

Spring 5-1-2016

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## Recommended Citation

Megson, Maureen, "Effects of Breakfast Eating and Eating Frequency on Body Mass Index and Weight Loss Outcomes in Adults Enrolled in a Web-based Obesity Treatment Program" (2016). *Honors Scholar Theses*. 496.  
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# Effects of Breakfast Eating and Eating Frequency on Body Mass Index and Weight Loss Outcomes in Adults Enrolled in a Web-based Obesity Treatment Program

Maureen Megson

This secondary data analysis examined the effects of breakfast eating and total daily eating frequency on baseline BMI and weight loss outcomes among overweight or obese adults enrolled in a weight loss program. Participants ( $N = 230$ ) from Shape Up Rhode Island (SURI), an annual wellness campaign, were recruited and randomly assigned into one of three intervention groups: SURI alone, SURI plus an Internet behavioral weight loss program, or SURI plus the Internet behavioral weight loss program plus optional group meetings. Participants reported breakfast eating and total eating frequency before and after treatment. BMI and weight were assessed before and after treatment. There was no significant association between baseline breakfast eating and weight loss or total eating frequency and weight loss. Also, no significant association was found between breakfast eating and baseline BMI or total eating frequency and baseline BMI. However, weight loss was associated with more frequent breakfast eating post-trial ( $P = 0.00$ ) and one trend in the data suggested more frequent eating post-trial may be associated with less weight loss ( $P = 0.085$ ). Eating breakfast and controlling daily eating frequency may enhance weight loss outcomes in obesity treatment.

## **Introduction**

Obesity and over eating is a problem plaguing developed nations across the globe as well as the U.S. As of 2014, 39% of all adults worldwide were classified as overweight (Heilbronn & Hutchison, 2015). In the United States alone, 2 out of every 3 adults are considered overweight or obese on average (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). Overweight individuals are considered those that have too much weight on their body. This is defined by the Centers for Disease Control and Prevention (2012) as individuals with a BMI between 25.0 and 29.9. Being overweight can lead to many other health related conditions, including type 2 diabetes, heart disease, high blood pressure, and many others (Centers for Disease Control and Prevention, 2012).

An array of research continues to be studied in hopes of gaining a better understanding in how to manage and reduce this worldwide epidemic. One aspect less studied in this topic is the effect of daily eating frequency on weight loss. Frequency of eating throughout a day may have a major impact on an individual's body weight. Some research has looked at cutting out eating early in the day. Americans often skip breakfast, however this has been proven to be detrimental by a widespread of researchers. One study carried out by Uemura et al. (2015) found a correlation with skipping breakfast and several health conditions. It is suggested that individuals who regularly skipped breakfast have an increased risk of developing diseases, such as type 2 diabetes and cardiovascular diseases (Uemura et al., 2015). These health problems have a correlation with those who skip breakfast on a regular basis because of their appetite that grows throughout the day. This increase in appetite leads to a higher probability of over-consuming later in the day (Cayres et al., 2015). In contrast, some assert that skipping breakfast has no effect on the overall energy consumption in a day and thus has no effect on overall weight management (Kant & Graubard, 2015).

Very little research is known on the effect of lunch and dinner frequency on weight loss. However, one eating habit more commonly studied among individuals is snacking. Snacking throughout a day can have negative outcomes on an individual's health and weight. A snack is often eaten between meals when an individual is not hungry. In contrast, a meal is often marked by a specific time of day when an individual has the feeling of hunger (Verhoeven, Adriaanse, Vet, Fennis, & Ridder, 2014). Evidence has shown eating more frequently, or snacking, in a day potentially increases the likelihood of being overweight (Verhoeven et al., 2014). Evidence also suggests that eating frequent low-energy snacks are associated with overall high dietary quality (Llaurado, Albar, Giralt, Sola, & Evans, 2015). Thus, eating more frequently in a day could have

beneficial health outcomes. The inconclusive question at hand remains about the frequency of eating in a single day. This study examined these specifics further by looking at the meal frequency of overweight adults going through a 3-month weight loss program, titled ShapeUp Rhode Island. Based on the previously reviewed literature, we investigated the effect of breakfast eating and total daily eating frequency on baseline BMI and weight loss of overweight adults.

