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EATING PACE INTERVENTION CLASSES 3: FEMALE STUDENTS AT THE UNIVERSITY OF RHODE ISLAND FEINSTEIN CAMPUS

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FEMALE STUDENTS AT THE UNIVERSITY OF RHODE ISLAND FEINSTEIN CAMPUS

BY

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ABSTRACT

Background: Over one-third of the United States is obese. This weight status is associated with many negative health implications including cardiovascular diseases and diabetes. Female college students are a sub-group especially prone to excess kilocalorie (kcal) consumption, leading to weight gain. Consuming food at a fast pace has been associated with increased kilocalorie consumption. Interventions reducing eating rate may be an effective method to reduce kilocalorie consumption in female college students.

Objective: To determine if a 5 week curriculum designed to reduce eating pace would decrease consumption rate (kcal/minute) and total kcal eaten at a control meal, in addition to decreasing kcal and consumption rate as reported with 24 hour food recalls.

Methods: In a randomized control trial with pre-post testing, experimental group subjects participated in 5 weeks of group classes, and the control group received no treatment. Groups underwent multi-pass dietary recalls, laboratory standardized lunches, anthropometric measurements, and surveys. Data were used to assess laboratory and free living eating rate and kcal consumption, along with change in anthropometrics and survey scores. Analysis of variance was used to compare within-group and between-group differences in eating rate for pre and post measurements.

Participants/Setting: Ten overweight and obese female students were recruited from colleges in the Providence area through classroom announcements, flyers, and mass emails.

Results: No significant time by group or within group differences were found for eating rate, meal duration, or energy intake. There were significant between group differences at baseline for free living eating rate. Both groups had a slower eating rate in the free living condition than the laboratory condition.

Conclusion: There was no significant change from pre to post for eating rate for either group. Overall, this research gathered valuable observations for the use of the intervention in the urban environment. With a larger sample size the effectiveness of an eating rate intervention may be assessed.

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PREFACE

This thesis was prepared in manuscript format following the author guidelines for the journal *Eating Behaviors.* After submitting this thesis, the manuscript may be submitted for publication.

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MANUSCRIPT:

"Eating Pace Intervention Classes 3:

Female Students at the University of Rhode Island Feinstein Campus"

by

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ABSTRACT

Over one-third of the adults in United States are obese. This weight status is associated with negative health implications including cardiovascular diseases and diabetes. Female college students are a sub-group especially prone to excess kilocalorie (kcal) consumption, leading to weight gain. Consuming food at a fast pace has been associated with increased kcal consumption. Interventions reducing eating rate may be an effective method to reduce kcal consumption in female college students. Techniques to promote reduced eating rate include putting the fork down between bites, taking smaller bites, and chewing thoroughly before swallowing. This study observed the effects of the Eating Pace Intervention Classes (EPIC) curriculum. The goal was decreasing the consumption rate (kcal/minute) and total kcal eaten. Eating rate and intake were measured through a control meal and 24 hour food recalls. Ten female students were recruited from colleges in the Providence area through classroom announcements, flyers, and mass emails. The intervention group (n=5, age 24.4±8.1) participated in 5 weeks of group classes on slow eating techniques. The control group (n=5, age 26.4±7.4) received no treatment. Both groups completed three multi-pass dietary recalls, laboratory standardized lunch, anthropometric measurements, and surveys pre and post intervention. Data were used to assess laboratory and free living eating rate and kcal consumption before and after the 5 weeks of classes, along with change in anthropometrics and survey scores. ANOVA was used to compare within-group and between-group differences in eating rate for pre and post measurements. There were significant between group differences at baseline for free living eating rate. No significant time by group or within group differences were found for eating rate. Both groups experienced a small, non-statistically significant decrease in

eating rate from pre to post in free living and laboratory conditions. The experimental group experienced a non-significant increase in kilocalories eaten from pre to post in both the laboratory and free living conditions. This was also seen in the laboratory condition in the control group. There was no significant change from pre to post in anthropometrics or survey data. Overall, this research gathered valuable observations for the use of this intervention in an urban environment. With a larger sample size the effectiveness of an eating rate intervention may be assessed.

Introduction

According to the Center for Disease Control, 35.7% of US adults were obese in 2009-2010, totaling over 78 million adults (CDC, 2012). Obesity is a risk factor for many chronic health conditions including diabetes and heart disease (Nejat, Polotsky, & Pal, 2010). Obesity accounted for 13% of cardiovascular disease related deaths in the year 2004 (Lloyd-Jones, et al., 2009). Obese individuals may experience a lower health-related quality of life, which can negatively impact both their physical and psychosocial well-being (Kushner, 2000). Perhaps due to these negative effects, many researchers have found that obesity can also shorten lifespan (Adams et al., 2006; Jee et al., 2006; McTigue et al., 2006). Due to the overwhelming negative effects of obesity, researchers have suggested exploring alternative approaches to weight gain prevention (Kushner & Foster, 2000).

Slow eating may be linked with a reduced kilocalorie intake (Andrade, Greene, & Melanson, 2008). Eating fewer kilocalories may help with weight loss or maintenance, thus making slow eating a potential target for weight loss interventions (Matsumoto, Greene, Sebelia, & Melanson, 2012). Several eating behavior studies have found that eating rate was significantly positively correlated with BMI (Otsuka et al., 2006; Sasaki, Katagiri, Tsuji, & Amano, 2003). In one University of Rhode Island study of females, eating quickly led to an increased kilocalorie intake compared to eating slowly (Andrade, Greene, & Melanson, 2008). The same researchers found that few females rated themselves as slow eaters, suggesting that slow eating may be uncommon in young women (Andrade, Greene, & Melanson, 2008). This may make young women a target group for an eating pace intervention.

Becoming aware of homeostatic and hedonic signals and appetite may be particularly useful for female college students (Matsumoto, Greene, Sebelia, & Melanson, 2012), a group at risk for weight gain (Racette, Deusinger, Strube, Highstein & Deusinger, 2008). One study found that the rate of obesity in freshmen increased from 14.7 to 17.8% during their first year (Lloyd-Richardson et al., 2009). Another study of college freshmen showed a significant weight gain during the first 12 weeks of the semester (Levitsky, Halbmaier, & Mrdjenovic, 2004). Students believed snacking, "all-you-can-eat" dining halls, "junk food", and increased meal frequency all played a role in their weight gain (Levitsky, Halbmaier, & Mrdjenovic, 2004). Exercise and dietary patterns may have contributed to the weight gain (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008).

In an eight-university study of college students (n=1689) researchers examined aspects of eating behavior believed to be associated with each other. They observed anthropometric measurements, physical activity, and eating behavior survey scores and ultimately found that the speed of eating and meal duration seemed to be a separate facet of eating behavior (Greene et al., 2011).

The present study examined an eating rate intervention with overweight, female, urban college students. This was done in an attempt to reduce the number of kilocalories consumed and thereby facilitate weight management. The Eating Pace Instruction Class (EPIC) curriculum combines several evidence-based methods for weight gain prevention into a 5 week program. Developed at the University of Rhode Island Energy Balance Lab, this curriculum encourages eating slowly, recognizing appetite and hunger levels, satiation, sensory signals, and meal enjoyment (Matsumoto, Greene, Sebelia, &

Melanson, 2012). Several key aspects of slow eating are taught with the EPIC curriculum, including taking smaller bites, chewing thoroughly, and pausing between bites (Matsumoto, Greene, Sebelia, & Melanson, 2012). Previously, this study has been used in Kingston, Rhode Island in individual interventions (Matsumoto, Greene, Sebelia, & Melanson, 2012). The purpose of the current study was to explore using the EPIC intervention modified for use in a group setting at the URI Providence campus, a different demographic than tested previously.

2. Methods

2.1. *Design*

This intervention was a pre/post design seeking to explore the use of the EPIC curriculum in Providence-area college students, and to generate preliminary data on modifying within-meal eating behaviors in both laboratory and free-living settings. The hypothesis was that exposure to the EPIC curriculum would decrease intervention group test meal eating rate (kcal/minute), increase test meal time and decrease kilocalories consumed at the test meal, and decrease in amount of kilocalories consumed and rate of food consumption as reported in 24 hour food recalls compared to non-intervention controls. Additionally, participant scores on the Intuitive Eating Scale, International Physical Activity Questionnaire, Mindful Eating Questionnaire, Weight-Related Eating Questionnaire and any weight and waist circumference were measured. The independent variable was group assignment (intervention group or control group). The dependent variables were lab-assessed test meal parameters measuring eating rate (kilocalories and meal duration). The intervention group participated in group classes outlined in the EPIC curriculum (Appendix B). The control group did not engage in intervention classes. They received no treatment and were not contacted after the first visit until it was time to schedule them for the post-assessment. Both intervention and control groups were measured during the same 5 week span in the spring of 2012.

In order to maintain enrollment, each participant was compensated $100 ($40 after the post-assessment and $60 after the follow-up). Each participant signed an informed consent form before beginning the study, and the EPIC Study was approved by the University of Rhode Island Institutional Review Board.

After participants were randomized into groups, they were each assessed at baseline with food recalls using the Nutrition Data System for Research (NDSR), anthropometric measurements, and with a laboratory ad libitum lunch. All surveys were administered to them at this visit via Survey-Monkey. The intervention group then engaged in 5 weeks of EPIC curriculum lessons. Pre-assessment measurements were repeated for both groups at the conclusion of the lessons. At the 12-week mark, the participants returned to the lab for anthropometric measurements and surveys. Data collection was completed in the spring semester between February and June, 2012.

2.2. *Participants*

Participants were recruited through flyers at the University of Rhode Island Feinstein campus (Providence), Johnson and Whales, Rhode Island School of Design, an informational table, direct email announcements, and through 16 in-classroom verbal announcements. Individuals with pre-existing conditions that would prevent them from following intervention recommendations were excluded from the study. Other exclusion criteria included pregnancy, lactation, chronic disease, and medication that effects appetite or weight (see Appendix C: Participant Screening Form for all exclusion and inclusion criteria). Eleven non-smoking female participants aged 18 to 48, with a BMI between 27 to 37 kg/m^2 were recruited and randomly assigned to either the control group or the experimental group. One participant in the control group did complete either pre assessment or post assessment and was therefore considered to have withdrawn from the study and her partial data were excluded.

2.3. *Materials*

Eating Pace Instruction Classes (EPIC) Curriculum: The EPIC curriculum is composed of 5 classes, and was designed to foster group discussion and learning techniques to lower eating pace. Each lesson provided the students with information, and homework assignments were distributed (Matsumoto, Greene, Sebelia, & Melanson, 2012). Each class was taught by a trained graduate student at the Feinstein campus in room 300. Lesson topics included smaller bites, hunger, satiety, within-meal awareness, physiological cues of hunger, satiation, true hunger and appetite, non-physiological cues of meal initiation, portion sizes, and habitual eating (Matsumoto, Greene, Sebelia, & Melanson, 2012). A lesson outline is included in table 1, and the curriculum is in Appendix B. This curriculum was piloted with students at the Providence campus and modified from the version used in Kingston to better suit the Providence student (for modifications, see underlined items in Appendix B). Modifications included the addition of soul food, bar food, parenthood, eating on the bus, and a few other topics to the discussion.

Food Recall Using Nutrition Data System for Research (NDSR):

An in-person food recall using NDSR was conducted by a trained graduate research assistant at the first assessment visit. Each recall was reviewed by a second NDSR-trained graduate student for quality assurance before finalizing. Food models and household measures were used to aid in estimating portion size (Jonnalagadda et al, 2000). In addition, participants were given a portions booklet to aid in describing portion sizes (Jonnalagadda et al, 2000). Subsequent food recalls were conducted over the phone. Participants were asked to refer to the portion sizes booklet during subsequent telephone

recalls. Recalls were conducted during the same week as the first and second assessment visits in both the control and experimental groups. Meal duration (in self-reported minutes) was entered into NDSR as a note with each meal. Only data from meals and snacks greater than 5 kilocalories were used in analyzing meal time and eating rate. Items that were under 5 kilocalories, such as non-caloric beverages, were removed from these analyses. Total kilocalorie intake, meal duration, and eating rate (kcal/min) were calculated as a three day average for baseline and for post-measurements.

Three 24-hour dietary recalls were conducted on non-consecutive days, including 1 weekend day, using the Nutrition Data System for Research (NSDR, University of Minnesota) (Probst & Tapsell, 2005). NDSR is a computerized diet history and 24-hour food recall analysis program that utilizes a multiple-pass method to help ensure accuracy of recalls (Probst & Tapsell, 2005). Additionally, meal duration, meal location, number of utensils, and number of people present at each meal were entered into NDSR as notes. Foods not present in the NDSR database were marked as "missing foods" (Probst & Tapsell, 2005) and entered after the conclusion of the recalls by a trained, upper-level undergraduate assistant.

Intuitive Eating Scale: The Intuitive Eating Scale (IES) is a 21 item survey used to measure attitudes and behaviors about eating (see Appendix C). This survey has three subscales: unconditional permission to eat, eating for physical reasons, and eating based on hunger cues (Galloway, Farrow, & Martz, 2010). Items are scored on a 5 point Likert-type scale ranging from "strongly disagree" (1) to "strongly agree" (5) (Tylka, 2006). Positive eating habits and higher levels of intuitive eating are indicated by higher scores

on the IES. In a study of 1,260 female students at Ohio State University, the IES was found to be valid and negatively related to body dissatisfaction, pressure to be thin, and body mass (Tylka, 2006).

International Physical Activity Questionnaire: The International Physical Activity Questionnaire (IPAQ) was found to be valid in 14 centers spread across 12 countries (Craig et al., 2003). The 7-item IPAQ questionnaire (see Appendix C) captures self-reported activity levels over the past seven days. The IPAQ gives information about time spent walking, time spent in moderate and vigorous intensity activity, and time spent being sedentary in minutes per week (Craig et al., 2003). The IPAQ is scored in MET-minutes/week (metabolic equivalent-minutes per week). Higher IPAQ scores indicate higher amounts of activity (Craig et al., 2003).

The Mindful Eating Questionnaire: The Mindful Eating Questionnaire (MEQ) is a survey instrument used to measure the mindful eating practices of individuals (see Appendix C). Items on the MEQ are scored on a 1 to 4 scale, with 4 indicating higher mindfulness (Framson et al., 2003). The five factors included on the item list are disinhibition, awareness, external cues, emotional response, and distraction (Framson et al., 2003). Each factor has a calculated mean score, as does the overall survey. This instrument has good internal reliability, with the item-total correlation ranging from 0.64 to 0.83 (Framson et al., 2003).

Weight-Related Eating Questionnaire: The Weight-Related Eating Questionnaire (WREQ) is a valid 16-item survey that examines eating behaviors including dietary restraint, external eating, and emotional eating (Schembre, Greene, & Melanson, 2009) (Appendix C). Items on this survey are scored on a 5-point Likert scale with 1 being "does not describe me at all" and 5 being "describes me completely." Higher scores on the WREQ are associated with a higher level of weight-related eating, or eating behavior influenced by weight status (Schembre, Greene, & Melanson, 2009). This survey has subscales including rigid control (all-or-nothing approach to eating), flexible control (a less habitual approach to eating), emotional eating, and susceptibility to external cues (Schembre, Greene, & Melanson, 2009).

