

BINGE EATING, IMPULSIVITY, AND DELAY DISCOUNTING AMONG INDIVIDUALS
ENGAGING IN INTERMITTENT FASTING

A Thesis

by

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ABSTRACT

Intermittent fasting (IF) is an increasingly popular diet that involves short-term fasting and/or caloric restriction every day or multiple times per week. Hardly any research has examined its associations with psychological factors. Previous research outlining cognitive models of bulimia nervosa and dietary restraint suggest that certain levels of dietary restraint, which is expected to highly correlate with engagement in IF, may lead to binge eating. However, other research has suggested that other variables may contribute to the relationship between dietary restraint and the likelihood of a binge. Thus, the purpose of this study was to explore the relationships between IF and dietary restraint, impulsivity, delay discounting, and binge eating. A sample of undergraduate students ($n = 299$) at a large public university participated in the online study for class credit. There were several important findings from this study. For instance, individuals who were engaging in intermittent fasting were more likely to binge eat than not ($p < .01$). In addition, those who were currently engaging in IF or who had fasted in the past reported significantly higher levels of dietary restraint than those who had never participated in intermittent fasting ($p < .001$). Across the entire sample, a rigid dietary style of eating was found to increase the odds of binge eating. However, the interaction effect between rigid dietary control and delay discounting was only marginally significant ($p = .06$). Significant main effects were seen for both dietary restraint and impulsivity, where heightened levels of both led to increased odds of binge eating ($p < .05$), and impulsivity further served as a moderator that strengthened the positive relationship between dietary restraint and binge eating. Additionally, preliminary findings indicated significant relationships between intuitive eating, psychological flexibility, eating with awareness, and

impulsivity. Future studies should seek to confirm these findings in randomized trials or longitudinal studies.

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Contributors

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All of the work conducted for the thesis was completed by the student independently.

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1. INTRODUCTION AND LITERATURE REVIEW

Annual reports from the Centers for Disease Control and Prevention (CDC) indicate that there has been a 7.9% increase in obesity prevalence among adults between 2011 to 2017, as well as a 4.3% increase among adolescents in grades 9-12 from 2001 to 2017 (CDC, 2019). While extensive funding and research has been conducted to measure whether dieting works, which types of dieting work, and how to get people to adhere to these diets, less is known about the potential harmful psychological effects associated with some of the more increasingly popular fad diets.

Intermittent Fasting

A particular type of diet known as intermittent fasting (IF) has grown in popularity in recent years, and is practiced purportedly for health reasons, such as to enhance one's diet, lifestyle, or achieve weight loss, despite inconsistent findings supporting its long-term benefits (Patterson & Sears, 2017). Specifically, IF is characterized by an engagement in voluntary periods of dietary or caloric restriction, and it can be traced back to several cultural and religious traditions (Patterson & Sears, 2017). There are varying different types of IF, of which some of those most commonly studied in research include: alternate-day fasting (ADF), time-restricted fasting (TRF), and modified alternate-day fasting, also known as the 5:2 diet (Templeman et al., 2019).

Alternate-day fasting (ADF) consists of completely restricting all caloric intake for approximately twenty-four hours typically with the exception of sugar-free and energy-free beverages or items including coffee, tea, gum, and water (Patterson & Sears, 2017). A fasting day is followed by a feeding day, which allows individuals to eat ad-libitum, or as they would typically eat, for the entire day (Heilbronn et al., 2005). There have been limited ADF

intervention studies conducted with humans, but some randomized controlled studies indicate that this type of fasting can help facilitate weight loss, increase fat oxidation, and decreases insulin and glucose levels (Halberg et al., 2005; Heilbronn et al., 2005; Horne et al., 2013).

On the other hand, modified alternate-day fasting (mADF), also known as the 5:2 diet, encourages individuals to fast for two non-consecutive days of the week by restricting energy or caloric intake to 25% of their typical intake, which results in eating approximately 500 calories per day for twenty-four hours. Similar to ADF, individuals may eat ad-libitum, or freely eat as they normally eat on feeding days (Tinsley & La Bounty, 2015). The few randomized controlled trials that have evaluated mADF have found evidence to suggest that the diet results in weight loss among healthy overweight or obese subjects, but they have also produced inconsistent findings of the diet's impact on common physiological biomarkers, such as glucose, insulin, and leptin (Patterson & Sears, 2017).

Time-restricted feeding (TRF) is a type of IF that requires no prior knowledge of nutritional or dietary needs, but instead focuses on the temporal component of fasting and meal intake. In other words, individuals in TRF are focused less on *what* they eat, but more on *when* they eat. Typically, TRF involves restricting daily caloric intake to a three or four-hour window of time each day (e.g., individuals will only eat from 6:00-10:00pm), but with no restrictions on the types or amount of food that is eaten (Templeman et al., 2019). While two studies (LeCheminant et al., 2013; Stote et al., 2007) examining TRF in normal-weight subjects have found significant weight loss at the end of the intervention in comparison to the control group, two other studies (Chowdhury et al., 2016a; Chowdhury et al., 2016b) demonstrated either no change in weight or weight gain among participants at the end of the intervention.

