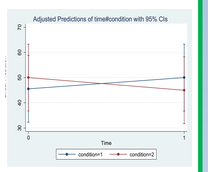
Salty



Sweet



Snack



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DISCUSSION

- Overall findings suggest significant decrease in appetite after an exercise bout in students ages 18-25.
  - Supports acute moderate to high intensity exercise transiently suppresses appetite in healthy, lean individuals (Douglas, 2017).
- Calorie intake did not significantly change
  - Contrary to a study that showed participants who exercise after a fasting period did not consume as much energy compared to those who were given a standardized breakfast (Bachman, et. Al. 2016)
- Limitations
  - Sample size
  - Usage of self report for the measures
    - Some participants could have purposefully given an inaccurate result or simply forgotten to report a certain aspect of their meal, which could lead to inaccuracies
- Subsequent studies
  - Measuring calorie intake using additional measures to discover whether self-report in this study was truly accurate.
  - Look at reasons behind the change in immediate appetite.
  - Could look at specific hunger hormones that affect appetite regulation such as ghrelin (Mani, Castorena, et. Al. 2018) and/or PYY (Schubert, et. Al. 2013).

CONCLUSIONS

This study showed that exercise does immediately decrease appetite, which shows that exercise aids in appetite regulation. This study also provided information on this topic for participants in an often-overlooked population, average healthy and young adults.

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