Personal Health History Questionnaire: Participants were asked to fill out a medical and diet history questionnaire asking if they have any pre-existing conditions, if they take any over-the-counter medications, when the date of the first day of their last menstrual period was, and questions about their dietary history. The questions about their dietary history included food allergies, number of meals and snacks eaten, and number of days they eat breakfast. It also included questions about caffeine withdrawal, abstaining from alcohol, questions about weight maintenance and changes in weight, and past diet history.

Self-Reported Eating Rate

Participants were asked to self-rate their eating speed (fast, medium, or slow-paced as measured on a 3 point scale). In a study of female students (n=1,695), self-rated

eating rate was found to be valid through comparison to reported rate of eating by of the participant's three close friends (Sasaki, Katagiri, Tsuji & Amano, 2003).

2.4. Procedure

Test Meal: A standardized ad libitum laboratory test meal was used to determine eating rate. Meals were eaten on an individual basis at a designated table in a private setting on the urban campus between 11:00AM and 2:00PM. Participants received instructions on test day procedures including no strenuous physical activity, and consumption of a standardized breakfast at home four hours prior to arrival at the laboratory. During this time they were to refrain from vigorous activity and consuming anything except water. They were required to stay in the lab for 60 minutes after meal initiation. This allowed for VAS scales to be administered at several time points including one full hour after the first bite. The test meal consisted of pre-weighed ditalini pasta with diced tomatoes, minced garlic, Italian seasoning, and olive oil with parmesan and romano cheese, and a pre-weighed glass of water. This meal was chosen because it is mixed-macronutrient, consistent, and the small pasta size lends itself to a wide range of eating paces. All items were weighed on a digital scale (OHAUS Adventurer Pro model AV3102C) immediately before and after they were presented to the subjects.

After signing the informed consent form (Appendix E) the participant was asked to void her bladder. At this time, the pasta was heated for 5 minutes in a microwave. When the participant returned, height, weight, and waist circumference were measured as described below. Before beginning the meal, the participant indicated her level of hunger, satiety, thirst and desire-to-eat on a visual analogue scale sheet by drawing a line at the

point that best described her at that moment. The time was recorded on the VAS sheet. After the pasta was removed from the microwave, cheese was added and stirred in. The subject was asked to eat until satiation, and was required to stay for an hour after the first bite. When the subject began eating, the time of her first bite was recorded.

When the participant finished eating, the time was recorded again. Once again, the participant indicated her level of hunger, satiety, desire-to-eat, and thirst on a VAS sheet. The weight of the food and water were measured on the digital scale and recorded. The subject could read or do school work but was required to remain in the lab for the full hour. At 20 minutes post-meal, and at 45 and 60 minutes post-meal initiation, the participant completed VAS ratings again.

Body Mass Index: Body mass index (BMI) was obtained using standardized protocols for all height and weight measurements taken in duplicate and averaged. The same researcher performed all height and weight measurements to help ensure uniformity in procedures. Height was measured using the Quick Medical Seca 214 Road Portable Stadiometer (Snoqualmie, Washington) with the participant's shoes and any hats or hair ornaments removed. The measurements were taken from floor to the top of the head, with the head in the Frankfort Plane. The researcher ensured that the participant's head, shoulders, buttocks, and heels were against the stadiometer during measurement, with the feet together and flat on the floor. Height was measured at the first data collection meeting with each participant. It was measured after inhalation to the nearest tenth of a centimeter, and in duplicate (Balestracci, 2007). Weight was measured after the participant had voided her bladder, with the Quick Medical Healthometer 320KL

(Snoqualmie, Washington) digital scale. With pockets emptied, shoes and excess clothing removed, participants were measured while standing at the center of the scale (Balestracci, 2007). Weight was measured to the nearest tenth of a kilogram. Participant weight was measured at the first, second, and follow-up visits. All measurements were taken in duplicate and then averaged. If BMI was calculated as outside of the BMI range of 27 to 37 at baseline, the individual was not permitted to enter into the study. BMI was calculated using the formula:

$$\text{BMI} = \frac{\text{Weight (kilograms)}}{(\text{Height (meters)})^2}$$

Waist Circumference: Waist circumference was measured in duplicate to ensure accuracy at first, second, and follow-up visits by the same investigator. With the participant standing, a measuring tape was placed against the skin at the level of the umbilicus and level to the floor. Waist circumference was measured to the nearest tenth of a centimeter after the participant exhaled. Waist circumference was not used as an inclusion or exclusion criteria.

2.5. Data Collection and Statistical Analysis

Data collected for test meal eating rate (time and amount), 24 hour food recalls, questionnaire scores, BMI, and waist circumference were analyzed using SPSS version 19 (SPSS, IBM inc., Chicago, IL) for statistical analysis. Data from 24 hour food recalls were averaged for the three days to obtain a single measurement for eating rate, duration, and energy intake for each data collection time point. All data were double checked for

accuracy. Missing values for survey data were imputed by taking the average of the other items within the subscale on that survey. Imputed values included 5 missing values on the IES, 4 on the WREQ, and 6 on the MEQ. Data were analyzed using two by two (2 groups by 2 occasions) repeated measures of analysis of variance in order to observe changes over time within in each group as well as a time by group interaction. T-Tests were performed on eating rate data for both the free living and laboratory values. The primary dependent variable is eating rate (kcal/second). Additional variables include kcal consumed at the control meal, control meal duration, scores on the questionnaires, BMI, waist circumference and kcal and eating rate as reported in the recalls.

3. Results

3.1. *Anthropometrics and Demographic Data at Baseline*

Ten non-smoking females aged 18 to 38 (26.4±7.4 in the control group, n=5, 24.4±8.1 in the experimental group, n=5) are included for data analysis (Table 2). The average BMI in the control group was 32.2±4.1, while in the experimental group it was 30.5±3.5. In each group, participants reported 2 to 3 meals daily (2.6±0.55 in the control group and 2.7±0.45 in the experimental group). Through analysis of the Personal Health History Questionnaire, it was determined that 60% (3) of the participants in the control group and 40% (2) of those in the experimental group had a family history of diabetes. In both the experimental and control groups 80% (4 per group) of the participants rated themselves as medium-paced eaters while 20% (1 per group) of the participants rated themselves as slow-paced. No participants rated themselves as fast eaters. Two of the five participants in the control group (40%) and 1 participant in the experimental group (20%) were parents.

3.2. *Laboratory Versus Free Living Eating Rate*

Analysis of variance was used to compare within-group and between-group differences in eating rate for pre and post measurements (Table 3). This was done for both free living and laboratory conditions. No significant time by group or within group differences were found. Both groups did experience a small, non-significant decrease in the average kilocalories per minute from pre to post in free living and laboratory conditions. Both groups exhibited a lower mean eating rate in the free living condition

than the laboratory condition. There was a significant difference between groups at baseline for eating rate in the free living condition (t (8 df) = 2.3, p = 0.048). There was also a trend towards a between group difference for laboratory eating rate at baseline (t (8 df) =1.9, p = 0.09).

Although none of the differences were statistically significant, the experimental group increased their eating duration (14.5±8.3 to 21.4±12.6 minutes in the laboratory condition and 18.5±9.1 to 23.4±7.9 minutes in the free living condition), and increased their caloric intake from pre to post (481.5±163.2 to 592.8±268.7 kilocalories in the laboratory and 373.3±148.4 to 434.6±159.1 kilocalories in the free living condition). The same non-significant results were seen in the control group for the laboratory condition (558.9±163.2 to 563.6±157.0 kilocalories and 7.7±1.6 to 11.7±8.5 minutes). In the free living condition, calorie intake decreased (447.4±209.5 to 452.3±141.2 kilocalories and 10.7±4.7 to 10.9±2.3 minutes).

3.3. *Survey Scores*

All questionnaire results are displayed in Table 4. The Weight Related Eating Questionnaire subscale scores did not exhibit significant time by group or within group differences.

For the Intuitive Eating Scale, the control group saw a significant increase in their score for eating for physical rather than emotional reasons (from 3.50±1.09 to 4.13±0.83, p=0.028). This increase was not seen in the experimental group.

On the Mindful Eating Questionnaire, there was also a significant between group difference for the awareness subscale score (F=8.94, p=0.012). The experimental group

saw a significant increase in their score for this subscale (1.97±0.60 to 2.51±0.47, p=0.048).

The IPAQ did not show any significant changes for either group.

3.4. *Anthropometric Changes from Pre to Post*

There were no significant between group differences for any anthropometric measurements. The experimental group showed a small non-significant increase in weight (0.78±2.13) and BMI (0.36±0.84) from pre to follow-up. They also exhibited a significant increase in waist circumference, from 98.53±16.08 to 104.10±16.06 centimeters, for a change of 5.57±2.66. The control group experienced a small, non-significant decrease in weight (-0.24±3.19), waist circumference (-1.46±6.24), and BMI (-0.13±1.25) from pre to follow-up (see table 5).

DISCUSSION

Overall, the study offered exploratory data and generated some insight into how to best implement an eating rate intervention in the low income Providence population in the future.

The BMI of the Providence participants was similar to that of a previous, Kingston-based wave of the study (Kingston: 31.8±2.6 versus Providence: 30.5±3.5 control and 32.3±4.1 experimental) (Hordern, Greene, Schwartz-Barcott, & Melanson, 2012). The participants in the Providence study were older (Kingston: 20±2.6 years, Providence: 26±7.4 in the control and 24.4±8.1 in the experimental) (Hordern, Greene, Schwartz-Barcott, & Melanson, 2012).

When comparing the laboratory eating rate at baseline, the experimental group in this Providence study was similar to the participants in the Kingston study (45.3±28.9 kcal/min for the Providence study, 54.9±22.5 for the Kingston study) (Hordern, Greene, Schwartz-Barcott, & Melanson, 2012). The control group, on the other hand, ate at a considerably higher rate compared to the Kingston study in the laboratory condition (72.4±13.1 kcal/min). In the free living condition, the experimental group seemed to be similar to Kingston participants (30.1±21.3 kcal/min in Kingston versus 24.7±13.3 kcal/min in the experimental group in Providence) while in the free living condition the control group ate at a much higher rate (50.3±20.7 kcal/min) (Hordern, Greene, Schwartz-Barcott, & Melanson, 2012).

At baseline the control group ate at a significantly faster rate than the experimental group in the free living assessment ($p=0.048$), and a trend towards a

difference in laboratory assessment ($p = 0.09$). Though the groups were randomly assigned, this large difference at baseline for one of the study's primary outcomes may make between-group comparisons difficult to make. It seems that the control group consumed their meals at a notably faster rate than the experimental group at every time point during the study. In this case, randomization of the participants did not prevent significant between group differences.

Self reported eating rate at baseline varied from the eating rate measured in the laboratory and free living conditions. Two participants (one in each group) were self-rated slow eaters, while the rest rated themselves as medium-paced. No participants rated themselves as fast eaters at baseline. The participants in both groups were measured to eat at a higher rate than the Kingston participants, thus did not appear to be slow eaters. It is unclear why there was a discrepancy between self-reported eating rate and measured eating rate. One Japanese study of eating rate in female students (n=1,695), evaluated the validity of self-rated eating rate. Researchers compared self-reported and friend-reported eating rate, and found that the level of agreement between the two validated the self-reported data (Sasaki, Katagiri, Tsuji & Amano, 2003). In future research on eating rate in the low income Providence population, the accuracy of self-reported eating rate may be further investigated.

One of the skills presented in the EPIC study curriculum was extending meal time. Participants in the intervention group were encouraged to extend their meal time to try and reach twenty minutes, while decreasing their eating rate during meals (Andrade, Greene, & Melanson, 2008). This was done in order to achieve fullness before excess kilocalories were consumed; it is estimated that it takes twenty minutes for feelings of

satiation to develop (Matsumoto, Greene, Sebelia & Melanson, 2012). Participants in the experimental group increased their laboratory meal duration from 14.5±8.3 to 21.4±12.6 minutes, thus meeting the goal outlined in their lessons. This may have aided in helping them to consume less kilocalories if they had sufficiently decreased eating rate, but their eating rate was not reduced sufficiently to compensate for the longer meal time (decreased from 45.3±28.9 kcal/min to 38.6±30.8 kcal/min). The experimental group increased their caloric intake in both the laboratory and the free living conditions (from 481.5±172.4 to 592.8±268.7 kilocalories per meal in the laboratory and from 373.3±148.4 to 434.6±159.1 kilocalories per meal in the free living condition). This is consistent with the results of another behavioral weight control therapy study that taught subjects slow eating. Martin and colleague found that recommending a reduced eating rate for research participants resulted in a decrease in food intake for males, but not for females (Martin et al., 2007). In future interventions, decreasing eating rate may need to be emphasized in order to achieve a lower energy intake per meal.

If the intervention focused solely on changing eating rate, the study may have seen different results. If the eating rate was reduced, and the baseline meal duration was maintained, the intervention group might have seen a reduced caloric intake at the post measurement time point. This raises the question of whether increasing meal duration while decreasing eating rate is an appropriate focus for the curriculum. This may be a topic for future research.

The increased caloric intake (though it was not a significant increase) was related to undesirable physical changes. From pre to follow-up, participants in the experimental group increased waist circumference by 5.57±2.66 centimeters. Body mass index and

weight both exhibited small, non-statistically significant increases from baseline to follow up in the experimental group. The control group on the other hand, exhibited a small, non-significant decrease in BMI, waist circumference, and weight. This study did not control for the participants' menstrual cycle, which may have played a role in these fluctuations.

One outcome from the study was the significant within-group change in the experimental group's scores on the awareness subscale of the MEQ. This change was coupled with a significant between-group difference in scores on the awareness subscale. The awareness subscale examines within-meal awareness through participant responses to statements concerning food qualities like taste, color, appearance, in addition to meal pleasantness and appreciation (Framson et al., 2009). Originally called the organoleptic subscale, the authors developed the scale to look at participant's appreciation of the effects of food on the senses. Higher scores on the subscale denote a higher level of mindful eating. Participants in the experimental group increased in their awareness subscale from a score of 1.97±0.60 at the pre-test to 2.51±0.47 at the follow-up. This may be indicative of an increase in within-meal awareness of sensory qualities of a meal, which might indicate that the participants were able to learn some mindful eating practices over the course of the implementation of the EPIC curriculum.

However, the increased level of mindful eating was associated with an increase in kilocalorie intake, which suggests the need for nutrition education encouraging choice of less energy dense foods.

Overall, scores on the surveys seemed to be comparable to the scores reported in the literature. Summary scores on the MEQ were comparable to those scores given in the study that developed and validated the questionnaire (2.74±0.17 experimental and 3.13±0.40 control at baseline for the EPIC study, 2.92±0.37 by Framson et al) (Framson et al., 2003). The average IPAQ scores in this study were lower than those reported by Craig et al. (2514 MET-min/week for validation study versus 1391.00±1126.98 experimental and 1289.30±905.02 control for Providence EPIC study) (Craig et al., 2003). The Intuitive Eating Scale total score for the EPIC study was similar to that achieved in the development and validation study for the instrument (3.04±0.27 for the experimental and 3.57±0.58 for the control versus 3.36±0.56 in the study that developed the instrument) (Tylka, 2006).