## **Methods**

This study is a secondary data analysis from a large trial that examined the effects of adding behavioral weight loss components to Shape Up Rhode Island (SURI), a large, annual wellness campaign in the state of Rhode Island (Leahey et al., 2014). SURI participants were recruited via local employers and mass media. Trial eligibility criteria were age 18 to 70, body mass index (BMI)  $\geq 25$  kg/m<sup>2</sup>, no current or planned pregnancy, no serious medical condition for which weight loss and regular exercise would be unsafe, Internet access, and English speaking. After providing informed consent, a total of N=230 participants were randomly assigned to SURI alone, SURI plus an Internet behavioral weight loss program (SURI+IBWL), or SURI plus the Internet behavioral weight loss program plus optional group meetings (SURI+IBWL+Group).

The intervention was 3 months in length. All participants received the SURI program which included access to the SURI website where they reported their weight, diet, and activity; a free pedometer; periodic newsletters focused on healthy eating; access to community exercise programs; and prizes and recognition for meeting weight loss goals. Those assigned to SURI+IBWL also had access to an Internet weight loss program. The online program included 12 weekly multimedia lessons based on the Diabetes Prevention Program as well as a self-

monitoring platform where participants reported their daily weight, caloric intake, and physical activity minutes and received weekly automated, tailored feedback messages.

SURI+IBWL+Group also had the option of attending weekly group meetings throughout the 3-month program. Trial results showed significant weight loss differences between all three arms with SURI+IBWL+Group yielding the most weight loss, SURI alone the least, and SURI+IBWL in between the other two.

### ***Measures***

All measures were completed before and after the 3-month weight loss trial, unless noted otherwise.

### ***Demographics***

Participants provided demographic information at baseline.

### ***Weight and Height***

Weight was measured to the nearest 0.1 kg using a digital scale. Height was assessed at baseline using a wall-mounted stadiometer. Height was taken in meters at baseline. BMI was calculated using the formula weight in kilograms / height in square meters.

### ***Breakfast eating and eating frequency***

To assess breakfast eating, participants indicated number of days each week they eat breakfast (0 to 7). To assess eating frequency, participants were asked to consider all meals and snacks and indicate number of times per day they usually eat.

## Statistical Analysis

Demographics of the participants were found with descriptive statistics. Any possible correlations among the demographic variables and the answers of interest to the questionnaire were identified with continuous variables and t-tests. Age was the only variable to have association with both Question 1 ( $r = 0.272$ ;  $P = 0.00$ ) and Question 4 ( $r = 0.152$ ;  $P = 0.022$ ). All other demographics were found to be not significant ( $P$ 's  $> 0.239$ ). A regression analysis was done to test whether baseline BMI or weight loss could be predicted by breakfast eating or eating frequency. Statistical significance was set at  $P < 0.05$ .

## Results

### *Participant Characteristics*

A total of 230 overweight or obese participants ( $BMI > 25 \text{ kg/m}^2$ ) went through a weight loss program. The demographics were obtained at baseline and can be found in Table 1. The two questions from the questionnaire were analyzed to find the average answers among participants. On average, participants reported eating breakfast 5.6 days per week and eating an average of 4.97 times per day.

Table 1 Participant Demographics

	<u>Total sample (N=</u> <u>230)</u>
Female, $n$ (%)	193 (83.9)
Age (years), $M \pm SD$	46.88 $\pm$ 11.15
Race/ ethnicity, $n$ (%)	
White	200 (87.0)
Education, $n$ (%)	
Less than college	21 (9.1)
College or beyond	208 (90.4)
Declined	1 (0.4)

### ***Associations Between Breakfast Eating and Eating Frequency with Baseline BMI***

BMI was calculated at baseline and tested for correlation with the responses to both Question 1 and Question 4. Controlling for age, there was no significance found between breakfast eating and daily eating frequency with baseline BMI ( $P$ 's  $> 0.380$ ).