Furthermore, some individuals engage in intermittent fasting due to religious beliefs. The

most prominent and well-known practice of this is Ramadan fasting. Annually, Muslim individuals engage in daily fasting and abstinence from smoking for the entirety of the holy month of Ramadan (Keshteli et al., 2017). Typically, individuals will still consume two meals per day: one light meal before dawn, and one heavier meal after sunset. The timing of Ramadan also depends on geographical location and season, which means that the fasting time can vary and potentially last between twelve to eighteen hours due to differences in when the sun will rise and set (Akgül et al., 2014). While studies have shown that Ramadan fasting can decrease body weight, daily energy intake typically remains the same as on non-fast days (Al-Hourani & Atoum, 2007). One possibility for the reduction in weight despite unchanged daily energy intake may be due to decreased fluid intake, since individuals are asked to abstain from both food and fluids during the day (Al-Hourani & Atoum, 2007).

Similar to how diets in general have been understudied, there has been widespread encouragement in the media to participate in IF despite the lack of research supporting consistent, beneficial outcomes. Importantly, there is a lack of clarity about the psychological ramifications of intermittent fasting. For instance, it is unclear how intermittent fasting relates to episodes of disordered eating and eating disorders in young women and men.

The few studies that have examined disordered eating in individuals engaging in intermittent fasting have all focused on those involved in fasting during Ramadan. Akgül et al. (2014) reported on the prevalence of eating disorders in adolescents in Turkey, where approximately six out of twenty-three adolescents in 2012-2013 were diagnosed with an eating disorder related to or triggered by Ramadan fasting. Based on six case interviews, most of the adolescents presented with anorexia nervosa (AN), or restrictive subtypes of Eating Disorder Not Otherwise Specified (EDNOS), with two reporting bulimic behaviors (e.g., purging or feeling a

lack of control while eating). In four of the cases, disordered eating thought patterns and/or behaviors preceded fasting, which aligned with the authors' belief that Ramadan fasting is not a causal factor of disordered eating, but instead may exacerbate or expedite the onset of disordered eating behaviors, due to a genetic predisposition. Another study (Erol et al., 2008) found that there was a significant elevation in severity scores on the Bulimic Investigatory Test (BITE) in adolescent females after Ramadan when compared to their scores before the start of Ramadan. However, the scores were not elevated enough to be considered clinically significant.

While this research is informative for the purposes of examining the relationship between disordered eating patterns and intermittent fasting, the results of these studies do not necessarily generalize to individuals in Western cultures participating in intermittent fasting for non-religious reasons.

Dietary Restraint and Disordered Eating

Polivy & Herman (1985) were pioneers of the idea that dietary restraint plays a causal role in binge eating. For instance, they posited that chronic hunger, which dieters often feel while controlling their intake or exhibiting dietary restraint, eventually leads to disinhibition and subsequent binge eating. Their ideas specifically target binge eating and purging, which are most characteristic of either bulimia nervosa or binge eating disorder. The American Psychiatric Association (APA; 2013) defines bulimia nervosa (BN) as characterized by an individual feeling a lack of control while eating, resulting in a binge (i.e., rapidly eating a large amount of food in a short period of time), which is then followed by a type of compensatory behavior such as vomiting/purging, diuretics, laxatives, or excessive exercise (Nylander, 1971). Individuals with binge eating disorder (BED) also engage in objective binge eating episodes, express feelings of shame and guilt afterward, and may eat even when uncomfortably full or not physically hungry

(APA, 2013). However, these individuals are different from those with BN in that they do not engage in compensatory behaviors following a binge.

Others also believe that dieting, or dietary restraint, is a causal factor in the development of bulimic behaviors, especially binge eating (Nylander, 1971; Lowe et al., 1996). Some researchers even go so far as to say that dieting is a “necessary” precursor for the development of bulimia nervosa (Ruderman & Besbeas, 1992). For example, Coffino & colleagues (2016) found that overweight or obese individuals, 71.9% reporting “mild” to “no binge eating” and 28.1% reporting “moderate” to “severe” binge eating, also engaged in restrained eating, even more so than the underweight or average-weight individuals also involved in the study. Moreover, across many years, studies have revealed similar results where reports of restrained eating or intermittent dieting often leads to overeating or binge eating (Polivy & Herman, 1985; Ruderman, 1986). Despite these findings, not all dieters turn into binge eaters. Therefore, two contrasting theories were developed in an attempt to explain why some people who diet end up engaging in disordered eating patterns that lead to diagnosable eating disorders, whereas others do not.

One of the theories that attempts to explain this phenomenon is the continuity model (Hsu, 1990; Polivy & Herman, 1987), which posits that individuals can be identified across a continuum of eating behavior. This places individuals with diagnosable eating disorders on one end of the continuum, those with “normal” eating patterns on the other end, and puts dieters without diagnosable eating disorders somewhere in the middle. The model emphasizes the causal role of dieting and dietary restraint in the development of BN, such that if bulimic symptoms increased as an individual moves from unrestrained to a restrained eater, the model would be supported (Lowe et al., 1996). At the same time, the model asserts that diagnosable eating

disorders will only occur in individuals presenting with severe manifestations (e.g., purging, starvation, binge-eating, etc.) of eating habits that are typical in Western cultures (e.g., conscientiousness of food choices).