The baseline WREQ subscale scores in this study were similar to those reported amongst college students, except for a few scores being lower: the experimental group compensatory restraint subscale score, the control group susceptibility to external cues subscale score, and the control group emotional eating subscale score (Schembre, Greene, & Melanson, 2009. Perhaps future interventions will be able to better explore these differences.

This study's greatest limitation was the small group size. Few of the results were significant. Another limitation was that the groups were unevenly matched for some factors. The control group had more parents and more vegetarians than the intervention group. This may have impacted the participant eating behaviors. Stress that students experience associated with final exams in May and June may also have impacted on the post and follow-up measurements. Additionally, those data that were reported as

significant were often $p<0.05$, which offers some chance of finding false positivesdue to the large number of comparisons. With a small sample size, the results of ANOVAs are unstable, and different analytical approaches may have seen found different results.

There were also some threats to external validity in the control group results, similar to those explored by Cook and Campbell (Cook & Campbell, 1979). Exposing the control group to surveys questioning their eating practices may have impacted on their subsequent behavior, even without access to intervention lessons. However, both groups completed all assessments which helped preserve internal validity (Cook & Campbell, 1979).

If this study were to be repeated, demographic assessment should be expanded. The Providence participants in the EPIC study included some parents, but parent status was not formally recorded. Employment status should have been assessed. Many of the participants reported working part or full time. Work break time allotments were often inadequate for a twenty minute meal to take place, which made it challenging for them to achieve certain EPIC curriculum goals. Full or part time student status should also be assessed, as that may also impact scheduling abilities for adequate meal time. Participant ethnicity should also be assessed in future research. Differences in the eating behavior of various ethnic groups may have been responsible for the disparities between the Providence data and the Kingston data (Rich & Thomas, 2008).

For future use with the low-income Providence population, some modifications should be made to the EPIC intervention. Besides the aforementioned additions to the data collection, the curriculum should also be modified. Eating rate reduction needs to be

better emphasized in the lessons in order to achieve the energy intake deficits necessary to make this intervention a success. During the lessons, the participants seemed to be the most engaged in lessons that included activities that physically manipulate real food. These lessons included the portion sizes demonstration and the pizza practice lunch. An activity should be developed specifically targeting the rate of eating that will allow participants to demonstrate eating food at a slower pace. In addition, there needs to be a focus in each lesson on how the techniques can be implemented in the lives of busy parents. The lessons were originally created for non-parent young adults, but the Providence population will likely have children to care for, which will impact on their ability to follow through with EPIC curriculum techniques. Perhaps with the addition of an eating pace-focused food activity and with parent-centered suggestions, this curriculum will see success in the low-income, Providence community.

Overall, this research gathered valuable observations of this intervention in the Providence environment. Ideally with a larger sample size and with more demographic information, detailed insight into the effectiveness of an eating rate intervention can be assessed.

Table 1. EPIC curriculum lesson summary			
Class Title	**Activities**	**Homework**	**Theory**
Class 1: Introduction to the EPIC study	• the benefits of slow eating • small bites • chewing more	Practice slow eating including smaller bite size Log experiences with these techniques.	Smaller bite size leads to a lower energy intake (Zijlstra, de Wijk, Mars, Stafleu, & de Graaf, 2009)
Class 2: Within-Meal Awareness	• orosensory signals of food • satiation vs. satiety vs. hunger • meal enjoyment • in-classroom practice meal	Practice within-meal awareness focusing on taste, texture and smell of meal. Rate meal awareness on a scale of 1 to 10 for 3 real meals.	Sensory signals including flavor, can aid in consuming less kilocalories. Taste and scent produce feelings of enjoyment, satisfaction, and meal termination. (Poothullil, 2009).
Class 3: Physiological Cues	• review of hunger, satiety, and satiation • define appetite and true hunger • eat slowly to the point of satiation	Practice rating hunger and satiety on VAS scales for 3 real meals.	Appetite is the desire to eat but true hunger is the physiological drive to fulfill energy needs (Melanson, 2004).
Class 4: Non-Physiological Cues of Meal Initiation and Termination	• Portion sizes • Habits that foster distracted eating • ways to manage portion sizes and eating habits • portion size estimation activity	Observe food recommended serving sizes and follow them. Record tips that helped with eating out of hunger, not habit.	Larger portion sizes lead to higher energy intake (Rolls, 2004). Excess energy intake occurs when distracted with other tasks while eating, such as when watching television (Hetherington, 2006).
Class 5: Applying EPIC Skills in Other Situations and Settings; Review and Strategies for Maintenance	• emotional eating • strategies for maintenance • review of strategies from all classes	n/a	Emotional eating is often a due to stress, boredom, or depression, not necessarily hunger (Arrow, 1995).

Table 2. Age, anthropometrics and health history of 10 female subjects at baseline

Characteristic	**Values*** ←Mean ± Standard Deviation (Range)→ *Control*	*Experimental*
Age (years)	26.4±7.4 (18-38)	24.4±8.1 (19-38)
Height (cm)	164.1±8.4 (149.8-170.6)	157.3±9.3 (145.8-165.3)
Weight (kg)	82.5±15.7 (61.1-104.6)	80.5±17.7 (58.6-98.7)
Body Mass Index (kg/m^2)	30.5±3.5 (27.6-37.0)	32.2±4.1 (27.3-36.0)
Waist Circumference (cm)	92.3±11.9 (76.7-114.5)	98.5±16.1 (75.3-107.4)
Average Number of Meals per Day [a]	2.6±0.6 (2.0-3.0)	2.7±0.5 (2.0-3.0)
Average Number of Snacks per Day [a]	2.2±1.3 (1.0-4.0)	2.2±0.8 (1.0-3.0)
Breakfasts per Week [a]	4.6±2.9 (0.0-7.0)	3.8±2.5 (2.0-7.0)
	Percent (Number)*	
	Control (n=5)	*Experimental (n=5)*
Family History of Diabetes [a]	60.0 (3)	40.0 (2)
Self-Rated Eating Rate [a]		
Fast	0.0 (0)	0.0 (0)
Medium	80.0 (4)	80.0 (4)
Slow	20.0 (1)	20.0 (1)
Vegetarian [a]	40.0 (2)	0.0 (0)
Weight fluctuation [a, b]	80.0 (4)	100.0 (4[c])
Parent [d]	40.0 (2)	20.0 (1)

*No significant between-group differences (chi squared tests for categorical variables and independent t-test for continuous variables)

[a] Data taken from baseline Personal Health History Questionnaire

[b] Weight fluctuation of at least 5 pounds in the past year on one or more occasions

[c] One person did not offer a response, n = 4 for the experimental group for this percentage

Table 3. Analysis of variance of eating rate, daily eating duration, and daily kilocalorie (kcal) intake in control (n=5) and experimental (n=5) groups in free living and laboratory conditions (mean ± standard deviation)

	Pre			**Post**			**Within Group Differences** (t)	**Between Group** (F)
	Kcal	Minutes	Kcal/Min	Kcal	Minutes	Kcal/Min		
Laboratory [a]								
Experimental	481.5±172.4	14.5±8.3	45.3±28.9	592.8±268.7	21.4±12.6	38.6±30.8	0.61	0.040
Control	558.9±163.2	7.7±1.6	72.4±13.1	563.6±157.0	11.7±8.5	61.6±31.0	0.63 (0.56)	
Free Living [b,c]								
Experimental	373.3±148.4	18.5±9.1	24.7±13.3	434.6±159.1	23.4±7.9	18.8±3.8	0.92	0.002
Control	477.4±209.5	10.7±4.7	50.3±20.7	452.3±141.2	10.9±2.3	45.1±11.7	0.38	

*p<0.05, **p<0.01, ***p<0.001

[a] Laboratory data was collected at in-lab lunches

[b] Free living eating rate, kcals, and minutes were determined using the Nutrition Data System for Research (NDS-R) food recalls and is an average of 2 weekday recalls and 1 weekend day recall at pre and post, excluding non-caloric beverages. Minute and kilocalorie data was achieved through taking the average minutes and kilocalories per meal per day, and then averaging the three days at baseline and three days post to achieve average kilocalories and minutes per meal for each assessment.

[c] Significant (p<0.05) between group differences at baseline..

Table 4. Analysis of variance of survey score for the Mindful Eating Questionnaire (MEQ), Weight-Related Eating Questionnaire (WREQ), International Physical Activity Questionnaire (IPAQ), and Intuitive Eating Scale (IES) at pre, post, and follow-up for both the control and experimental groups (mean ± standard deviation, n=10)

Survey	Subscale	Group	Pre	Post	Follow-Up	Within Group F	Between Group F
WREQ[a]	Routine Restraint	Exp	1.93±0.55	1.93±0.64	1.80±0.51	6.00	1.80
		Con	2.27±0.95	3.07±1.42	2.07±1.14	1.69	
	Compensatory Restraint	Exp	2.53±1.02	2.13±0.99	2.53±1.15	0.74	1.43
		Con	2.13±1.56	2.73±1.48	2.67±1.56	1.13	
	Susceptibility to External Cues	Exp	2.64±0.62	2.24±0.91	2.16±0.88	4.25	2.39
		Con	1.48±0.41	1.92±0.33	1.38±0.30	3.03	
	Emotional Eating	Exp	2.64±1.09	2.61±1.05	1.69±0.70	4.31	3.66
		Con	1.52±1.16	1.52±0.95	1.44±0.88	0.26	
IES[b]	Unconditional Permission to Eat	Exp	3.24±0.37	2.93±0.17	2.91±0.34	1.93	1.03
		Con	3.18±0.62	2.78±1.18	3.13±0.99	1.03	
	Eating for Physical Rather than Emotional Reasons	Exp	2.83±0.82	2.97±0.53	2.73±0.45	0.49	2.49
		Con	3.50±1.09	3.90±1.04	4.13±0.83	14.67*	
	Reliance on Internal Hunger/Satiety Cues	Exp	2.93±0.87	3.06±0.74	3.53±0.36	1.36	1.46
		Con	4.23±0.64	4.62±0.52	4.67±0.51	4.29	
	Total Score	Exp	3.04±0.27	2.98±0.22	3.04±0.05	0.29	0.74
		Con	3.57±0.58	3.62±0.50	3.80±0.55	2.95	

Exp: experimental, Con: control

*p<0.05, **p<0.01, ***p<0.001

[a] The WREQ is a 16-item survey that examines eating behaviors including dietary restraint, external eating, and emotional eating. Items on this survey are scored on a 5-point scale in which higher scores indicate higher levels of weight-related eating.

[b] The IES is a 21-item survey used to measure attitudes and behaviors about eating scored on a 5 point scale in which positive eating habits and higher levels of intuitive eating are indicated by higher scores.

[c] The MEQ is a 28-item survey used to measure the mindful eating practices of individuals. Items are scored on a 1 to 4 scale, with greater scores indicating higher mindfulness.

[d] The IPAQ is a 7-item survey that gives information about time spent walking, time spent in moderate and vigorous intensity activity, and time spent being sedentary in minutes per week, with higher scores indicating higher amounts of activity.

[e] METs listed here are MET-minutes per week, where MET stands for metabolic equivalents

Table 4 (continued). Analysis of variance of survey score for the Mindful Eating Questionnaire (MEQ), Weight-Related Eating Questionnaire (WREQ), International Physical Activity Questionnaire (IPAQ), and Intuitive Eating Scale (IES) at pre, post, and follow-up for both the control and experimental groups (mean ± standard deviation, n=10)

Survey	Subscale	Group	Pre	Post	Follow-Up	Within Group F	Between Group F
MEQ[c]	Awareness	Exp	1.97±0.60	2.86±0.48	2.51±0.47	9.87*	8.94*
		Con	2.74±0.87	2.74±0.91	2.57±0.93	1.71	
	Distraction	Exp	3.07±0.86	3.00±0.71	3.13±0.73	2.25	2.28
		Con	3.20±0.56	3.20±0.84	3.03±0.82	1.17	
	Disinhibition	Exp	2.90±0.34	2.97±0.21	2.88±0.15	0.38	0.07
		Con	3.42±0.45	3.45±0.43	3.43±0.17	0.02	
	Emotional	Exp	3.15±0.45	3.15±0.55	2.88±0.60	0.64	0.39
		Con	3.60±0.55	3.80±0.21	3.65±0.49	0.72	
	External	Exp	2.60±0.75	2.40±1.09	2.62±0.48	0.20	1.38
		Con	2.70±0.97	2.73±1.03	2.40±1.08	2.59	
	Summary Score	Exp	2.74±0.17	2.88±0.09	2.81±0.12	4.79	0.52
		Con	3.13±0.40	3.19±0.58	3.02±0.54	1.05	
IPAQ[d]	Walking METs[e]	Exp	759.00±563.90	323.40±146.47	270.60±274.52	0.95	1.24
		Con	333.30±352.42	415.80±268.96	511.50±251.32	0.27	
	Moderate METs[e]	Exp	320.00±521.54	312.00±401.15	2240.00±4387.62	0.83	2.74
		Con	300.00±261.53	960.00±960.00	624.00±625.84	1.68	
	Vigorous METs[e]	Exp	312.00±445.78	1432.00±1219.97	3128.00±6317.24	1.21	0.34
		Con	656.00±588.97	1440.00±2219.19	880.00±1559.49	0.21	
	Total METs[e]	Exp	1391.00±1126.98	2067.40±1494.70	5638.60±10552.80	0.35	0.63
		Con	1289.30±905.02	2814.80±3022.44	2015.50±2238.85	0.57	

Exp: experimental, Con: control

*p<0.05, **p<0.01, ***p<0.001

[a] The WREQ is a 16-item survey that examines eating behaviors including dietary restraint, external eating, and emotional eating. Items on this survey are scored on a 5-point scale in which higher scores indicate higher levels of weight-related eating.

[b] The IES is a 21-item survey used to measure attitudes and behaviors about eating scored on a 5 point scale in which positive eating habits and higher levels of intuitive eating are indicated by higher scores.

[c] The MEQ is a 28-item survey used to measure the mindful eating practices of individuals. Items are scored on a 1 to 4 scale, with greater scores indicating higher mindfulness.

[d] The IPAQ is a 7-item survey that gives information about time spent walking, time spent in moderate and vigorous intensity activity, and time spent being sedentary in minutes per week, with higher scores indicating higher amounts of activity.

[e] METs listed here are MET-minutes per week, where MET stands for metabolic equivalents

Table 5. Anthropometric measures for control and experimental groups at all time points (mean ± standard deviation)

Variable	Pre-Intervention	Post-Intervention	Follow-Up	Within Group F[a]	Between Group F[a]
Weight (kg)					
Experimental	80.53±17.71	80.44±17.13	81.32±17.78	0.93	1.81
Control	82.47±15.75	82.75±16.84	82.24±17.74	0.70	
BMI[b] (kg/m2)					
Experimental	32.18±4.08	32.18±4.00	32.53±4.30	1.09	2.04
Control	30.48±3.54	30.56±4.10	30.34±4.44	0.80	
WC[c] (cm)					
Experimental	98.53±16.08	104.74±13.11	104.10±16.06	10.81*	2.36
Control	92.33±11.93	93.14±17.13	90.87±17.72	2.47	

*p<0.05, **p<0.01, ***p<0.001

[a]Within and between group F found using pre, post and follow up data for the control and experimental group.

