The Psychological Effects of Meal Timing Among Individuals with Obesity

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Introduction

Studies with rodents and humans have shown a link between the timing of eating and body weight due to the association between circadian rhythms and glucose metabolism.[1] In a preliminary study with healthy adults [Body Mass Index (BMI): 21.9±1.7 kg/m^2], a delayed eating schedule (1200h-2300h) resulted in changes in metabolism including an increase in body weight, insulin resistance, and cholesterol levels and a worsening of fat oxidation.[2] While these conclusions suggest that an earlier eating schedule may promote weight management, the findings may not be applicable to individuals outside of the preliminary study's demographic (e.g., those outside of the normal weight range).

This current study aims to examine the effects of a daytime as compared to a delayed eating schedule in participants with obesity (BMI: > 30 kg/m^2). In addition, the psychological processes of eating behaviors are being investigated via questionnaires to determine if meal timing schedules affect a person's psychology of eating, including cravings, susceptibility of eating foods in the environment, and confidence in their ability to manage their weight. This poster focuses on three questionnaires in particular: the Food-Craving Inventory (FCI), the Power of Food Scale (PFS), and the Weight Efficacy Lifestyle (WEL).

Objectives

The overall purpose of this study is to determine how the timing of eating impacts weight and metabolism by examining changes in body weight, resting energy expenditure, body composition, gene expression, glucose metabolism, hormone levels, and cognitive tests.

By comparing the responses on three questionnaires, this poster intends to explore how differing meal timing schedules may have psychological implications on eating behaviors and an individual's relationship with food.

Methods

Twenty-five adults with obesity (mean age (SD): 36.4±8.6y; BMI: 36.5±5.3 kg/m^2; 9 males, 16 females; 17 Whites, 6 Black/African Americans, 2 Asians; 1 Hispanic/Latino, 24 non-Hispanic/Latino) participated in a randomized controlled trial with two eating conditions: 1.) daytime eating schedule (0800h-1900h); 2.) delayed eating schedule (1200h-2300h). Each condition was 8 weeks long with a 2-week washout period in between schedules. The order of the conditions was randomly assigned. All food was provided (3 meals and 2 snacks per day) to maintain the same caloric intake for both conditions. Participants were asked to keep sleep/wake times and physical activity levels consistent (verified by wrist actigraphy).

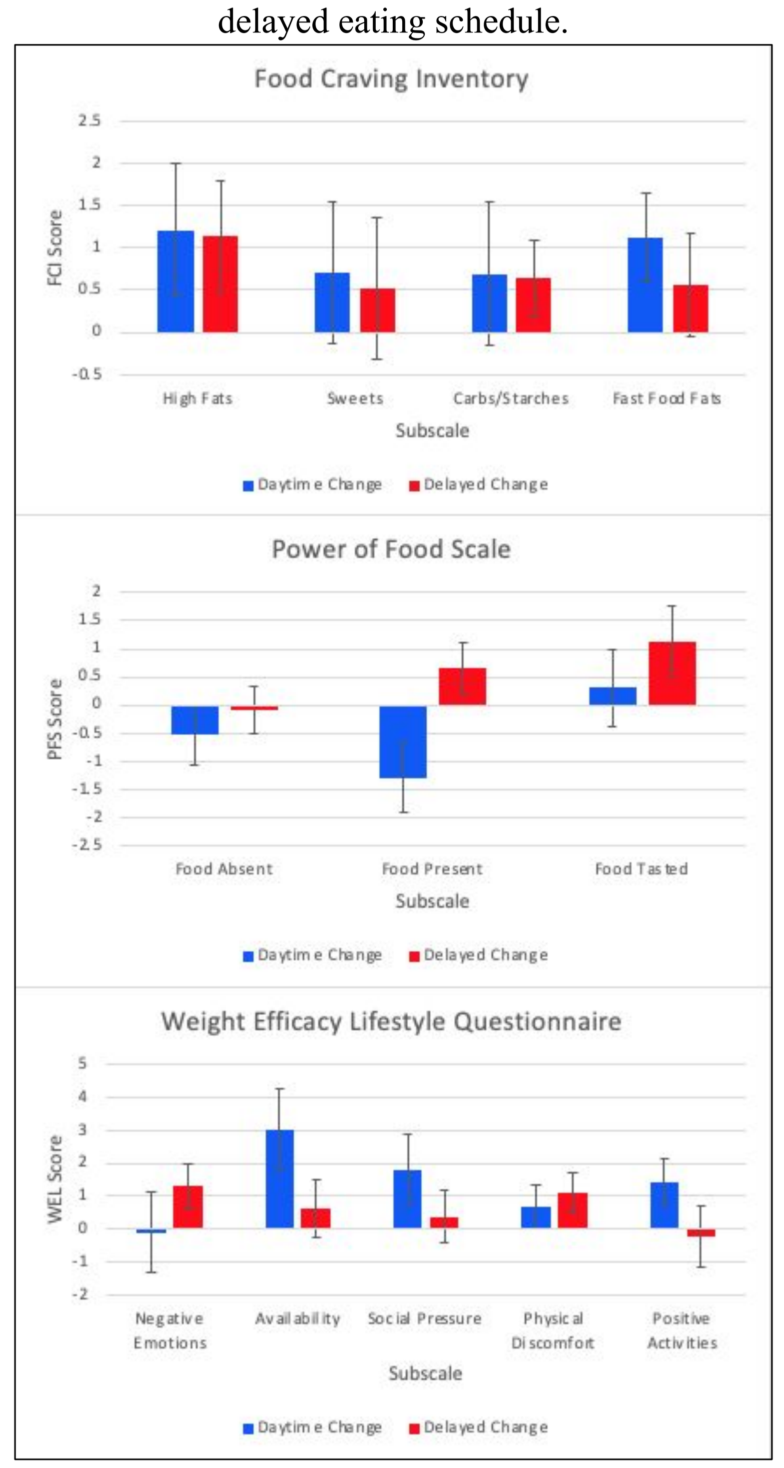
During 4 overnight assessment visits (at baseline, after the first eating condition, after the washout period, and after the second eating condition), blood and saliva samples were collected to analyze eating, sleep, and hormone levels. DXA scans were used to assess body composition, and mRNA was examined from collected adipose tissue and blood samples. The FSIGT test (Frequently Sampled Intravenous Glucose Tolerance Test) measured insulin sensitivity. Various questionnaires were given to evaluate psychological processes in relation to food and eating behaviors. We will examine three of these questionnaires in this project.