Multiple studies have investigated the continuity model, including Lowe et al.'s (1996) study, where they examined four different groups of female eaters: unrestrained non-dieters, restrained non-dieters, dieters, and individuals with BN. This study uniquely acknowledged a group of individuals who had perhaps dieted or learned to restrict their food in the past, but were not currently dieting (“restrained non-dieters” vs “dieters”). Interestingly, individuals who were currently dieting and those who were restrained non-dieters were not significantly different in their reports of binge eating (low), general psychopathology, dietary restraint, or daily caloric intake. However, their use of the term “diet” was very broad, and they did not differentiate the different types of diets, for instance those that focus on the timing of meals (e.g., intermittent fasting), quality of food (e.g., ketogenic diet or “organic-only” diets), or quantity of food.

On the other hand, Bruch (1973) also introduced the *discontinuity* model, which proposes that there are critical or qualitative pathological differences among dieters, non-dieters, and individuals with eating disorders that aid in determining whether or not their eating behaviors will become problematic. Crisp (1965) asserted that individuals with eating disorders and individuals who diet but do not develop an eating disorder pursue a thin physique for different reasons and vary on aspects of psychopathology unrelated to food, including interpersonal distrust (Selvini-Palazzoli, 1978) and the inability to cope with maturity or avoidance of puberty (Crisp, 1965). Therefore, the key difference between the discontinuity and the continuity model is that the discontinuity model primarily emphasizes the role of predisposing factors (i.e., depression, impulse control) in the development of BN, rather than dietary restraint or other

factors related to food. Most studies that have evaluated both the discontinuity model and continuity model have shown either no support for the discontinuity model or have varying amounts of support for both models (Lowe et al., 1996; Rossiter et al., 1989). Therefore, it is unclear whether or not either of these models accurately explain when, why, and how dieting may cause or predict bulimic behaviors.

Furthermore, other studies have shown that there are dieters who are successful at dieting or weight loss that do not develop severely dysfunctional eating behaviors (Lowe & Kleifield, 1988). For instance, research distinguishing individuals who display “rigid control” and “flexible control” has found that individuals who are more “rigid” in their dietary style are more likely to endorse binge eating and other problematic behaviors (Westenhoefer, 1991; Westenhoefer et al., 1999). Rigid control is conceptualized as an “all-or-nothing” approach to dieting, where although individuals are conscious about what they eat (e.g., they avoid “forbidden” or tempting food, diet frequently, feel immense guilt or shame after overeating), if they do eat food that they would consider “breaking their diet” (in some cases, a binge), they are less likely to compensate for it afterward. For instance, these individuals would answer “true” to this question on the Rigid Control subscale of the Three-Factor Eating Questionnaire (TFEQ): “I would rather skip a meal than stop eating in the middle of one” (Stunkard & Messick, 1985; Westenhoeffer et al., 1999). On the other hand, individuals exhibiting “flexible control” in their dieting report less binge eating and lower disinhibition (Westenhoefer, 1991), demonstrate moderation in eating “unhealthy” food, take smaller helpings, and display lower levels of guilt or shame in the instance that they do overeat or break their diet. The relationship between rigid control and binge eating has been supported among community study participants (Tylka et al.,

2015) and female college students (Póinhos et al., 2015), but not yet with individuals engaging in intermittent fasting.

Despite these ideas, there is still conflicting research on whether or not individuals who diet are more likely to engage in disordered eating behaviors such as binge eating (Bulik et al., 1997), leading some researchers to conclude that dietary restraint by itself is not sufficient to explain whether or not individuals will engage in binge eating (Byrne & McLean, 2002; Westenhoefer, 1991). Therefore, it is thought that other forms of psychopathology, such as impulsivity, may moderate the relationship between dietary restraint and binge eating. While there are some studies that have explored this option (Coffino et al., 2016), conclusive results have not yet been established.

Impulsivity, Delay Discounting, and Disordered Eating

Impulsivity is often described as a personality trait characterized by sensation-seeking, reward sensitivity, and rash or risky behaviors (Lowe & Eldredge, 1993). It is also often regarded as a multidimensional construct (Paulsen & Johnson, 1980). For instance, impulsivity is typically broken down into different facets that seek to describe motivating factors, urges, and behaviors seen in impulsive individuals. Some of these facets include negative and positive urgency (tendency to act hastily when in a negative or positive mood), sensation seeking, [lack of] persistence (e.g., “I tend to give up easily”), motor impulsivity (behaving without thinking), decision-making, cognitive impulsivity (making quick cognitive decisions) and disinhibition (inability to suppress a response or behavior) (Buss & Plonim, 1975; Evenden, 1999; Patton et al., 1995; Whiteside & Lynam, 2001).

There is some evidence that elevated impulsivity predicts higher rates of binge eating (Coffino et al., 2016). Impulsivity is commonly linked to BN and BED due to the symptoms

these individuals exhibit, such as a loss of control while eating and a heightened sensitivity to reward (e.g., eating without restriction, and the sense of relief during a binge) (APA, 2013; Dawe & Loxton, 2004). In addition, one study assessed whether short-term fasting (i.e., fasting for 20 hours) affected inhibition (Howard et al., 2018). In this study, thirty-three subjects completed behavioral inhibition tasks at two different time points: once when satiated, and once after fasting for 20 hours. Compared to when they were satiated, participants performed worse on a food-related shifting/action inhibition task. Interestingly, there were no differences in decision-making or risk-taking while satiated or fasting, but this may have been due to the short duration of the fast.