[b] BMI: body mass index

[c] WC: waist circumference

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Appendix A. Literature Review

1. Introduction

There high incidence of obesity in the United States (Center for Disease Control, 2012). This is a concern for college students, who generally gain weight during their years in college (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008). The urban environment of the present EPIC study also may present challenges to weight management (Lopez & Hynes, 2006), making Providence students a target for weight management interventions. With the many health risks associated with obesity (Nejat, Polotsky, & Pal, 2010), it is inherent that interventions address these issues.

One eating behavior tied to obesity is eating rate, which has been shown in research to be positively correlated with BMI (Otsuka et al., 2006). In addition, hedonic and homeostatic controls of eating (Harrold, Dovey, Blundell, & Halford, 2012), hormonal responses (Kokkinos et al., 2010), appetite, and hunger (Whitney, 2008) each impact on eating behavior.

Some previous interventions that teach participants to eat slowly have shown a statistically significant decrease in participant eating rate and energy intake (Matsumoto, Greene, Sebelia, & Melanson, 2012). Other researchers found that this type of intervention worked better in males than females (Martin et al., 2007).

The EPIC study is firmly grounded in research and a discussion of the related literature will follow.

2. Obesity

Obesity has dramatically increased in the last twenty years such that now over one-third of the United States is obese (Center for Disease Control, 2012). According to the Center for Disease Control, 35.7% of adults were obese in 2009-2010, totaling over 78 million adults (2012). Within the state of Rhode Island, 26.0% of adults are obese and 37.5% are overweight, putting the majority of the state at risk for weight-related health issues (CDC Office of Surveillance, Epidemiology and Laboratory Services, 2010). The number of United States citizens who are overweight or obese is expected to rise to 75% by the year 2015 (Wang & Beydoun, 2007). Obesity is a risk factor for many chronic health conditions including, but not limited to, stroke, cancer, (Center for Disease Control, 2012) diabetes and heart diseases (Nejat, Polotsky & Pal, 2010). Along with these negative health implications comes an estimated cost of $147 billion dollars for obesity-related medical care (Center for Disease Control, 2012). Obese individuals may experience a lower health-related quality of life which can negatively impact both their physical and psychosocial well-being (Kushner & Foster, 2000). Due to the overwhelming negative effects of obesity, researchers have suggested exploring approaches to weight gain prevention (Kushner & Foster, 2000).

2.1. Health Risks of Obesity

Obesity is related to a wide ranging spectrum of health issues including diabetes, hypertension, coronary artery disease (CAD), sleep apnea, and depression (Nejat, Polotsky, & Pal, 2010). Several studies have indicated that those who are obese have a shorter lifespan (Adams et al., 2006; Allison, Fontain, Manson, Stevens, & VanItallie, 1999; Jee et al., 2006; McTigue et al., 2006). One study of 90,185 women over an

average of 7 years found that those with a BMI greater than 40 kg/m^2 were nearly twice as likely to have a shorter lifespan as those with a lower BMI (McTigue et al., 2006). Being overweight at age 40 results in a lifespan decrease of 3.3 years in women and 3.1 years in men (Lloyd-Jones et al., 2009). A United States study of over 500,000 males and females aged 50-71 found similar results, indicating that overweight and obese individuals were more likely to die than those with a healthy weight (Adams et al., 2006).

Many studies have indicated that obesity is a risk factor for insulin resistance and type 2 diabetes (Shoelson, Herrero, & Naaz, 2007; Zeyda & Stulnig, 2009). The risk for type 2 diabetes associated with obesity increases with age, which may be due to the increased odds for becoming overweight and/or obese with age (Zeyda & Stulnig, 2009). The inflammation that occurs with obesity may be the cause for the relationship between diabetes and obesity, but these connections are not yet clear (Zeyda & Stulnig, 2009).

This obesity-inflammation relationship may also play a role in the increased risk for cardiovascular health problems that come with obesity (Zeyda & Stulnig, 2009). Risk for coronary artery disease is increased with obesity, along with elevated total cholesterol, hypertension, and venous thrombosis (Nejat Polotsky, & Pal, 2010). Adominal obesity was considered to be a risk factor for ischemic stroke (Lloyd-Jones et al., 2009). Additionally, thromboembolic stroke risk increased 10 to 30% with an increase in BMI of approximately 3kg/m^2. In 2004, obesity accounted for 13% of all cardiovascular disease related deaths (Lloyd-Jones et al., 2009).

Besides cardiovascular health issues, the risk for several types of cancer is also higher in obese individuals (Nejat Polotsky, & Pal, 2010). These cancers include, but are not limited to, cancer of the esophagus, colon, liver, kidney, pancreas, and gallbladder

(Nejat Polotsky, & Pal, 2010). One meta-analysis found that an increase in BMI of 5kg/m2 resulted in a 59% higher risk for endometrial cancer (Renehan, Tyson, Egger, Heller, & Zwahein, 2008). Another meta-analysis of 28 studies found a possible positive relationship between ovarian cancer and obesity, but only 10 of the 28 studies had statistical significance (Olsen et al., 2007). The American Cancer Society states that one in every three cancers in America are related to overweight, obesity, diet, or sedentary lifestyle (2011). These links are not fully understood yet, and more research is needed in order to establish a clear relationship between weight status and cancer risk (American Cancer Society, 2011). Researchers speculate that possible reasons may include the effect that excess weight has on the immune system, hormone levels, insulin-like growth factor-1, and the way in which the body processes fats and sugars (American Cancer Society, 2011). Some types of cancer show a reduced risk with weight loss, but evidence is not substantial enough to establish a clear link (American Cancer Society, 2011).

Besides of chronic disease, obesity also has a negative impact on quality of life. Body pain, fatigue, and physical limitations all have a negative impact on the health related quality of life of obese individuals (Sarwer, Lavery, & Spitzer, 2012). Obesity is also associated with higher rates of depression and low self esteem (Nejat Polotsky, & Pal, 2010). One cohort study found that women who were overweight were less likely to be married, completed less years of school, and experienced higher rates of poverty that non-overweight individuals (Gortmaker, Must, Perrin, Sobol, & Dietz, 1993). Reproductive functioning is reduced in obesity, further impacting quality of life (Sarwer, Lavery, & Spitzer, 2012). With weight loss, researchers have shown that individuals may experience an improved quality of life (Kolotin, Meter & Williams, 2001).

2.2. Weight Gain in College

College students are particularly at risk for weight gain (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008; Lloyd-Richardson, Bailey, Fava & Wing, 2009). One study followed college students from freshman to senior and found that females (n=138) gained an average of 1.7 ± 4.5 kg during the four years of study (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008). Another study found that rates of obesity in females increased from 14.7 to 17.8% during freshman year, with 70% of study participants (n=382) gaining an average of 1.6 kg (Lloyd-Richardson et al., 2009). A Cornell University study of male and female college freshmen (n = 68) showed a significant weight gain (1.9±2.4kg) during the first 12 weeks of the semester (Levitsky, Halbmaier, & Mrdjenovic, 2004). The weight gain is greater than that experienced by the non-college population (Levitsky, Halbmaier, & Mrdjenovic, 2004). In a nationally representative sample (n = 3,683), Zagorsky and Smith found that females gain 4.0±7.5 kilograms during their four years in college (Zagorsky & Smith, 2011).

Levitsky and colleages used a questionnaire to assess male and female students' perceptions about causes of weight gain. Students revealed that they believed snacking, "all-you-can-eat" dining halls, "junk food", and increased meal frequency all played a role in their weight gain (Levitsky, Halbmaier, & Mrdjenovic, 2004). The exercise and dietary patterns of college students over four years did not meet the guidelines for their age group, which may have contributed to the weight gain (Racette, Deusinger, Strube, Highstein, & Deusinger, 2008). Stress, increased alcohol intake, and changes in family

and friend support have been identified as additional pressures (Lloyd-Richardson et al., 2009)..

In an eight-university study of college students, researchers examined the relationship between anthropometric measurements, physical activity, and eating behavior survey scores and meal duration and eating rate (Andrade & Greene, 2011). There were gender differences in eating rate and meal duration ($p<0.001$). Data showed that eating rate and meal duration were associated with some survey subscales, but eating rate and meal duration seemed to be different facets of eating behavior (Andrade & Greene, 2011). This may explain the discrepancies between the present study's participant survey scores, anthropometric measurements, eating rate, and meal duration as they are separate facets of eating behavior and not necessarily related.

2.3. Obesity in Urban Environments

Living in an urban environment presents several challenges to weight management (Lopez & Hynes, 2006). Income inequality and poverty are social factors (Eberhardt & Pamuk, 2004) that are associated with lower physical activity and higher rates of obesity (Lopez & Hynes, 2006). Low income urban neighborhoods experience "economic isolation", or areas with high percentages of low income people (Lopez & Hynes, 2006). Economic isolation is considered to be a risk factor for poor health (Lopez & Hynes, 2006). Additionally, researchers suggest that aging city infrastructure and crime rates in some urban environments make them conducive to reduced levels of physical activity and thus higher rates of obesity (Lopez & Hynes, 2006). These factors may make urban environments a target for weight management interventions.

2.4. Obesity and Eating Rate

Several studies have proposed a link between eating rate and BMI (Sasaki, Katagiri, Tsuji, & Amaro, 2003, Otsuka et al., 2006, Maruyama et al., 2008, Lee et al., 2012). In a study of 1695 female nutrition students Sasaki et al. found that eating rate was significantly positively correlated with BMI (Sasaki, Katagiri, Tsuji, & Amaro, 2003). This was seen again by Otsuka et al. in a study of 3737 males and 1005 females where fast eating was associated with obesity (Otsuka et al., 2006). In this epidemiological study, these researchers compared current reported weight with reported weight at age 20, found that fast eaters were more likely to become obese as they aged.

This research coincides with findings from Maruyama et al. indicating that eating rate was positively associated with weight (Maruyama et al., 2008). However, another study (n = 442) found a positive correlation between eating rate and BMI in male patients, not in females (Takayama et al., 2002). More recently, a nationwide New Zealand study of 2,500 middle-aged women explored categories of eating rate and self-reported BMI (Leong, Madden, Gray, Waters & Horwath, 2011). This study found that after adjusting for many factors including age, socioeconomic status, and physical activity, BMI was 2.8% higher for every category increase in eating rate. The researchers in this study suggested exploring interventions to promote slower eating.

The relationship between a fast eating rate and obesity may be related to greater energy intake. In a University of Rhode Island study of 30 healthy women, instructions to eat quickly led to a consumption of 645.7±155.9 kcal ($p < 0.01$) while instruction to eat

slowly led to an intake of 579.0±154.7 kcal (Andrade, Greene, & Melanson, 2008). Over time, an increase in kilocalorie intake will lead to weight gain.

Researchers sometimes divide participants into two decelerated and linear eaters based on their eating rate over the course of the meal. Linear eaters maintain their eating rate during the meal, while decelerated eaters eat at a rate that decreases over the course of the meal (Zandian, Ioakimidis, Bergh, Brodin, & Södersten, 2009). One study compared women who were decelerated eaters or linear eaters. Data indicated that instructing the participants to eat slowly resulted in a reduction of intake in only the linear eaters. This suggests that an intervention aimed at decreasing eating rate in women may only be effective in those who are linear eaters (Zandian, Ioakimidis, Bergh, Brodin, & Södersten, 2009). Later in this paper, the implications of eating rate on eating behaviors and energy intake will be discussed more fully.

2.5. Obesity and Underreporting of Energy Intake

When obtaining food recall data, the question of underreporting is often raised (Mendez et al., 2011). One way to combat the possibility of underreporting is to compare diet recalls with an objective measure of energy intake (Mendez et al., 2011). One such technique is to use doubly labeled water. This was developed to assess the validity and accuracy of self-reported energy intake (Hill & Davies, 2001). This technique has been shown in literature to illustrate the inaccuracies of food recalls, often identifying substantial under-reporting in research subjects (Hill & Davies, 2001). One study compared reported energy intake with doubly-labeled water data in obese and non-obese twins (Pietiläinen et al., 2010). Researchers found that obese participants significantly (p

= 0.036) underreported their energy intake by 3.2±1.1 MJ per day (Pietiläinen et al., 2010). Under-reporting in the non-obese twins was not significant. In another study, researchers used doubly labeled water to examine ten overweight patients reporting low energy intake and weight stability over three months (Buhl, Gallagher, Hoy, Mathews, & Heymsfield, 1995). Through analysis of doubly labeled water, data indicated that all of the patients had substantially underreported their energy intake (Buhl, Gallagher, Hoy, Mathews, & Heymsfield, 1995). This may explain their lack of success in losing weight while on this diet. Low income, high BMI, and low body satisfaction, all of which have been observed in urban populations, have been associated with under-reporting in doubly-labeled water research (Scagliusi et al., 2009). This reinforces the importance of laboratory measures of eating rate.

3. Eating Behavior

3.1. Hunger and Satiety

Eating events are controlled by physiological experiences that are a combination of responses to the environment and the body's needs **(**Harrold, Dovey, Blundell, & Halford, 2012). These signals vary based on the time point during the meal (before, during, and after) and are a combination of sensory and hormonal signals throughout the body.

Homeostatic control of appetite is regulated by the body's need for energy **(**Harrold, Dovey, Blundell, & Halford, 2012). This control will respond when the body's energy stores decrease in order to increase motivation to eat **(**Harrold, Dovey, Blundell, & Halford, 2012).

Hedonic control of appetite is regulated by reward based pathways **(**Harrold, Dovey, Blundell, & Halford, 2012). These pathways are based on sensory pleasure, palatability of food, and anticipated rewards. Hedonic control can lead to eating energy dense, highly palatable foods, and thus overconsumption of energy in relation to energy needs **(**Harrold, Dovey, Blundell, & Halford, 2012). Researchers propose that the hedonic control of appetite can override homeostatic signals, thus creating an obesigenic environment **(**Harrold, Dovey, Blundell, & Halford, 2012).

Signals from the sight and scent of food can generate anticipatory reactions such as hedonically controlled hunger **(**Harrold, Dovey, Blundell, & Halford, 2012). The body responds to this by salivating and preparing the stomach through the actions of gustatory and somatosensory neorones. Ghrelin, a hormone that stimulates eating behavior, is linked with the absense of CCK (a satiety hormone) and thus peaks right before a meal begins **(**Harrold, Dovey, Blundell, & Halford, 2012).

The experience of eating is part of an inter-related cycle called the satiety cascade. The first stages of this cascade is called pre-preadinal and involves sensory hunger signals (i.e. the scent and sight of food) and signals from the body (i.e. stomach nerves, low blood glucose, and the presence of nutrients in the body) **(**Harrold, Dovey, Blundell, & Halford, 2012). Nerve signals reach the brainstem, which will then generate eating (pradinal) and eating termination (post-pradinal) signals during the subsequent meal **(**Harrold, Dovey, Blundell, & Halford, 2012).