The FCI (N = 25) consists of 28 items of commonly craved foods, and participants report how often they crave certain foods within the past month from a scale of 1 (never) to 5 (always/almost every day).[3] The food items can be broken down into four subscales: high fats (HF), sweets (S), carbohydrates/starches (C/S), and fast food fats (FFF). The PFS (N = 23) determines how a participant is psychologically impacted by food using its proximity and availability.[4] There are 15 items among three subscales: food available (FA), food present (FP), and food tasted (FT). The WEL (N = 21) consists of 20 statements, and participants must rate how confident they are in controlling their eating in various situations from 0 (not confident) to 9 (very confident).[5] These items are broken down into five subscales that represent different situational factors that are associated with eating: negative emotions (NE), availability (A), social pressure (SP), physical discomfort (PD), and positive activities (PA).

Descriptive statistics were used to characterize the sample. Pearson's correlation was used to examine the relationships between various questionnaires. Paired *t*-tests were used to analyze the responses for the FCI, PFS, and WEL questionnaires to determine if there were statistically significant differences in the changes of the participants' responses during the daytime eating schedule versus the delayed eating schedule. SPSS (v 26) was used for statistical analyses and $p < 0.05$ was considered significant.

Figure 1

Figure 1 shows the average (+/-SEM) change scores of participants for each subscale on the FCI (N = 25), PFS (N = 23), and WEL (N = 21) questionnaires. Change scores were derived by comparing the daytime eating schedule to the delayed eating schedule.