Further, impulsivity can be measured through self-report or behavioral measures. While some of the benefits of using a self-report measure include their ease of use and distribution as well as the ability to ask questions that cover a variety of types of impulsivity, the validity of results can often be limited by an individual's insight (or lack thereof) into their own behaviors, and may not be reliable in predicting and reporting actual impulsive behavior (Lejuez et al., 2002). Therefore, behavioral measures can be useful in assessing certain types of impulsivity, including risk-taking behaviors and the ability to delay gratification, which is a type of impulsive decision-making often referred to as "delay discounting."

Delay discounting is observed when an individual values a delayed reward (usually monetary) less than an immediate reward (Koffarnus & Bickel, 2014). While most individuals tend to desire an immediate reward rather than a delayed reward worth the same value, people who more often choose an immediate reward and discount a delayed reward of the same or higher value are more likely to endorse problematic behaviors such as substance use, gambling, or overeating (Koffarnus & Bickel, 2014). For instance, individuals with BED compared to

healthy control individuals are more likely to have a difficult time delaying gratification, or in most delay discounting tasks, prolonging a monetary reward (Davis et al., 2010). In addition, delay discounting is also thought to be linked to self-control, or lack thereof (Shamosh & Gray, 2008). However, delay discounting is not considered a fixed trait, but rather depends on factors such as the type of reward, probability of receiving the reward, context, and conceptions about the reward (Matta et al., 2012).

In research, delay discounting is often measured by observing participants' ability to delay hypothetical monetary rewards. Typically, participants are asked whether they would prefer immediate or delayed rewards (i.e., "Would you prefer \$31 today or \$85 in 7 days?"), with the lesser immediate reward systematically increasing and the greater, delayed reward decreasing or adjusted based on the participant's previous choices until they reach what is referred to as an indifference point (Kirby et al., 1999; Matta et al., 2012). The indifference point is when the immediate and delayed rewards are considered to be of equal value. A series of indifference points can then be used to calculate a discounting rate (k), often shown as a hyperbolic-like curve. Higher k values tend to correspond with greater levels of impulsiveness (Herrnstein et al., 1981).

Recently, Koffarnus & Bickel (2014) created a brief adjusting delay task that can calculate a discounting rate after five trials, and it takes less than one minute to complete. While the monetary version of the task is the most often used version in research, there are also versions of the task that use commodities such as snacking and weight-loss, which can be useful in measuring disinhibition related to eating behaviors. Interestingly, in their initial study, Koffarnus & Bickel (2014) discovered that discounting rates were greater for snack food than for

money. Therefore, three versions (monetary, snack-based, weight-loss-based) of the task were included in this study.

Hypotheses

The current study aims to determine whether or not individuals who engage in IF will be more vulnerable to episodes of binge eating dependent on their levels of impulsivity, delay discounting, and “flexible” or “rigid” control style of dietary restraint. Based on the existing literature, it is hypothesized that individuals who engage in intermittent fasting will be more likely to have higher rates of dietary restraint and binge eating in comparison to healthy control subjects. In addition, it is predicted that there will be an interaction effect between dietary restraint style (“rigid” or “flexible”) and delay discounting on whether or not an individual endorses engaging in binge eating episodes. For instance, it may occur that when someone is considered to have a “rigid” dietary style and discounts delayed rewards at a high rate, the relationship between the two independent variables (dietary restraint style and delay discounting) and the dependent variable (binge eating status) will be positively stronger. Further, it is thought that impulsivity will be a significant moderator between dietary restraint and binge eating status, such that higher impulsivity will strengthen the positive relationship between dietary restraint and binge eating. Finally, it is hypothesized that higher rates of discounting delayed rewards will be positively correlated with reported episodes of binge eating.

2. METHODS

Participants

The participants in this study were recruited through SONA, an online pool of students taking psychology courses at Texas A&M University. Individuals who were currently engaging in intermittent fasting, as well as non-intermittent fasting control subjects, were asked to participate. In order to further verify that individuals were attentive throughout the online surveys, there were multiple manipulation-check items.

Procedure

This study was conducted completely online through Qualtrics (<https://www.qualtrics.com/>). After reading and signing the consent form, participants were directed to begin the survey. Participants were first asked to provide responses to demographic questions. Then, participants were directed to answer questions related to intermittent fasting. Answers to these questions were used to separate participants into one of three categories: those who were currently engaging in intermittent fasting, those who had engaged in intermittent fasting in the past but were not currently fasting, and those who had never participated in intermittent fasting. The final component of the survey consisted of a variety of clinical scales measuring dietary restraint, impulsivity, intuitive eating, disordered eating symptoms including binge eating behaviors, mindful eating, psychological flexibility, and delay discounting. While the mindful eating, intuitive eating, and psychological flexibility scales were not mentioned in the hypotheses, an exploratory analysis was still conducted in order to examine the potential associations of these constructs with the main study variables.