Stomach fullness at the start of a meal correlates to restraint during that meal, and can impact the amount of food ingested at the meal (de Castro & Plunkett, 2002). Calorie content delays gastric emptying and can affect the stomach fullness sensations (Marciani

et al., 2001). Increased meal viscosity also can result in an early sense of fullness (Marciani et al., 2001). Researchers speculate that the higher viscosity causes more forceful stomach contractions and can trigger stomach stretch receptors, thus resulting in the feeling of fullness (Marciani et al., 2001). Like viscosity, meal volume also can impact stomach fullness through stretch receptors (Marciani et al., 2001). If the perception of fullness is poor, individuals may consume excess energy and gain weight (de Castro & Plunkett, 2002). High water content foods are generally less energy dense, occupy a larger volume, and thus produce greater stomach fullness with less caloric ingestion (de Castro & Plunkett, 2002).

In addition to the signals provided by the stomach, the peripheral tissues of the body generate signals that inform the central nervous system of the consequences of eating. This aids the brain in determining the amount and when food is eaten **(**Harrold, Dovey, Blundell, & Halford, 2012). These signals can generate feelings of satiety. Satiety signals can can be regulated by hormones including CCK, GLP-1, PYY, and amylin **(**Harrold, Dovey, Blundell, & Halford, 2012).

As the meal draws to a close, the negative feedback signals of homeostatic control will trigger a signal to end eating **(**Harrold, Dovey, Blundell, & Halford, 2012). Hormonal levels in the body change and signal meal termination **(**Harrold, Dovey, Blundell, & Halford, 2012). Leptin inhibits food intake and helps to regulate the conclusion of a meal through supressing appetite **(**Harrold, Dovey, Blundell, & Halford, 2012). Decreasing levels of ghrelin will reduce hunger levels as the meal ends. This hormone does not become as suppressed in obese individuals after a meal as it does in

those with a healthy BMI, thus possibly contributing to the weight status of obese individuals **(**Harrold, Dovey, Blundell, & Halford, 2012).

Overall, the body offers sensory signals to the central nervous system about its energy needs, the central nervous system responds with the appropriate hormonal reactions, and thus energy levels are maintained in the body. Homeostatic and hedonic pathways come together to manage the multi-stage process of the eating experience.

3.2. Hormonal Responses to Eating

One example of homeostatic control is the hormonal response to eating. Physiological signals of appetite and fullness in the postpradinal state are comprised of a series of hormonal changes (Kokkinos et al., 2010). Immediately following a meal, ghrelin will decrease as peptide YY (PYY) and glucagon-like peptide-1 (GLP-1) increase (Kokkinos et al., 2010). These hormones work to control feelings of hunger, satiety, and energy intake, and can may play a role in postpradinal insulin response (Chaudhri, Small & Bloom, 2006, Kokkinos A, 2010).

In a crossover study of 17 healthy male participants, PYY and GLP-1 were higher in those who consumed the same meal in 30 minutes than those who only took 5 minutes (Kokkinos et al., 2010). Ghrelin is derived in the stomach and increases food intake. PYY is created in the intestines and is anorexigenic, reducing food intake through its action on appetite (Goldstone, 2006). The participants experienced a reduced level of hunger and a higher satiety immediately following the longer meal versus the shorter meal in a way that corresponded to the greater change in hormones. The researchers did not, however, find any significant differences in insulin and glucose response in blood drawn after the

short and long meal times (Kokkinos et al., 2010). The authors point out that the anorexigenic effect of this change in hormones is also seen in gastric bypass patients (Kokkinos et al., 2010), and thus it may play an important role in the success of these surgeries.

A second study opposed Kokkinos' findings, showing no difference in peptide YY and GLP-1 response in 25 healthy adult men and women after consuming an isocaloric meal at a fast, medium, or slow pace (Karl, Young, & Montain, 2011). Participants were obese (BMI≥30, n=10) or non-obese (BMI<25) US Army Soldiers between the ages of 30±12. Participants were given a standardized, fixed-portion meal of Hormel corned beef hash and water. They were instructed to maintain their eating rate by following feedback given on a computer screen (Karl, Young, & Montain, 2011). The researchers suggest that the lack of a significant difference in GLP-1 and peptide YY means there would not be a difference in energy intake between the different eating rates, because there would be no difference in hormonally mediated appetite (Karl, Young, & Montain, 2011).

One study examined the effects of weight loss on appetite hormones (Verdich et al., 2001). Researchers examined thirty five severely overweight males (age 18 to 50) who lost a mean of 18.8 kg over the course of 6 months through the consumption of a low calorie diet (Verdich et al., 2001). Data show that that GLP-1 levels showed an increase in obese subjects, and became very similar to that of the lean subjects used for a non-intervention control group (Verdich et al., 2001). This shows that with weight loss, some improvement in appetite regulating hormones may occur.

3.3. Appetite Versus Hunger

Appetite is the desire to eat and is often a response to the environment. Appetite can be influenced by sensual perceptions like the taste, scent, the sight of food, and portion size (Whitney, 2008). Previous research on appetite sensations has determined that assessing these perceptions is a valid method for determining motivation to eat (Flint, 2000; Parker et al., 2004; Stubbs, 2000). Appetite sensations have been associated with the level of energy intake in a laboratory setting (Parker, Ludher, Loon, Horowitz, & Chapman, 2004). In a 6 week weight loss study of 176 men and 139 women, researchers found that appetite level was a good predictor of energy intake and that participants with a greater fasting appetite experienced lower weight loss (Drapeau et al., 2007).

One Australian study examined the link between appetite ratings and energy intake in 32 healthy males and females aged 65-85 (Parker, Ludher, Loon, Horowitz, & Chapman, 2004). Researchers used VAS measurements of appetite during a standardized meal and determined that line ratings were an effective means of predicting food intake in older adults (L. A. Parker BA, Loon TK, Horowitz M, Chapman IM, 2004). Previous research by some of the same authors determined that a similar effect was seen in 45 healthy younger adults, aged 18-35 (Parker, Ludher, Loon, Horowitz, & Chapman, 2004).

Oppositely, hunger is triggered by physiological factors such as nerve signals in the body (Whitney, 2008). Hunger can also be triggered by the sight or scent of food, resulting in a chain of events that prepares the body for eating **(**Harrold, Dovey, Blundell, & Halford, 2012). One Purdue study examined hunger and the impact it had on energy intake in a group of 128 participants. Through examining three 24-hour recalls in

conjunction with hourly appetite ratings, they found that hunger was significantly related to energy intake within the same hour (McKiernan, Hollis, McCabe, & Mattes, 2009).

The EPIC study curriculum includes education on eating in response to hunger and not in response to appetite with the intent of decreasing energy intake.

3.4. Cognitive, Social, and Demographic Factors Influencing Food Intake

Factors influencing food intake are wide ranging and can vary from disinhibition (Hayes et al., 2002; Zandian, Ioakimidis, Bergh, Brodin, & Södersten, 2009) and restraint (Martin et al., 2007) to the environment (de Castro & Lilenfeld, 2005), gender (Martin et al., 2007), and family attitude (Matheson, 2008).

Disinhibition in food intake can result in overeating. This phenomenon can be caused by disruptions in cognitive control and can be related to emotion, alcohol, availability of foods, and food appearance (Zandian, Ioakimidis, Bergh, Brodin, & Södersten, 2009). Perceived palatability has also been related to disinhibition and increased energy intake (Andrade, Greene, & Melanson, 2008). Moreover, in a twin study, individual environment was found to have a significant impact on an individual's disinhibition (de Castro & Lilenfeld, 2005).

Alcohol has been associated with enhanced disinhibition, through lowering cognitive self-restriction of eating (Yeomans, 2004). Researchers speculate that alcohol consumption may even enhance the reward effect of food (thus enhancing disinibition's effects), and may constitute a risk factor for obesity (Yeomans, 2010). Perhaps adding to the negative effects of alcohol and disinhibition, greater intakes of energy-dense foods has been associated with high disinhibition (Hays et al., 2002). One study suggests that

disinhibition may be both a cause and a consequence of being overweight (Hays et al., 2002). Researchers go on to state that disinhibition is an independent predictor of weight gain (Hays et al., 2002).

Restraint is a conscious effort to control eating (Martin et al., 2007). Restraint at very high levels has been associated with eating disorders such as anorexia nervosa (de Castro & Plunkett, 2002). Other research shows the opposite, that those with high levels of restraint often have a higher weight status than those with a lower restraint score (Nederkoorn & Jansen, 2001; Roefs, Herman, MacLeod, Smulders & Jansen, 2005). This was also shown in a study by de Castro and Lilenfeld, in which restraint level was found to be significantly related to body size (2005). Researchers looking at responsiveness to the palatable food intake found that those with a high restraint score had an increased level of reward signals compared to those who had a lower restraint score. This may be the cause of restrained eaters binge eating and overeating, due to their hyper-responsive reward responses (Roefs, Herman, MacLeod, Smulders & Jansen, 2005). Martin et al. found a gender difference for restraint response in a study on responses to restraint (2007). His data show a negative relationship between restraint levels and energy intake for female subjects, but not for male subjects (Martin et al., 2007).

The family environment also has a significant impact on disinhibition (de Castro, Lilenfeld, 2005). In a study of 282 self-identified family food preparers (FFP), researchers found that family members' eating habits were similar (Hannon, Bowen, Moinpour, & McLerran, 2003). Fruit and vegetable and high-fat food intake of the FFP predicted that of their children and spouses (Hannon, Bowen, Moinpour, & McLerran, 2003). FFP are essentially "nutritional gatekeepers" for the household, determining many

aspects of food preparation and availability and playing a key role in family food environment (Larson & Story, 2009). Additionally, family attitude towards foods impacted the food choice of their children (Matheson, 2008). Parents who rated food taste as more important than food healthfulness had children who consumed more fat and sugar and less vitamin A (Matheson, 2008).

When considering familiar influence on eating behavior, the idea that this behavior might be genetic must be considered. Researchers de Krom et al. state that feeding is controlled by genetic factors in combination with the aforementioned environmental factors (2009). Macronutrient preference, bitter or sweet taste, and meal size and frequency are all influenced to some extent by genes (de Krom, Bauer, Collier, Adan, & la Fleur, 2009). Family studies have provided evidence for genetic influence over daily caloric intake as well as macronutrient percentrages (Rankinen & Bouchard, 2006). The magniture of heritability for these traits ranges from 20 to 40% (Ranikinen & Bouchard, 2006). Four genes code for the sweet, unami, and bitter taste receptors: TAS1R1, TAS1R2, TAS1R3, and TAS2R. More research is needed to determine the sour and salty taste receptor genes (Ranikinen & Bouchard).

Hunger, meal size, the effect that hunger has on food intake and the effect that food intake has on hunger are all genetically influenced traits. The level of hunger, meal size, and food intake is controlled in part by the genetic determination of hormone, peptide, and neuron reactions to hunger and satiety feelings (Ranikinen & Bouchard, 2006). The mechanism of these traits being heritable is still unclear, but preliminary studies seem to show that the end results (i.e. diabetes, obesity, hunger and satiation levels) are consistent with some degree of genetic control (Ranikinen & Bouchard, 2006).

More research is needed to determine the effect that specific genes have on human eating behavior (Ranikinen & Bouchard, 2006).

Another environmental category not mentioned by de Castro and Lilenfeld is social environment (Larson & Story, 2009). Mechanisms such as social norms, support systems, and role modeling are all included in this category (Larson & Story, 2009). Coworkers, peers, and friends all play a role in the social food environment (Larson & Story, 2009). The attitude of the individuals in a social environment can impact both types and amounts of food consumed. This may be related to the observation that having peers with a greater BMI increases the risk for obesity (Larson & Story, 2009). The overall social environment can impact on an individual's ability to make positive health changes of it supports healthful food choices (Larson & Story, 2009).

Larson and Story also bring up the macro-level of the food environment, which is comprised of the community and the physical setting (2009). At this level, economy can impact on foods available and on pricing structures that might influence affordability of foods (2009). The macroenvironment also includes socioeconomic status (Larson & Story, 2009). In a nationwide study of over 28,000 zip codes, low income neighborhoods were found to have 75% as many supermarkets as middle-income neighborhoods (Powell, Slater, Mirtcheva, Bao & Chaloupka, 2007). In addition, more fast food and convenience stores are located near high schools in low income areas than high income areas (Zenk & Powell, 2008). Socioeconomic status may also make price a deciding factor when making food choices. Having a low income often resulted in cyclic periods of adequate intake and food deprivation (Matheson, 2008).

Besides environmental influences on food intake, body mass index may also have an influence on eating behavior (Sung, Lee, & Song, 2009). In a Korean study of 1576 adults, researchers administered the Dutch Eating Behavior Questionnaire (DEBQ) and attained self-reported weight both at age 20 and 4 years later. Participants spent these four years intentionally trying to lose weight (Sung, Lee & Song, 2009). After adjusting for factors including demographics and energy intake, restrained eating scores on the DEBQ were found to be positively associated with increases in weight ($p<0.001$) and BMI ($p<0.001$) (Sung, Lee & Song, 2009).

Emotional eating exhibited the same positive relationship with BMI and weight gain (Sung, Lee & Song, 2009). In a 2-year study of 1,562 adults, increases in BMI were positively associated with emotional eating as reported on the Dutch Eating Behavior Questionnaire (Koenders & van Strien, 2011). Similar results were seen in many eating behavior studies (Chesler, 2012; Pinaguy, Chabrol, Simon, Louvet, & Barbe, 2003, Geliebter & Aversa, 2003; Nolan, Halperin, & Geliebter, 2010). Closely related to this is the observation that food intake can be significantly affected by emotional state (Geliebter & Aversa, 2003). Emotions seem to drive overweight and obese individuals to overeat, but do not have that effect on underweight individuals (Koenders & van Strien, 2011).

Researchers have noted that there are also gender differences in food choices and food intake (Martin et al., 2007). Researchers found that males were reported as reducing food intake when engaging in reduced-rate eating, but not females (Martin et al., 2007). Though this does not coincide with the aforementioned research on eating rate with female participants, it does raise the suggestion of gender as a factor in eating rate and

food intake. Kanter and Caballero state that females are more obese than males worldwide, but that in developed nations, males are more obese (2012). This may be due to how some cultures favor a larger body size for women, as it signifies fertility, prosperity, and health (Kanter & Caballero, 2012).

Cultural variations in food intake account for more than just gender differences, and can have a large impact on eating behavior (Matheson, 2008). Stanford researchers examined factors that influenced food intake of Hispanic children (Matheson, 2008). They noted that different ethnic groups had a different distribution of macronutrients. For example, Mexican-American children consumed a higher fat intake than African-American or non-Hispanic white children (Matheson, 2008). The social context of living in America also played a role in food choice for ethnically diverse groups. Many immigrant cultures often have a different diet in the United States than what they had in their home country (Matheson, 2008). Matheson states that exposure to food advertisements, food branding, and acculturation all played a role in the way that social context can impact food choice (2008).