Preliminary Results

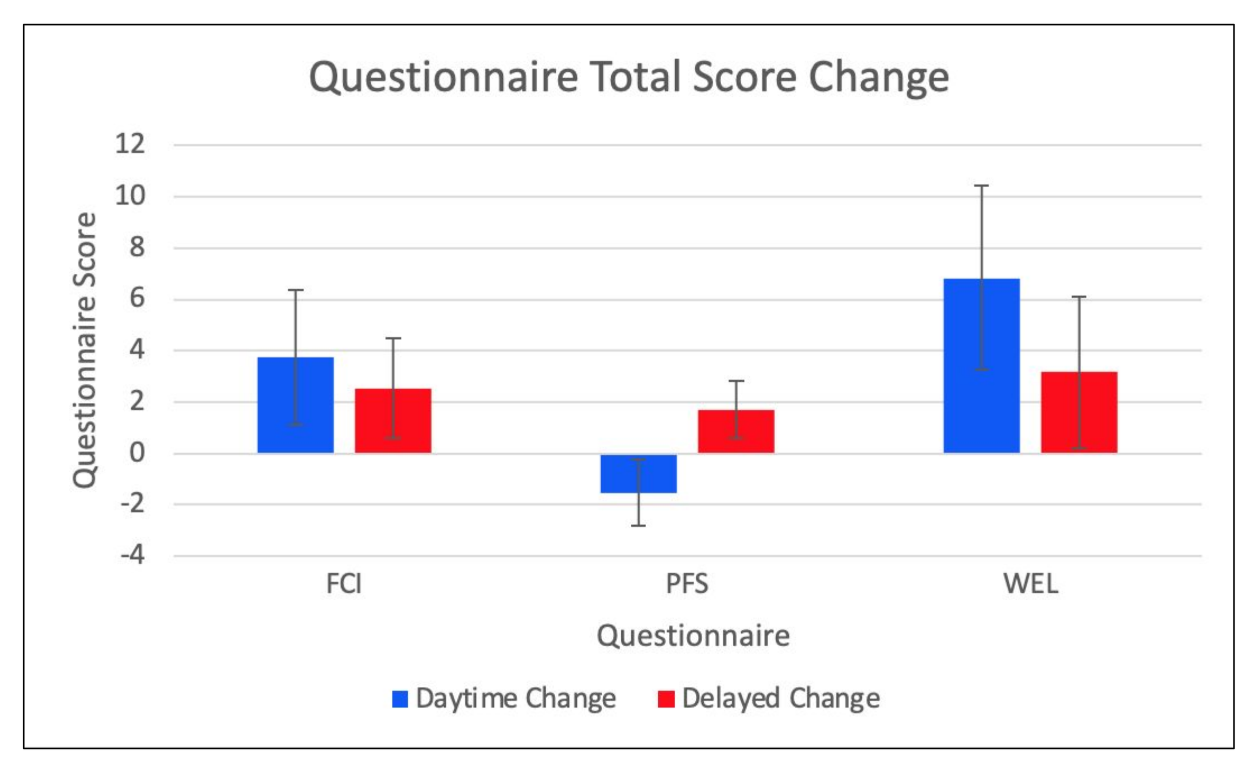
At baseline, there were significant positive correlations between FCI subscales (all *p*'s < 0.05). HF was positively correlated with C/S (r = 0.791) and FFF (r = 0.783). S was correlated with FFF (r = 0.579), and C/S was correlated with FFF (r = 0.744). Within the PFS subscales, FP was correlated with FA (r = 0.748) and FT (r = 0.529). Within the WEL subscales there were positive correlations between PD and NE (r = 0.703) and PD and SP (r = 0.638). Additionally, there were positive correlations between A and SP (r = 0.756), PD (r = 0.624), and PA (r = 0.712).

Across subscales, there were significant negative correlations between several PFS and WEL subscales (all *p*'s < 0.05). PFS FA was negatively correlated with WEL NE (r = -0.553), A (r = -0.747), SP (r = -0.758), PD (r = -0.589), and Total (r = -0.797). This indicates that the less control participants believe food has over them when it is available, the more confident they are in their ability to resist eating under different circumstances. There were negative correlations between PFS Total and WEL A (r = -0.718), SP (r = -0.656), PD (r = -0.572), and Total (r = -0.733). PFS FP was negatively correlated with WEL A (r = -0.717) and SP (r = -0.645), PD (r = -0.599), and Total (r = -0.717).

For change across conditions, there was a statistically significant difference in the **PFS FP** subscale score between the daytime condition (M = -1.304, SD = 2.899) and the delayed condition (M = 0.652, SD = 2.124); $t(df = 24) = -2.267$, $p = 0.034$). After the delayed eating schedule, participants agreed with more statements saying that they were compelled by food that was present. In contrast, participants disagreed more with these same statements after the daytime eating schedule. There were no other statistically significant differences for changes in the total or subscales between the conditions.

Figure 2

Figure 2 shows the total change scores (+/-SEM) of participants compared between the two eating schedules for the FCI (N = 25), PFS (N = 23), and WEL (N = 21) questionnaires.



Conclusions

The most prominent difference between the daytime and delayed eating schedule was how significant of an effect the presence of food had on the participants. The delayed eating schedule resulted in food presence having a greater psychological impact on participants compared to the daytime eating schedule, which resulted in a lesser psychological impact than at baseline.

The total change scores for the three questionnaires compared between the daytime and delayed eating schedules showed marked, although not significant, differences on average. Although not statistically significant, for the FCI, participants on the daytime schedule reported more cravings for commonly craved foods than during the delayed schedule, especially fast food fats (e.g., hamburgers or pizza). For the PFS, participants on the daytime schedule reported decreases in the amount of power food had over them, but this increased during the delayed schedule. For the WEL, participants on the daytime schedule reported more confidence in their ability to resist eating foods under various difficult situations compared to when they were on the delayed schedule.

Next Steps

This research is part of an ongoing 5-year study evaluating whether the timing of eating affects changes in metabolic markers and weight, among other variables. At the conclusion of the study in 2024, analyses will be conducted on the other data collected including hormones, weight changes, body fat composition, and insulin sensitivity. These data will provide more insight into how the timing of eating affects biological processes in addition to behavioral and psychological changes.

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Acknowledgements

Thank you to Dr. Kelly Allison and Dr. Namni Goel for their mentorship on this project. Thank you to Hailey Golden, Laura Ospina, and Molly Moore for their support throughout our internship. Thank you to the CURF office for providing this research opportunity through the PURM program. This study is funded by the National Institutes of Health (R01DK117488).