Measures

Demographic information such as age, race, ethnicity, gender, level of education, education classification, religion, and socioeconomic status were collected using a simple questionnaire format.

Dietary Pattern/Intermittent Fasting Questions. Participants were asked about their dietary habits and whether or not they currently considered themselves to be dieting. Participants were then asked whether or not they were engaging in intermittent fasting. Only those who were currently fasting answered the remaining dietary questions, which inquired about the details of their experience with intermittent fasting. For instance, participants were provided with definitions of the three most popular types of intermittent fasting, as well as an “other diet” option, and were asked to choose the option that aligned most closely with their current fasting regimen. In addition, a Likert scale ranging from 1 (“Not at all”) to 4 (“Always”) was used for participants to answer the following question, “How successful do you consider yourself to be at maintaining this diet regimen?” Other informative questions (i.e., initial reasoning for engaging in intermittent fasting; whether friends, family, or roommates are engaging in the same diet as them; chronicity of their diet/intermittent fasting routine) were also included.

Short UPPS-P Impulsive Behavior Scale. The SUPPS-P Impulsive Behavior Scale (Lynam, 2013) is a 20-item shortened version of the original UPPS-P Impulsive Behavior Scale (Whiteside & Lynam, 2001), which assesses five facets of impulsivity: negative urgency, positive urgency, (lack of) premeditation, (lack of) perseverance, and sensation seeking. Questions are endorsed using a Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), where higher scores indicate higher levels of impulsivity. The scale demonstrated good internal reliability in the present sample ($\alpha = .81$).

5-Trial Adjusting Delay Task. This task has been formatted to be used online and is able to support three different iterations of a typical delay discounting task. In this study, participants completed five trials for each of the three versions of the task for a total of fifteen trials: money-now/money-later (“*Would you rather receive \$50 now, or \$100 in three weeks?*”), favorite food-now/favorite food-later (“*Which would you rather have: 1.5 servings of your favorite food now, or 3 servings of your favorite food in 3 weeks*”), and weight-loss-now/weight-loss-later (“*Which would you rather have: 10 lbs. lost in 3 weeks, or 5 lbs lost now*”) (Koffarnus & Bickel, 2014; Snider et al., 2019). Participants were simply asked to choose hypothetical monetary or commodity-based rewards that they could decide to receive immediately or at a later time. Each of the three tasks takes less than one minute to complete (Koffarnus & Bickel, 2014). This task automatically adjusts the next offer of a reward and the time lapse between the two options based on the participant’s last response. The online version of this task automatically calculates the k value, or discounting rate, based on the participants responses, where a higher k value tends to indicate greater impulsivity. The k value from the monetary task will be used to represent the delay discounting variable in the analyses for this paper.

Three-Factor Eating Questionnaire. The TFEQ (Stunkard & Messick, 1985) is a self-report assessment that measures dietary restraint, disinhibition, and hunger. This scale has been validated among normal-weight, overweight and obese adults (Bohrer et al., 2015) and has demonstrated high internal reliability ($\alpha = .90$) among undergraduate students (Allison et al., 1992). In this study, only the flexible and rigid dietary control subscales were used, which were validated by Westenhoefer & colleagues (1999). A greater endorsement of items on the flexible control subscale (12 items) has been found to be associated with lower body weight, maintenance of weight reduction, and cases of anorexia (Shearin et al., 1994; Westenhoefer et

al., 1999). On the other hand, higher scores on the rigid control subscale (16 items) have been associated with elevated rates of binge eating (Westenhoefer et al., 1999). The scale demonstrated good internal reliability for the Flexible Control subscale ($\alpha = .83$), and acceptable internal reliability for the Rigid Control subscale in the present sample ($\alpha = .79$).

Intuitive Eating Scale 2 (IES-2). The IES-2 (Tylka & Kroon Van Diest, 2013) is a 23-item scale intended to measure the extent to which individuals rely on hunger, satiety, or emotional cues to determine when to stop or start eating. This scale contains four subscales: Unconditional Permission to Eat (UPE), Eating for Physical Rather Than Emotional Reasons (EPR), Reliance on Hunger and Satiety Cues (RHSC), and Body-Food Choice Congruence (B-FCC). Internal consistency has been high ($\alpha = 0.87$ for women, $\alpha = .89$ for men) in the original study (Tylka & Kroon Van Diest, 2013). The scale demonstrated good internal reliability in the present sample ($\alpha = .86$).

Revised Restraint Scale (RRS). The RRS (Polivy & Herman, 1975) contains ten items meant to measure diet history and attitudes towards weight and eating. As one of the most commonly-used scales to measure dietary restraint, this scale will be able to provide a total score of restraint, as well as two subscale scores (Concern for Dieting and Weight Fluctuation). It has also been one of the main scales used in research to test both the continuity and discontinuity models of dieting and its relationship to the development of BN. The scale demonstrated good internal reliability in the present sample ($\alpha = .80$).