One last factor playing a role in eating behavior that should be mentioned is parental status. When adults become parents, many aspects of their eating behavior change (Laroche, Wallace, Snetselaar, Hillis, & Steffen, 2012). The effect that having children has on finances and scheduling, along with meeting the requests and needs of a child (or children), can change the diet of an adult significantly (Laroche, Wallace, Snetselaar, Hillis, & Steffen, 2012). In a study by Laroche et al., researchers sought to compare adults who brought their first child into their home (parent, abbreviated P) to adults who do not have children (non-parent, abbreviated NP), over the course of seven

years (2012). Over the course of the study, both P and NP adults experienced a reduction in the percentage of saturated fat in their diet (2.1% lower), but P adults experienced a smaller reduction (only 1.6% lower, between group difference with $p<0.001$) (Laroche, Wallace, Snetselaar, Hillis, & Steffen, 2012). When comparing kilocalorie intake, sugar sweetened beverage intake, fruit and vegetable intake, and fast food intake, P adults and NP adults had no significant differences (Laroche, Wallace, Snetselaar, Hillis, & Steffen, 2012). Interestingly, approximately 50% of P adults think that their children influence their food choices (Kraak & Pelletier, 1998). Some researchers hypothesize that parents consume more high-fat, high-sugar food items after purchasing them for their children (Laroche, Wallace, Snetselaar, Hills, & Steffen, 2012). The constraints that parenthood place on time may also impact their eating behaviors. Convenience foods may therefore be a larger part of P diets (Jabs et al., 2007). Other research aligned with this convenience food theory, finding that amounts of pizza, salty snacks, bacon and other processed meats were higher in P homes than NP homes (Laroche, Hofer, & Davis, 2007). Overall, parenthood may influence the food choices that an individual makes, perhaps not for the better.

4. Eating Rate

4.1. Eating Rate: Energy Intake, Body Mass Index, and Satiety

Eating rate is defined as food intake (either kcals or grams) per minute (Melanson, 2004). Aforementioned factors such as hormones, physiological need, and environment, each play a role in eating rate (Melanson, 2004). Slow eating is hypothesized to reduce energy intake and aid in weight loss through allowing feelings of satiation to develop

before excess calories have been consumed (Martin et al., 2007). Similarly, some researcher believe that the enjoyment of eating is enhanced with a slower eating rate, which can help smaller portions to be more satisfying for those who are restricting energy intake for weight management or weight loss (Martin et al., 2007).

Slow eating is hypothesized to decrease energy intake by allowing for feelings of satiation to develop before large amounts of food are consumed (Andrade, Greene, & Melanson, 2008). Increased chewing that may occur during slower eating can stimulate physiological signals of satiety (Sakata, Yoshimatsu, Masaki, & Tsuda, 2003). A reduction in energy intake resulting from slow eating can also be attributed to participants savoring and enjoying their food more when they eat slowly, thus becoming satisfied while consuming fewer kilocalories (Rolls, 2005).

4.2. Health Risks and Eating Rate

The negative impact that a fast eating rate has on health includes an association with insulin resistance and diabetes. In a cross sectional study of 2704 men and 761 women, Otsuka et al. found a positive association between eating rate and insulin resistance (2008). This observance might be explained in men by the higher BMI that was found to be associated with greater eating rate, and the connection between increased BMI and increased chance for insulin resistance. For women, BMI was not found to be statistically significantly related to energy intake (Otsuka et al., 2008). In this study, researchers also found that females who reported themselves as very slow eaters had a higher energy intake than those who intermediate eating rate, which is in opposition to what other research has shown (Otsuka et al., 2008).

Other research on eating rate and insulin resistance found that fast eaters had a 1.5 times higher odds for insulin resistance than those who did not. Self-administered questionnaires were completed by 321 males and 131 females aged 53±10 years and with a BMI of 23.4±3.0 (Shigeta, Shigeta, Nakazawa, Nakamura, & Yoshikawa, 2001). Using a homeostasis model of assessment and logistic regression, fast eaters were determined to have a 1.8 times higher risk for obesity (P=0.007) and a 1.5 times greater risk for insulin resistance (P=0.027) than slow eaters (Shigeta, Shigeta, Nakazawa, Nakamura, & Yoshikawa, 2001).

The same connection between insulin resistance and eating rate was observed in a larger cohort study examining 2,050 factory workers in Japan. Eating rate was measured by self-report and diabetes incidence was observed during medical examinations over a 7 year period (Sakurai et al., 2012). Fast eaters had a 17.3 crude incidence rate (per 1000 person-years) of diabetes, compared to 15.6 for medium-pace and 9.9 for slow eaters. Moreover, the same researchers observed that slow, medium, and fast eaters had a 14.6, 23.3, and 34.8% prevalence of obesity, respectively. Though there is a trend in the numbers, the results this association was not found to be significant after adjusting for BMI (Sakurai et al., 2012).

In a large cross-sectional study of 8,775 Korean adults (4819 male, 3956 female), researchers examined the relationship between eating rate and cardiometabolic risk factors including blood glucose levels (Lee et al., 2012). Participants were recruited from a Korean health center. Eating rate was determined through interviews with a nutritionist, and blood testing confirmed levels of several biomarkers including fasting blood glucose, lipids, and blood cell count. After adjusting for BMI, age, smoking, and activity level,

men were found to have elevated blood glucose that was proportional to their speed of eating. Women were not found to exhibit the same trend (Lee et al., 2012).

4.3. Measuring Eating Rate

Eating rate studies have several options when it comes to the measurement of within-meal eating rate and satiation (Dovey, Clark-Carter, Boyland, & Halford, 2009). Researchers could monitor participants throughout the meal with a Universal Eating Monitor (Dovery, Clark-Carter, Boyland, & Halford, 2009). This technique would allow for variances in eating rate throughout a meal to be noticed (Dovery, Clark-Carter, Boyland, & Halford, 2009), i.e. when a participant starts off eating fast and then slows down as they eat or vice-versa. The second way, which was utilized in this version of the EPIC study, is to time the participants as they consume their meal, to determine the caloric content of the meal, and then to simply just divide the kilocalories consumed by the meal duration in minutes to achieve kilocalories per minute (Hordern, Greene, Schwartz-Barcott, & Melanson, 2012). As future generations of the EPIC study may be utilizing the intervention in a community setting (Greene, 2009), utilizing the method of Horden et al. (2012) seems to be more appropriate for the urban, Providence setting.

4.4. Interventions to Modify Eating Rate

University of Rhode Island researchers conducted the EPIC study in Kingston as a one-on-one individual intervention to improve within meal eating rate (Matsumoto, Greene, Sebelia, & Melanson, 2012). Researchers recruited twenty-three overweight (BMI 31.8±2.6kg/m^2) females age 20±2.6 that were interested in managing their weight.

Baseline visits included an ad libitum macronutrient mixed pasta lunch to measure eating rate along with NDSR food recalls and anthropometric measurements (Matsumoto, Greene, Sebelia & Melanson, 2012). The participants then engaged in five weeks of intervention lessons that were designed to teach within-meal eating techniques for slow eating. At the conclusion of the lessons, participants had a second assessment to measure the same variables that were measured at baseline. ANOVA showed that both eating rate and energy intake were lower ($p=0.032$ and $p=0.022$, respectively) at the post-measurement.

In previous research, some eating rate interventions seem to work better in males than females. Martin et al. found that reduced eating rate meals only resulted in a reduction in energy intake in males, not females (2007). The males and females in this study also differed in that men rated desire to eat lower during the combined-rate meals (began eating at the baseline rate and then intentionally slowed down rate part-way through the meal) (Martin et al., 2007).

5. Conclusion

In conclusion, this body of evidence suggests that fast eating is an eating behavior associated with weight gain and obesity. Through teaching participants to eat slowly, some interventions have found success, while others did not observe the same results. The EPIC intervention has been shown to decrease energy intake and may be a useful tool for obesity treatment in future research.

Appendix B: Curriculum

EPIC Study Year 3 Lessons

Week 1: Introduction

-Lessons have been modified from the EPIC Study Year 1 Individual Intervention Lessons and year 2 group lessons to utilize group process and create a supportive group environment.

-Approximate duration of each lesson is 40 minutes. Weekly summary handouts will contain main points and techniques.

-Introduction to the Importance of Within-Meal Eating Behaviors Basic Techniques of Slow Eating

Coach– Ground Rules:

1.) Confidentiality– "what's said in the group stays in the group."
    a. gen ideas okay, must keep names/details of group members confidential
2.) Please turn off all cell phones (related to Rule #1 and Rule #4).
3.) Group discussion will focus on skills development for life; other issues can be discussed by e-mail with the coach. Group Leader will interrupt people who stray off topic. This helps keep the class at 40 minutes.
4.) Respect the group time and other members; let everyone have a turn to speak.
5.) No advice will be given; one size doesn't fit all.
    You may share what worked for you in a situation.
6.) No "volunteering" other people to talk.
7.) If you miss a class, meet with the coach *before* the next class.
    There are only 5 classes, so any missed class *must* be made up.
    If you don't make up a missed class, you will not be allowed to attend any more classes.
    ATTENDANCE IS MANDATORY
        -please save make-ups for emergencies only.
        -you agreed to participate in a GROUP intervention, so this depends on EACH ONE OF YOU being here in the same room at the same time

Purpose of our group intervention lessons:
To teach skills involved in slow eating, so you are in charge of your eating behavior. We will provide many techniques, with the understandings that one size doesn't fit all and you can rent to own.

Five weeks is just a start. Once you are able to use the techniques, you will own the skill and you will be in control of your eating.

Benefits of a group intervention:

-benefit from what others have to share and what they have experienced
-group vs. individual: support of other members and discussions we have can contribute

Overview for each class: a.) outline of what volunteers will learn and do
b.) review of past week and homework (except 1st class)
c.) lesson, activities
d.) summary of what volunteers have learned
e.) assignment of homework.

Group– information from each participant

- First name
- Where you live (e.g. campus dormitory, off campus w/family or friends or alone)
- Where you eat real meals (e.g. URI cafeteria, restaurants, at home, other)
    - real meal = filling and psychologically satisfying;
        - eaten sitting down and enjoyed at a leisurely pace
- Why are you interested?
- What do you hope to gain?
- Have you ever thought about how fast you eat?

Rationale and Basic Techniques of Slow Eating

<u>Opening question for the group: Have you ever thought about the speed of your eating?</u>

Why consider the speed of eating? Do you think there is a difference between fast and slow eating in weight management?

- -eating fast:
    - Has been associated with weight gain
    - Basis: consumption of excess calories in a short period of time before you realize you are full can result in weight gain over time
    - Eating fast is easy to do, but can lead to weight gain
- -eating slow:
    - Slow eating may help with weight control
        - -can reduce food intake
        - -can lead to less hunger and desire to eat
        - -can increase meal enjoyment
- Slow eating may decrease food intake
    - Taking small bites, chewing thoroughly and pausing between bites reduced food intake

    - compared to taking large bites, chewing less and not pausing between bites
  - Eating slowly can result in less hunger and lower desire to eat, as well as greater meal enjoyment per calorie (more bang for your buck)
  - Large population studies have shown that rapid eaters consume more calories and have higher BMIs compared to slow eaters

<u>Ask: How does slow eating relate to food intake? What happens in the body that makes this possible?</u>

- Slow eating enhances satiety (feeling of fullness)
  - Slow eating allows hormones enough time to send signals to the brain that you're full (preventing overeating)
    - Chewing stimulates these signals
    - Receptors in stomach stimulate signals
    - These signals tell your brain that you are full
  - The idea is to:
    - Give your body enough time to realize its full
    - Generate signals that communicate fullness

<u>Ask: Have you ever over-eaten without realizing until after you were done eating due to eating too quickly?</u>

  - Possible missed signals.
  - The idea of this study is to make you more aware of your own physiology so you can be in control of your eating

Remember the timer from the test lunch that was set to 20 minutes?

    - Can average 20 minutes for body and brain to realize we are full
    - Fast eaters can consume hundreds of calories in 20 minutes
      - Ex: another 2 or 3 pieces of pizza, soda refill
    - Most snacks are fast and many real meals are also less than 20 minutes
      - 11 minutes- eating at fast food restaurant alone
      - 13 minutes- eating at workplace cafeteria alone
      - 28 minutes- eating at moderately priced restaurant alone
    - = consumption of excess calories before we realize we are full

  - Smaller bite sizes lead to less calories (Zijlstra et al, 2009)
    - Increased orosensory exposure (time that food/drink stays in the mouth, mouth sensations)

What are you thinking about when you take a huge bite of food?

- Increased exposure time to sensory receptors in oral cavity
  - Increased exposure to taste, texture, smell of food
  - Process of chewing itself stimulates satiety signals
- Slow eating is not all about longer meal durations, it is about techniques that we will discuss here.

Slow eating decreases overall consumption of food

Decreased food intake helps with weight management, and can lead to weight loss over time

**People who ate slower and consumed less calories were able to achieve the same level of fullness as when they ate fast and consumed more calories

How slow is slow eating?

Can take an avg. of 20 minutes for body and brain to realize it's fullness

Clarify: slow eating does not simply mean that you increase meal time, you have to slow down your eating to allow your body to realize when its full and when you should stop eating

Example: thanksgiving: long meal with lots of food, if you eat fast you overeat

- Techniques:
  1. Take small bites
  2. Chew each bite at least 15-20 times (take time for orosensory processing)
  3. Swallow and pause between each bite (make sure you're not reaching for the next bite while the previous one is still in your mouth)
  4. Put down utensil between bites

Repeat "one size doesn't fit all" (i.e. different techniques may work for different people) and "rent to own" (i.e. try out the techniques without the obligation to adopt them if they do not work for you; the techniques may work now or later; find what techniques work best for you and use them).

Coach– in preparation for Week 1 Homework to use the 4 slow-eating techniques:
Challenges may be different for different people.
Some techniques will work for some people and not others (rent to own).
Use this week to see when it is easy or difficult to practice these techniques.

- Homework:
    - Practice the 4 slow-eating techniques for one real meal each day.
    - ➢ Make a log of how easy/difficult it was to put these techniques into practice.
    - Observe situations when these techniques are not possible.

Distribution of EPIC binder

- a 3-ring binder with 5 tabbed dividers (1 for each week) and 1 plastic pouch (to contain napkins or papers with notes made during meals/snacks)
- for lesson sheets (handed out each week after the lesson and before assignment of homework), additional information, and homework
- please bring it with you each week *and* please do not lose it

Week 2: Within-Meal Awareness (Enjoyment, Hunger, and Satiety during Meals)

Group– review of homework
Participants each *anonymously* complete an index card with the following information:

1. When/Where using the slow-eating techniques was easier and harder (e.g. with others, without others; in the car)
2. What technique(s) worked.

Coach collects all cards and randomly reads them aloud, organizing the information on the board.
Coach and participants discuss challenges and strategies for slow-eating, based on the group's experiences and any other comments that members have.
Coach says that different strategies may work for different people. So if something is not working now, try something else.
Coach encourages people to try (more than once) any new approaches that might work. In time, what seems difficult now may become easier.
Coach says that techniques that work in some situations (e.g. real meals) may not be effective in other situations (e.g. grabbing fast food or eating with others). First, practice the skills in easy situations ("go for the low hanging fruit"). Then, as you become more confident, practice the skills in difficult situations.
Coach recommends arranging physical and social cues to help you succeed instead of relying on willpower alone.
Coach emphasizes that *the important thing* is that each person eventually finds a strategy or a combination of strategies that she feels comfortable using and that work for her.