### ***Breakfast Eating and Eating Frequency at Baseline Predicting Weight Loss***

A regression analysis was tested to identify if breakfast eating or eating frequency at baseline predicts weight loss. Controlling for age, there was no statistical significance found between baseline breakfast eating and weight loss ( $P = 0.133$ ) and no statistical significance was found between baseline total daily eating frequency and weight loss ( $P = 0.706$ ).

### ***Associations Between Change in Breakfast Eating and Eating Frequency and Weight Loss***

Correlational analyses were run to test for associations between the change in breakfast eating and eating frequency and weight loss. The change in breakfast eating was calculated by subtracting baseline breakfast eating from post-trial breakfast eating. Controlling for age, it was found to be statistically significant when comparing change in breakfast eating with weight loss ( $R = -0.297$ ;  $P = 0.00$ ). This implied that weight loss was associated with more frequent breakfast eating post-trial as compared to baseline breakfast eating.

The change in daily eating frequency was calculated by subtracting baseline eating frequency from post-trial eating frequency. Controlling for age, a correlational analysis indicated a trend between the association of change in eating frequency and weight loss ( $R = 0.119$ ;  $P = 0.085$ ). This trend suggests more frequent eating episodes post-trial compared to baseline may be associated with less weight loss.

## **Discussion**

This study examined the effect of breakfast eating and total eating frequency on baseline BMI and weight loss of overweight adults. The results of this study indicated that participants who had an increase in frequency of eating breakfast during obesity treatment lost more weight. Furthermore, individuals who decreased their daily eating frequency during treatment lost more weight. No findings suggested a relationship between breakfast eating and total eating frequency and baseline BMI.

Unlike some studies (Kant & Graubard, 2015), we found a correlation between breakfast eating and weight loss. The discrepancy here may be explained by a difference in methods between studies. Our study focused on weight management, looking at change in both BMI and weight loss, along with self-recall of breakfast eating. Previously, other health factors were compared to breakfast eating, such as incidence of Type 2 Diabetes Mellitus (Uemara et al., 2015).

The results of our study were inconsistent with other studies conducted on breakfast eating (Uemura et al., 2015). Detrimental health effects, such as being overweight, have been found to be associated with a lack of breakfast eating, however our data showed no association between baseline BMI and breakfast eating frequency. However, our data did show that participants lost more weight when they increased how often they were consuming breakfast. Our data was also consistent with some findings already produced. Particular studies (Cayres et al., 2015) have found that skipping breakfast regularly leads to over-consumption of calories later in the day. Our results suggest these findings because participants who ate breakfast infrequently lost less weight than the regular breakfast eaters.

Our study suggested different findings about total eating frequency on weight loss compared to other research studies. Previously, increasing total daily eating frequency has shown to not influence body weight (Raynor et al., 2015). Data from our study indicated that increasing eating frequency might be associated with less weight loss. Our study is one of the first studies to produce findings showing high eating frequency may have a correlation with decreased weight management.

This study had both limitations and strengths. The population of the study included predominantly white individuals. This lack of diversity could limit the ability to generalize the results to all populations. To reduce some of these limitations, future studies could focus on diverse demographic groups, such as different ages or ethnic backgrounds. The majority of participants were also female. This also limits the ability to generalize results. A larger male representation could indicate if there are any differences among males and females in terms of breakfast eating and total eating frequency with weight loss and baseline BMI. Last, this study relied on self-reporting of diet for each individual. Participants could have inaccurately reported data. This may have decreased validity of the results. However, this is difficult to mitigate when studying eating frequency on individuals over an extended period of time. Future studies could try and eliminate the potential self-reporting problem by extending the experiment for a longer duration of time.

The study also had many strengths. The sample size of individuals was large, which presented a lot of data to be analyzed. Also, the study lasted for a significant amount of time. Participants had three months to follow a weight loss program and potentially lose weight. This extended period of time yielded strong data. This study is the first to examine the direct effect of total daily eating frequency on weight loss outcomes. Other studies have examined breakfast

eating (Uemura et al., 2015) and snacking (Verhoeven et al., 2014), but this study demonstrated the possible importance of total daily eating frequency on weight management. Overall, the findings of this study emphasize the value in eating breakfast and controlling total daily eating for those attempting to lose weight.

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