Eating Disorder Diagnostic Scale for DSM-5 (EDDS-5). The EDDS-5 (Bohon & Stice, 2015) is a 23-item self-report measure that captures all DSM-V criteria for BED, as well as for anorexia nervosa and BN. This scale has demonstrated adequate internal consistency in a past study ($\alpha = 0.71$) (Mehak & Racine, 2019). In addition, the DSM-IV version of the scale has been

shown to produce high specificity (96%) and sensitivity (77%) for detecting BED (Stice et al., 2000). The DSM-V version is very similar to the DSM-IV version, but there has been little to no research validating the new items. Since this study is focused on intermittent fasters and not detecting positive cases of BED, the relatively high specificity for this scale will be useful. The two final questions about age and gender were removed since they were already asked in the demographics section of the study. Due to an error in the data collection, the internal reliability of the scale could not be calculated.

Mindful Eating Behaviour Scale (MEBS). The MEBS (Winkens et al., 2018) is a recently developed scale that measures the degree to which individuals eat with awareness and attention to their thoughts, feelings, and body. Many of the questions reflect different concepts from intuitive eating, since this scale emphasizes the idea of being mindful, or having present-moment awareness while eating, rather than attempting to decipher whether individuals rely on physiological or emotional cues before consuming food. The scale contains 17 items, including six items (i.e., “I rely on my hunger signals to tell me when to eat,” “I trust my body to tell me what to eat,” etc.) taken from the IES-2 (Tylka & Kroon Van Diest, 2013). Since the authors advised against computing a total score for this scale, only scores from the four subscales (Focused Eating, Reliance on Hunger and Satiety Cues, Eating with Awareness, and Eating without Distraction) were used in the exploratory analysis. The scale demonstrated good internal reliability in the present sample ($\alpha = .80$).

Acceptance and Action Questionnaire – II (AAQ-2). The AAQ-2 (Bond et al., 2011) consists of seven items, which measure psychological flexibility and inflexibility. This revised measure was created in order to improve upon the original version, which produced low internal consistency and test-retest reliability, thought to be in part due to the unnecessarily complicated

wording of items on the original scale. However, the items in the second version are simple and brief (e.g., “Emotions cause problems in my life.”) and can be used in various medical or psychological settings. Importantly, a higher score on the scale indicates a lower level of psychological flexibility. In the present sample, the scale demonstrated excellent internal reliability ($\alpha = .94$).

Data Analyses

The IBM SPSS Statistics 25 package was used to analyze the data. For the first hypothesis, a chi-square test of independence was used to assess the association between intermittent fasting status and the dichotomous dependent variable, binge-eating status (“yes-binge” or “no-binge”). The independent variable was computed based on participants’ response to an item asking about their involvement in intermittent fasting, and participants were categorized accordingly into one of three groups: those currently engaging in intermittent fasting (Current IF), those who have engaged in intermittent fasting in the past (Past IF), and those who have never done intermittent fasting (No IF). The dichotomous dependent variable was computed based on responses to two items (items 5 and 6) from the EDDS-5 that asked the participant to report the number of binge-eating episodes on average they had engaged in per month within the last three months, and whether they had experienced a sense of a loss of control during those episodes. Any participant that reported <1 binge episode were categorized as “no-binge” and participants that endorsed ≥ 1 binge episode were considered “yes-binge.” This same dichotomous variable was used for the second and third hypotheses as well. A Kruskal-Wallis test was used to address the second part of the first hypothesis by evaluating any differences in the continuous independent variable (dietary restraint), measured by the Revised Restraint Scale, among the three different intermittent fasting groups.

To address the second hypothesis, a binomial logistic regression was used to determine how well dietary control (“rigid” or “flexible”), delay discounting, and an interaction between dietary control and delay discounting, predict binge-eating status. In this case, the dietary control variables were calculated based on participants’ total scores on the TFEQ Flexible Control and Rigid Control subscales. Two steps were included in the regression in order to observe the model with and without the interaction term, so as to see the extent to which the interaction term contributed to the model. The first step consisted of only the three variables: rigid control, flexible control, and delay discounting. The second step included the interaction term.

For the third hypothesis, a moderation effect was tested using logistic binary regression to determine whether impulsivity would moderate the relationship between dietary restraint and binge-eating status. For this analysis, the dietary restraint variable consisted of the total score from the Revised Restraint Scale, and impulsivity was captured by the total score from the SUPPS-P Impulsive Behavior Scale. Similar to the second hypothesis, a two-step model was conducted with these variables in order to test the contribution of the interaction or moderation in the model. The first step consisted of the impulsivity and dietary restraint variables, and then the second step included the interaction term with impulsivity as the moderator.

In order to test the fourth hypothesis, a Spearman-Rho correlation was conducted to examine the relationship between delay discounting and the number of binge-eating episodes participants have reported engaging in on average within the past three months. This nonparametric test was chosen because both variables were not normally distributed.

Lastly, a correlation matrix was generated as an exploratory analysis between the primary study variables and the Mindful Eating Behaviour Scale, Intuitive Eating Scale-II, and the Acceptance and Action Questionnaire-II.