Coach
Observe if there is any participant who has not spoken until now.
If so, remember to involve her in discussion at some point in the remainder of this class.

Rationale and Techniques of Within-Meal Awareness

- Discussion of importance of enjoyment of foods, hunger, and satiety through meals
  - Signals generated from food intake:
    - Orosensory signals (taste, smell, temperature, flavor intensity), accumulation of food in stomach, intestinal signals, post-absorptive signals (Poothullil, 2009)
  - Listen to body's hunger, fullness and satiety cues
    - Hunger = physiological response to need for food triggered by nerve signals and chemical messengers originating and acting in the brain (Whitney & Rolfes, 2010)

        - Eat based on hunger, not based on the clock, class, bus schedule, etc.
    - Satiation = the suppression of hunger and development of satisfaction *during* meals/snacks, which normally leads to ending the meal/snack (Melanson 2004)
        - Emphasize hunger and satiety are opposite
    - Satiety = feeling of fullness and satisfaction that occurs *after* a meal and inhibits eating until the next meal (Whitney & Rolfes, 2010)
    - Use these cues to guide decisions regarding when to begin/end eating
        - Begin meal= ↑ hunger, ↓ satiation
        - End meal= ↓ hunger, ↑ satiation
        - Begin according to cues
        - Do not eat if you could not finish an apple, a.k.a. "The apple test"
        - Don't eat by the clock or other people, eat according to hunger
        - There is no set number of meals/snacks per day. Everyone is different!
- Can enjoyment help you to not overeat?
    - Eating should be a pleasurable activity
    - Use enjoyment of food to promote satiety and to stay in-tune with actual hunger
    - Choose to eat foods that are pleasing and use all of the senses while eating
        - If you eat foods that you like, you might take more time to eat them so that you can enjoy them
    - Focus on taste, smell, texture, temperature, color, flavor, spiciness or other features of food (Mathieu, 2009). Enjoy and savor each bite.
        - Temperature is important, because there are windows of temperatures when taste receptors are more receptive
        - Example: ice cream at room temperature more enjoyable
    - Orosensory satisfaction to limit food intake (Poothullil, 2009)
        - Taste perception and olfaction (smell) produce enjoyment and satisfaction
        - Produces sensory feedback that leads to satisfaction and meal termination
- Satiety
    - Focus on awareness of hunger suppression and satiety enhancement during meal

        - Use of slow eating behaviors (week 1) has been shown to increase satiety while decreasing calorie consumption
        - Satiety signals—communication between GI tract and brain
            - Talking about specific hormones was taken out of the Providence curriculum: CCK, GLP-1, PYY
            - Stomach distention, stretch receptors
- Techniques:
    1. Chew thoroughly, savor each bite, and swallow before the next bite
    2. Take a break to breathe and assess fullness
    3. Take a sip of water after every bite, or every few bites, to cleanse the palate
    4. Be conscious of hunger and satiety before and after a meal

Group– review with sample meal, the "pizza practice lunch"

PRACTICE within-meal awareness techniques from today's lesson.

REVIEW mechanics of slow eating from Week 1 (small bites, pauses, chewing thoroughly).

- Homework:
    - Practice within-meal awareness, focusing on the taste, texture, and smell of what you eat and drink.
        - For 3 real meals in the upcoming week:
            -rate your awareness on a scale of 1-10
            -note the taste, texture, and smell of your food and drink.

Week 3: Physiological Cues (True Hunger and Satiation; Meal Termination)

Group– review of homework

Any comments on awareness of taste, texture, smell of your 3 real meals?
Were these easy or difficult to assess?

What within-meal awareness techniques worked?

Coach and participants discuss challenges and strategies for within-meal awareness, based on the group's experiences and any other comments that members have.

Problem solve for any difficulties: (review of same points from Week 2, p.4)

Coach says that different strategies may work for different people ("one size doesn't fit all").So if something is not working now, try something else ("rent to own").

Coach encourages people to try (more than once) any new approaches that might work. In time, what seems difficult now may become easier.

Coach says that techniques that work in some situations (e.g. real meals) may not be effective in other situations (e.g. grabbing fast food or eating with others). First, practice the skills in easy situations ("go for the low hanging fruit"). Then, as you become more confident, practice the skills in difficult situations.

Coach recommends arranging physical and social cues to help you succeed instead of relying on willpower alone.

Coach emphasizes that *the important thing* is that each person eventually finds a strategy or a combination of strategies that she feels comfortable using and that work for her.

Physiological Cues (True Hunger and Satiation/Meal Termination)

- Review hunger, satiation, satiety

Group– Coach writes the 3 words IN LARGE LETTERS on one side of the board. The group provides the definitions and the coach writes them in.

  - HUNGER = physiological response to need for food triggered by nerve signals and chemical messengers originating and acting in the brain (Whitney & Rolfes, 2010)

- SATIATION = feeling of fullness and satisfaction that occurs *during* a meal and halts eating (Whitney & Rolfes, 2010)
- SATIETY = feeling of fullness and satisfaction that occurs *after* a meal and inhibits eating until the next meal (Whitney & Rolfes, 2010)

- Distinction between TRUE HUNGER and APPETITE

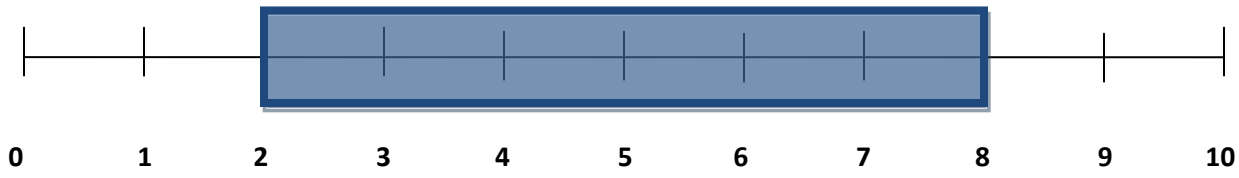
Group– Coach writes these 2 words IN LARGE LETTERS on the other side of the board. Coach asks the group for the difference between them and then confirms their definitions by writing them in.

  - TRUE HUNGER: drive to fulfill a physiological need for energy (Melanson, 2004)
  - APPETITE: desire to eat (influenced by hunger, food palatability, social setting, environmental conditions, emotional state) (Melanson, 2004)

- Eat in response to true hunger rather than in response to time of day, mood or other environmental circumstances
  - Happy/sad
  - Comfort food
  - Soul Food
  - Eating at weekly church potlucks
- Listen to true hunger signals (don't let yourself get overly hungry)
  - Hunger pains
  - Hypoglycemia (low blood sugar), feeling faint or dizzy
  - No energy, lack of focus

- Satiation/Meal termination
  - Eat slowly to allow appetite regulatory system to work and for satiation to register
  - Stop eating at a point when hunger is suppressed and satiation is reached
  - Avoid eating to point of being overly full or "stuffed"

Stay in "the Zone": between 2 and 8



Hunger **Satiety**

- ✓ Stay within this range of 2—8 when you eat.
- ✓ Avoid hunger (less than 2), such as in dieting and starvation, that can lead to overeating and weight gain [9 out of 10 dieters gain weight, a statistic extrapolated from the scientific literature].
- ✓ Avoid extreme satiety (greater than 8) that results from eating until "stuffed."
- ✓ By eating when hungry and using slow-eating and within-meal awareness techniques, you can reach satiety after consuming smaller amounts of food.

- Techniques:
  1. Pay attention to physiological hunger and satiety signals
  2. Eat only when hungry, not according to the clock or habits
  3. Stop eating at the point of comfortable satiation to avoid consuming excess calories. Remember that it takes an average of 20 minutes for fullness to register, but this may differ from person-to-person, so get to know *your* body.

- Homework:

  - ➢ Rate hunger and satiety for each of 3 real meals using VAS sheets for the following time points:
    -before
    -midway
    -immediately after
    -20 minutes after finishing.

Week 4: Non-Physiological Cues of Meal Initiation and Termination (Portion Sizes, Habits) – How to Control Your Eating According to Your Physiological Cues

Group– review of homework
Any comments on hunger and satiety ratings at the time points for your 3 real meals (recorded on the VAS sheets)?
How easy or difficult was it to assess these?

Group– discussion of the following 3 topics
Coach introduces each topic by asking the group about difficulties and suggestions to overcome them. Popcorn method will be used: coach first lets people contribute freely and then questions individuals who have not yet spoken.
Coach summarizes strategies for each topic before moving on to the next one.

- Food intake is complex and is regulated by both physiological and environmental factors (Melanson, 2004)
    - Physiological factors can be easily overridden by environmental factors (Hetherington, 2007)
    - Best approach involves taking time to recognize internal signals (hunger and satiety) and potentially conflicting external factors (social situations, availability of energy dense foods, variety, portion sizes, habits, emotions, etc.)

        Energy dense foods: foods high in fat and/or sugar
            Energy dense foods should be a relatively small portion of foods consumed each day.
        Labeling foods as "good or bad" is an over-simplification

    - Focus on what we can control (TECHNIQUES OF SLOW EATING, portion sizes, habits, response to emotions)

Portion sizes

- Portion sizes ↑ since 1970's; LARGER PORTION SIZES HAVE BEEN ASSOCIATED WITH FASTER EATING RATES (Westerterp-Plantenga, 2000).
    - may be implicated in rise of obesity
- ↑ portion sizes leads to ↑ energy intake (Rolls, 2004)
- ↓ portion sizes by 25% led to a 231 calorie/day reduction (Rolls, 2006)
- ↓ portion sizes, ↓ calories, ↓ pounds

- Methods to combat increasing portion sizes
    - When dining out- e.g. split portions with friends
    - At home- e.g. save leftovers
    - In our society, big servings happen (e.g. being served at a restaurant or friend's house, etc.), but even with a bigger portion in front of you, do not let the amount of food present dictate how much you eat, let your physiological hunger and satiety do so. Throughout a meal or snack, eat slowly and stay aware of your physiological state. As you become satiated, slow down to a stop.
    - Take time as you eat to savor the food, so you do not feel like you have to eat a lot of it to enjoy it.
    - Johnson and Whales students: because your food is scooped for you at the cafeteria, ask for a smaller scoop or a smaller serving

Suggestion (to mention only if it comes up in discussion):
When politely refusing more food from family or friends, say something like, "That is fabulous (tastes good, looks good, smells good, etc.), but I'm full and I can't eat anymore."

Habits

- Discuss common habits
    - Snacking while watching TV, eating while studying, eating while driving, skipping breakfast, bar food with friends
        - Excess calories are consumed when eating in front of the TV or when eating with friends (Hetherington, 2006)
- Discuss ways to make these habits healthier
    - Planning ahead for meals and snacks, so you can Stay in the Zone
      e.g. bring food or snacks with you to avoid skipping breakfast
    - Smaller pre-determined portions
    - Eat from smaller plates using smaller utensils
    - Don't eat directly from the bag. Portion out individual servings from a multi-serving bag to control portions, and then put the bag back in the cabinet.
    - Avoid being a member of the "clean plate club"
    - Avoid second helpings (for 20 minutes)
    - If you eat with friends who tend to eat a lot, and if you feel that you need to be eating the whole time they are, take extra care to eat slowly.

This way, it is likely that you will still be eating your first serving while they are finishing up their second.

- Don't use food as a reward; fuel with food, and enjoy the experience slowly.
- Limit distractions while eating and allow yourself to focus on internal cues
- Distracting yourself with something other than food
- Gum chewing and/or drinking water or seltzer.
- Don't mindlessly nibble at your child's leftovers

- Techniques:

1. Become familiar with recommended serving sizes and stick to them as closely as you can
2. Take note of why you are eating. Is there a reason other than hunger?
3. Don't feel defeated if you forget to follow the technique. It's okay to lapse; get right back on track for the next meal/snack.
4. Normalize your eating pattern to allow physiological mechanisms to work
5. Remember that small changes add up!

- Homework:
  - Practice using smaller plates and follow recommended serving sizes, from dishes not packages.
  - Ask if a second helping is out of habit or hunger.
  - Try leaving food on your plate for at least one meal a day.
    - Make note of times you felt tempted and/or caught yourself either with distracted eating or eating out of packages.
    - Record tips that helped you eat out of hunger. Note any difficulties.

Group– serving sizes activity with foods (e.g nuts), liquids (e.g. milk), and measuring cups:

- each participant shows what she thinks a serving is of a food or liquid
- then she measures out the actual amount (as revealed by the coach) for all to see.

Additional resources for recommended serving sizes:

- ✓ food models on display
- ✓ handouts of serving sizes (same ones from Year 1 or revised versions)
- ✓ how serving sizes have changed: http://hp2010.nhlbihin.net/portion
- ✓ recommended serving sizes: http://www.choosemyplate.gov

Week 5:Applying Your EPIC Skills in Other Situations and Settings; Review and Strategies for Maintenance: DOs and DON'Ts to Take with You

Group– review of homework

What techniques worked to ensure that eating is out of hunger?
Did you have any difficulties?
Suggestions to overcome them.

Applying Your EPIC Skills in Other Situations and Settings

- Emotions
  - Identify individual triggers for eating
    - Take charge; keep trigger foods outside of the house. If you are faced with them elsewhere, ask yourself if you want to eat it out of physiological hunger or something else. If it is really out of physiological hunger, make sure that you eat it slowly, savor & enjoy, and stop when satiated.
    - When you feel driven to eat more, take some deep breaths, assess your hunger/satiety level, and/or sip some water.
    - Try to avoid eating on impulse; eat calmly with appropriate purpose.
  - Emotional eating
    - Response to stress, boredom, depression, etc. (Arrow, 1995)
  - Assess your emotions and ask yourself if you are eating out of hunger or in response to a particular situation, a food cue, or a frame of mind.
  - Find an alternative to emotional eating, such as journaling your feelings, going for a walk, contacting a friend, listening to/ playing your favorite music, painting your nails, applying a fragrant body lotion, taking a bath, reading a good novel.
  - Lapses happen. If you happen to overeat, re-focus immediately. Don't give up on the rest of the day.

    [Technique of elite athletes: focus on the event at hand; address mistakes en route at a later time.]
  - Restriction ↑ likelihood of overeating (Polivy and Herman, 1985; Stice 1999)
    - Try to avoid getting too hungry or too full.
    - Food cravings are normal—the key is to be in charge:

      "stimulus control": make a small indulgence to satisfy a craving
      e.g. If you crave potato chips, buy a small package of potato chips to eat slowly and enjoy.
- How to maintain slow-eating techniques, and eat with awareness….

- during final exams, during holiday parties, when you return to your parents' home, at church, on the bus, when eating with your children

Have you had habits in these settings in the past that lend themselves to rapid, unaware eating?

What strategies can you use to replace such habits with skills like you learned during EPIC?

When you can apply your skills to various circumstances,
you know that you own the skill!

Remember "rent to own" and "one size doesn't fit all"
as you find the techniques to keep you in control of your eating.

Review

Group– overall review of techniques that worked for you ("one size doesn't fit all").

As members give responses, Coach records the techniques on the board.

This will be the starting point for the next section.

Strategies for Maintenance: DOs and DON'Ts to Take with You

Group– review of DOs and DON'Ts

Coach writes on the board DOs and DON'Ts supplied by the group.