3. RESULTS

Data was collected online through the Department of Psychological & Brain Sciences SONA pool through two waves of data collection (April to May and September through December) in 2020. A total of 355 responses were collected through Qualtrics. However, data was excluded from participants that did not clearly indicate their consent ($n = 10$), were considered duplicate responses due to the same ID number and/or IP address ($n = 9$), or did not pass one of the three manipulation check questions (e.g., “Please choose ‘4’”) ($n = 37$). In addition, since we were finding it difficult to recruit enough participants engaging in intermittent fasting, prior to September, participants were pre-screened for their intermittent fasting status. However, from September to October, only participants who had been currently engaging in intermittent fasting were asked to participate. The final sample consisted of 299 participants.

The demographics for the sample can be found in Table 1. In order to test the first hypothesis, a chi-square test of independence was used to assess the association between IF status (Current IF, Past IF, and No IF) and binge-eating status. A significant association between IF and binge-eating status was observed, $\chi^2(2) = 15.83, p <.001$. Those in the No IF group were less likely to binge-eat (40.8%) than not, while those in the Current IF group were more likely to endorse binge eating (66.7%) than not. The frequencies are displayed in Figure 1. There was not a significant difference in the number of Past IF group participants that reported binge-eating (60.4%) or no binge-eating.

Table 1: Sample Characteristics and Demographics.

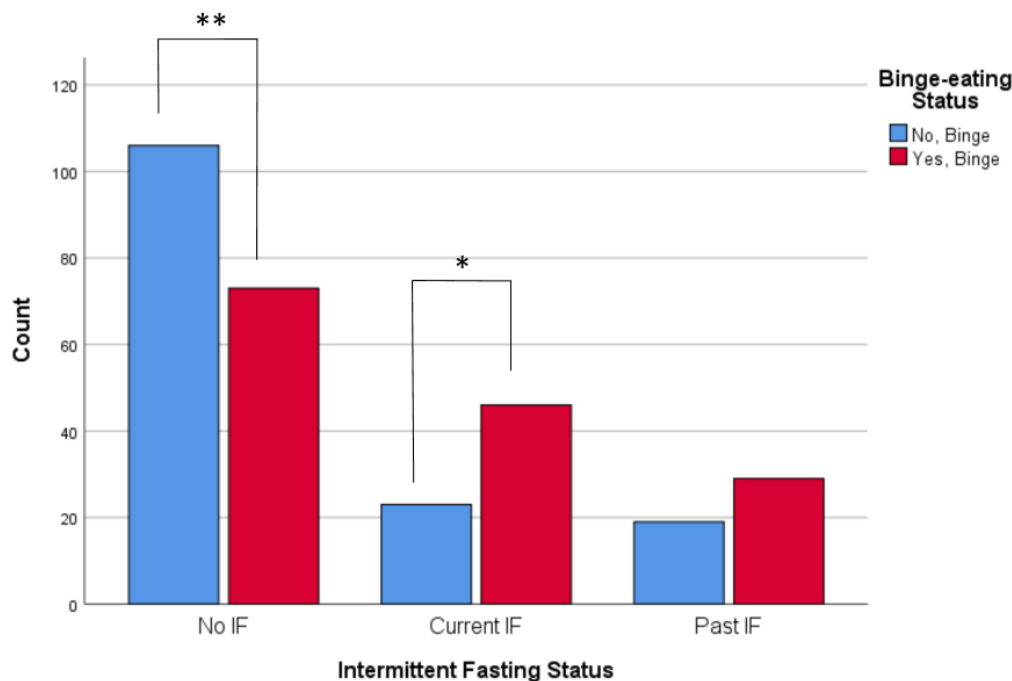
Characteristic /Measure	Current IF (<i>n</i> = 70*)	No IF (<i>n</i> = 180*)	Past IF (<i>n</i> = 48)	Total (<i>n</i> = 299)
Gender, female, <i>n</i> (%)	44 (62.9)	101 (56.1)	27 (56.3)	173 (57.9)
Age, <i>n</i> (%)				
18	28 (40.0)	59 (32.8)	15 (31.3)	102 (34.1)
19	23 (32.9)	68 (37.8)	19 (39.6)	110 (36.8)
20	11 (15.7)	27 (15.0)	7 (14.6)	45 (15.1)
21	6 (8.6)	21 (11.7)	4 (8.3)	32 (10.7)
22	2 (2.9)	2 (1.1)	1 (2.1)	5 (1.7)
23-25	0 (0.0)	3 (1.7)	2 (4.2)	5 (1.7)
Body mass index, mean (SD) kg/m ²	25.03	23.83	25.35 (5.42)	24.36(4.55)
Race, <i>n</i> (%)				
White	57 (81.4)	150 (83.3)	39 (81.3)	247 (82.6)
African American	1 (1.4)	1 (0.6)	3 (6.3)	5 (1.7)
Asian	3 (4.3)	15 (8.3)	3 (6.3)	21 (7.0)
American Indian or Alaska Native	1 (1.4)	4 (2.2)	0 (0.0)	5 (1.7)
Other (please specify)	5 (7.1)	3 (1.7)	0 (0.0)	8 (2.7)
Multiracial (>1 race)	3 (4.3)	6 (3.3)	3 (6.3)	12 (4.0)
Did not say	0 (0.0)	1 (0.6)	0 (0.0)	1 (0.3)
Ethnicity, <i>n</i> (%)				
Hispanic or Latino	21 (30.4)	47 (26.1)	15 (31.3)	83 (27.8)
Not Hispanic or Latino	48 (68.6)	131 (72.8)	32 (66.7)	212 (70.9)
Did not say	1 (1.4)	2 (1.1)	1 (2.1)	4 (1.3)
Income				
\$0-10,000	10 (14.3)	22 (12.2)	7 (14.6)	39 (13.0)
\$10,000-20,000	5 (7.1)	9 (5.0)	2 (4.2)	17 (5.7)
\$20,000-30,000	2 (2.9)	7 (3.9)	3 (6.3)	12 (4.0)
\$30,000-50,000	5 (7.1)	15 (8.3)	4 (8.3)	24 (8.0)
\$50,000-100,000	8 (11.4)	38 (21.1)	9 (18.8)	55 (18.4)
\$100,000+	27 (38.6)	64 (35.6)	13 (27.1)	104 (34.8)
I do not know	7 (10.0)	13 (7.2)	6 (12.5)	26 (8.7)