All should be participating; if not, the coach should ask the silent ones to contribute.

Coach adds to the lists any remaining items.

(List is on the next page.)

DO…

- ✓ Take small bites
- ✓ Cut food into smaller pieces
- ✓ Chew each bite at least 15-20 times
- ✓ Put your utensil down in between bites, and swallow before reaching for the next mouthful
- ✓ Take a sip of water after each bite or every few bites
- ✓ Take a break to breathe and assess fullness
- ✓ Eat slowly and savor each bite so you don't feel like you have to eat a lot of food to enjoy it
- ✓ Be conscious of the flavors, aromas, and textures of your food
- ✓ Focus on awareness of hunger suppression and satiety enhancement during meals
- ✓ Allow your brain a chance to register that your stomach is full (~20 minutes)
- ✓ Be conscious of hunger and satiety before, during, and after each meal
- ✓ Stay in the Zone
- ✓ If you aren't truly hungry, but feel yourself wanting to eat, turn your attention to things other than food
- ✓ Follow recommended serving sizes and eat smaller, pre-determined portions
- ✓ Let your hunger and satiety dictate your intake—not the amount of food on your plate or other factors
- ✓ Listen to satiety signals, and when you sense fullness slow down more and end the meal or snack
- ✓ Get to know your body and let internal cues guide your eating decisions

DON'T…

- ✗ Take another bite before swallowing the one in your mouth
- ✗ Let fast eaters around you determine your pace
- ✗ Mindlessly eat while doing something else
- ✗ Let yourself get too hungry or too full
- ✗ Give up on the rest of the day if you happen to overeat
- ✗ Eat on impulse or in response to the time of the day, your mood, or boredom
- ✗ Keep eating just because others around you are still eating
- ✗ Use food as a reward
- ✗ Feel the need to clean your plate
- ✗ Ignore your body's feedback
- ✗ Go long periods without eating…waiting until you're ravenous leads to overeating
- ✗ Reach for seconds out of habit rather than hunger

- ✘ Chew and swallow rapidly just to get out your next sentence during meal conversations

Appendix C: Instruments

Weight-Related Eating Questionnaire

Directions: Please choose a response that best expresses how well each statement describes you.

1. I purposefully hold back at meals in order not to gain weight.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

2. I tend to eat more when I am anxious, worried, or tense.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

3. I count calories as a conscious means of controlling my weight.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

4. When I feel lonely I console myself by eating.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

5. I tend to eat more food than usual when I have more available places that serve or sell food.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

6. I tend to eat when I am disappointed or feel let down.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

7. I often refuse foods or drinks offered because I am concerned about my weight.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

8. If I see others eating, I have a strong desire to eat too.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

9. Some foods taste so good I eat more even when I am no longer hungry.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

10. When I have eaten too much during the day, I will often eat less than usual the following day.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

11. I often eat so quickly I don't notice I'm full until I've eaten too much.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

12. If I eat more than usual during a meal, I try to make up for it at another meal.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

13. When I'm offered delicious food, it's hard to resist eating it even if I've just eaten.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

14. I eat more when I'm having relationship problems.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

15. When I'm under a lot of stress, I eat more than I usually do.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

16. When I know I'll be eating a big meal during the day, I try to make up for it by eating less before or after that meal.

__1=Not at all; __2=Slightly ; __3=More or Less; __4=Pretty Well; __5=Completely

Appendix C: Instruments

Intuitive Eating Scale

Directions: For each item, please circle the answer that best characterizes your attitudes or behaviors.

1. I try to avoid certain foods high in fat, carbohydrates, or calories.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

2. I stop eating when I feel full (not overstuffed).

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

3. I find myself eating when I'm feeling emotional (e.g., anxious, depressed, sad), even when I'm not physically hungry.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

4. If I am craving a certain food, I allow myself to have it.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

5. I follow eating rules or dieting plans that dictate what, when, and/or how much to eat.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

6. I find myself eating when I am bored, even when I'm not physically hungry.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

7. I can tell when I'm slightly full.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

8. I can tell when I'm slightly hungry.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

9. I get mad at myself for eating something unhealthy.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

10. I find myself eating when I am lonely, even when I'm not physically hungry.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

11. I trust my body to tell me when to eat.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

12. I trust my body to tell me what to eat.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

13. I trust my body to tell me how much to eat.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

14. I have forbidden foods that I don't allow myself to eat.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

15. When I'm eating, I can tell when I am getting full.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

16. I use food to help me soothe my negative emotions.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

17. I find myself eating when I am stressed out, even when I'm not physically hungry.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

18. I feel guilty if I eat a certain food that is high in calories, fat, or carbohydrates.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

19. I think of a certain food as "good"or "bad" depending on its nutritional content.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

20. I don't trust myself around fattening foods.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

21. I don't keep certain foods in my house/apartment because I think that I may lose control and eat them.

_1=Strongly Disagree _2=Disagree _3=Neutral _4=Agree _5=Strongly Agree

Appendix C: Instruments

Mindful Eating Questionnaire

MINDFUL EATING QUESTIONNAIRE

Question		Never/Rarely	Sometimes	Often	Usually / Always
1. I eat so quickly that I don't taste what I'm eating.		☐	☐	☐	☐
2. When I eat at "all you can eat" buffets, I tend to overeat.	☐ *I don't eat at buffets*	☐	☐	☐	☐
3. At a party where there is a lot of good food, I notice when it makes me want to eat more food than I should.		☐	☐	☐	☐
4. I recognize when food advertisements make me want to eat.	☐ *Food ads never make me want to eat.*	☐	☐	☐	☐
5. When a restaurant portion is too large, I stop eating when I'm full.		☐	☐	☐	☐
6. My thoughts tend to wander while I am eating.		☐	☐	☐	☐
7. When I'm eating one of my favorite foods, I don't recognize when I've had enough.		☐	☐	☐	☐
8. I notice when just going into a movie theater makes me want to eat candy or popcorn.	☐ *I never eat candy or popcorn.*	☐	☐	☐	☐
9. If it doesn't cost much more, I get the larger size food or drink regardless of how hungry I feel.		☐	☐	☐	☐
10. I notice when there are subtle flavors in the foods I eat.		☐	☐	☐	☐
11. If there are leftovers that I like, I take a second helping even though I'm full.		☐	☐	☐	☐
12. When eating a pleasant meal, I notice if it makes me feel relaxed.		☐	☐	☐	☐
13. I snack without noticing that I am eating.		☐	☐	☐	☐
14. When I eat a big meal, I notice if it makes me feel heavy or sluggish.		☐	☐	☐	☐

Question		Never/Rarely	Sometimes	Often	Usually / Always
15. I stop eating when I'm full even when eating something I love.		☐	☐	☐	☐
16. I appreciate the way my food looks on my plate.		☐	☐	☐	☐
17. When I'm feeling stressed at work, I'll go find something to eat.	☐ *I don't work*	☐	☐	☐	☐
18. If there's good food at a party, I'll continue eating even after I'm full.		☐	☐	☐	☐
19. When I'm sad, I eat to feel better.		☐	☐	☐	☐
20. I notice when foods and drinks are too sweet.		☐	☐	☐	☐
21. Before I eat I take a moment to appreciate the colors and smells of my food.		☐	☐	☐	☐
22. I taste every bite of food that I eat.		☐	☐	☐	☐
23. I recognize when I'm eating and not hungry.	☐ *I never eat when I'm not hungry.*	☐	☐	☐	☐
24. I notice when I'm eating from a dish of candy just because it's there.		☐	☐	☐	☐
25. When I'm at a restaurant, I can tell when the portion I've been served is too large for me.		☐	☐	☐	☐
26. I notice when the food I eat affects my emotional state.		☐	☐	☐	☐
27. I have trouble not eating ice cream, cookies, or chips if they're around the house.		☐	☐	☐	☐
28. I think about things I need to do while I am eating.		☐	☐	☐	☐

Appendix C: Instruments

International Physical Activity Questionnaire

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐

Don’t know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don’t know/Not sure

This is the end of the questionnaire, thank you for participating!

Appendix C: Instruments

EPIC Study Participant Screening Form

Inclusion Criteria:

YES	NO	Female 18-38 years old	age = _____
YES	NO	BMI 27-37 kg/m^2	ht (in) = _____ wt (lb) = _____
			BMI = wt (lb) * 703/ ht^2 (in^2) = _____
YES	NO	Healthy, non-smoking	
YES	NO	Not currently on a weight loss diet	

Exclusion Criteria:

YES	**NO**	Allergies/aversions to test foods
YES	**NO**	Caffeine or alcohol dependency
YES	**NO**	Type 1 or Type 2 Diabetes Mellitus
YES	**NO**	Any chronic illness that might cause significant weight loss
YES	**NO**	History of clinically-diagnosed eating disorder
YES	**NO**	Currently taking appetite suppressant medication
YES	**NO**	Pregnant or lactating
YES	**NO**	Adrenal disease
YES	**NO**	Hypoglycemia (low blood sugar)
YES	**NO**	Seizures
YES	**NO**	Kidney or bladder problems
YES	**NO**	Stomach ulcers
YES	**NO**	Thyroid diseases

Would You Like To:

- Earn $100
- Enjoy 2 FREE lunches
- Learn eating techniques to help with weight management
- Receive free diet and weight management counseling and materials

If you…

- are a non-smoking female
- are between 18-38 years old
- have a BMI between 27-37 kg/m^2…

you may qualify for a nutrition research study conducted by the URI Nutrition & Food Sciences Department.

Email URIEPIC3@gmail.com or call 277-5277

Appendix E. Informed Consent Form

The University of Rhode Island

Department of Nutrition and Food Sciences

Providence, RI 02903

Eating Pace Instruction Classes (EPIC)

CONSENT FORM FOR RESEARCH

You have been invited to take part in a research project described below. The researcher will explain the project to you in detail. You should feel free to ask questions. If you have more questions later, Ruthann Sampson, the person mainly responsible for this study, will discuss them with you (Nutrition Education Office, Room 300, Feinstein Campus, 80 Washington Street, Providence, RI). You must be at least 18 years old to be in this research project.

***Description of the project**:*

You have been asked to participate in a research study testing an intervention aimed at modifying within-meal eating behaviors (such as eating rate, meal awareness, responses to internal and external cues) through group coaching sessions. It involves assignment to either an intervention or a control group, which will be assigned randomly.

***What will be done**:*

The study will involve completion of questionnaires, two assessment visits, a 5-week intervention, and a 12-week follow-up. The total time commitment for this study is approximately 11.5 hours if you are randomized to the intervention group and approximately 7.5 hours if you are randomized to the control group. If you decide to take part in this research, here is what will happen over the course of the study:

First assessment visit (~2 hours):

- You will report to the lab after a 4-hour fast following the consumption of a standardized breakfast.
- You will be asked to void your bladder.

- Your height, weight, and waist circumference measurements will be taken.
- You will eat lunch (small pasta with tomato and cheese sauce, and water to drink) in the lab.
- You will be instructed to consume as much of the meal as you would like, to the point of comfortable satiation (fullness).
- You will be asked to rate your hunger, satiety, desire-to-eat, and thirst on a visual analogue scale (a line from 0-10) at time 0, upon meal completion, 20 minutes after meal completion, and 60 minutes after meal initiation. You will also be asked to rate meal palatability after the meal.
- Between meal completion and 60 minutes after meal initiation, you will be asked to remain in the lab and to refrain from consuming additional food and beverages. You will be free to read or study during this time.
- You will complete a total of three 24-hour diet recalls with an inverviewer (~45 minutes each) on nonconsecutive days (including one weekend day) with questions relating to meals and meal duration (the first will be during your lab visit and the other two will be conducted over the phone).

After your first visit (~15 minutes):

- Within 1 week, you will complete on-line questionnaires regarding dietary behaviors, physical activity, and personal and family health history. If there is time during your first visit, you may complete these questionnaires in the lab.

After completion of the first assessment visit, you will be randomized either to an experimental group or to a non-treatment control group. The experimental group will receive weekly group coaching sessions (~50 minutes each) for 5 consecutive weeks and will be asked to complete homework assignments that will be e-mailed to the coach for review. *Please note*, because there are only 5 classes and the sequential completion of the classes is part of the intervention, any missed class *must* be made up before the following class. If you do not make up this missed class, you will not be allowed to attend any more classes. However, you will still be invited to return for a second assessment visit and follow-up. In order to be fully compensated, you must attend all five sessions and the follow up visit.

Second assessment visit (~2 hours):

- Same protocol as the first assessment visit (see above).
- You will receive $40. You may retain this payment even if you choose to withdraw before completion of the study.

Follow-up (~15 minutes):

- You will complete on-line questionnaires regarding dietary behaviors and physical activity.
- You will be asked to void your bladder.

- Your height, weight, and waist circumference measurements will be taken.
- You will receive an additional $60 upon completion of all study procedures.
- You will receive a free packet of diet and weight management information.
- At this point, if you were randomized to the intervention group, you will be invited to participate in a focus group for an additional $20. If you choose to participate, you will provide a verbal consent and you will then be asked for your feedback about the intervention.

Risks or discomfort:

There are no known risks for the following procedures: questionnaires, consumption of a test meal, measures of height, weight, waist circumference, food intake and appetite.

Benefits of this study*:*

This study will help to determine the effects of an intensive within-meal eating behavior modification in both the laboratory and in the real-world setting. The direct benefits to you include learning how eating behavior modification can aid in weight management. Upon completion of the study, you will be given a total of $100.00 for participating in this research.

Confidentiality*:*

Your participation in this study is confidential. All of your information will be coded by an identification number that cannot be traced to you after all of your data has been collected and your personal information is removed. None of the results of this study will identify you by name. Data access will be limited to study investigators. Data will be stored in locked file cabinets and password-protected computers within the locked Nutrition Education Office in room 300 of the Feinstein Campus. Data will be discarded after manuscript submission. The researchers and the University of Rhode Island will protect your privacy, unless they are required by law to report information to city, state or federal authorities or to give information to a court of law. Otherwise, none of the information will identify you by name.

In case there is any injury to the subject*:*

If you have any injury or discomfort as a result of the experiment, you should notify Ruthann Sampson at (401) 277-5277 or Dr. Kathleen Melanson at (401) 874-4477. You may also contact the office of the Vice President for Research at 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328.

***Decision to quit at any time**:*

The decision to take part in this study is up to you. You do not have to participate. If you decide to take part in the study, you may quit at any time. Whatever you decide will in no way penalize you. If you wish to quit, you simply inform Ruthann Sampson at (401) 277-5277 of your decision.

***Rights and Complaints**:*

This study is part of research being conducted by the University of Rhode Island. If you have any questions or if you are not satisfied with the way this study is performed, you may discuss your complaints with Ruthann Sampson at (401) 277-5277 or Dr. Kathleen Melanson at (401) 874-4477, anonymously, if you choose. In addition, if you have questions about your rights as a research participant, you may contact the office of the Vice President for Research at 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328.

You have read the Consent Form. Your questions have been answered. Your signature on this form means that you understand the information and you agree to participate in this study.

_____	_____
Signature of Participant	Signature of Researcher
_____	_____
Printed Name	Printed Name
_____	_____
Date	Date

Please sign both consent forms, keeping one for yourself.

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