Prefer not to say	6 (8.6)	12 (6.7)	3 (6.3)	21 (7.0)
Did not say	0 (0.0)	0 (0.0)	1 (2.1)	1 (0.3)

*The *n* reflected here includes some participants that were excluded from analyses due to missing data.

IF = intermittent fasting group, No IF = group who had never participated in intermittent fasting, and Past IF = group who had fasted in the past but were not currently fasting

Figure 1: Proportions of Individuals Engaging or Not Engaging in Intermittent Fasting and Binge Eating.



* $p < .01$, ** $p < .001$

Further, a Kruskal-Wallis test was performed in order to test differences in dietary restraint, taken from the Revised Restraint Scale, between the Current IF, Past IF, and No IF groups. There was a statistically significant difference between groups on dietary restraint, $H(2) = 72.27, p < .001$. The mean rank for the Current IF group was 210.59, 179.70 for the Past IF

group, and 114.17 for the No IF group. Using a Bonferroni-adjusted alpha level of .017 (.05/3), the post-hoc analysis revealed statistically significant differences in dietary restraint between the No IF group and the Current IF group ($p < .001$), and between the No IF group and Past IF group ($p < .001$). There was no significant difference between the Current IF and Past IF groups ($p = .16$). Therefore, individuals who were currently fasting were more likely to have higher dietary restraint than the group who had never fasted, but not significantly more so than those who had fasted in the past. Yet, individuals who had fasted in the past were also more likely to have higher dietary restraint than the individuals who had never fasted.

In order to test the second hypothesis, a binomial logistic regression was performed to determine the effects of flexible dietary control, rigid dietary control, and delay discounting on the likelihood that participants engage in binge eating. Due to a data collection error with the 5-Trial Adjusting Delay Task, only a portion of the sample ($n = 100$) was able to be used in this analysis. The predictor variables, flexible and rigid dietary control and delay discounting, were tested to verify that there was no violation of the assumption of the linearity of the logit.

The results from the logistic regression are displayed in Table 2. A two-step model was run in order to evaluate the contribution of the main effects only and then the interaction terms to the model. The second model explained 30.3% (Nagelkerke R^2) of the variance in binge eating status. Both interactions between flexible or rigid dietary control and delay discounting were not significant ($p = .097$ for FC; $p = .068$ for RC). However, it should be noted that the interaction between delay discounting and rigid dietary control was marginally significant. Yet, the second hypothesis was rejected. However, interestingly, there was a significant main effect for rigid

Table 2: Logistic Regression Model Predicting Binge Eating Status from the Interactions Between Dietary Restraint (“Flexible” and “Rigid”) and Delay Discounting.

Variable	Estimate	SE	95% CI		OR	<i>p</i>
			UL	LL		
Block 1						
Constant	-1.302	.533	--		.272	.014
Rigid Control	.253	.098	1.063	1.560	1.288	.010**
Flexible Control	-.034	.103	.790	1.184	.967	.745
Delay Discounting	-1.782	1.609	.007	3.938	.168	.268
Block 2						
Constant	-1.589	.598	--		.204	.008
Rigid Control	.454	.134	1.211	2.046	1.574	.001**
Flexible Control	-.180	.128	.650	1.073	.835	.159
Delay Discounting	-1.197	2.975	.001	102.964	.302	.688
Delay Discounting*Flexible	2.304	1.389	.658	152.416	10.016	.097
Control						
Delay Discounting*Rigid	-3.013	1.653	.002	1.254	.049	.068
Control						

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

dietary control ($B = .454$, $se(B) = .134$, $p = .001$), where increased scores on the TFEQ-RC were associated with a higher likelihood of binge eating. In other words, for every one-unit increase in rigid dietary control, measured by the TFEQ-RC, the odds of engaging in binge eating were higher by a factor of 1.574.

For the third hypothesis, a moderation effect was tested using logistic binomial regression to predict the likelihood of individuals engaging in binge eating based on the interaction between dietary restraint and impulsivity. Data was missing from 16 participants ($n = 283$) for these variables; thus, those participants were excluded from this analysis. The predictor variables were tested beforehand to verify that there was no violation of the assumption of the linearity of the logit. The results for the moderation and main effects can be viewed in Table 3. As shown in

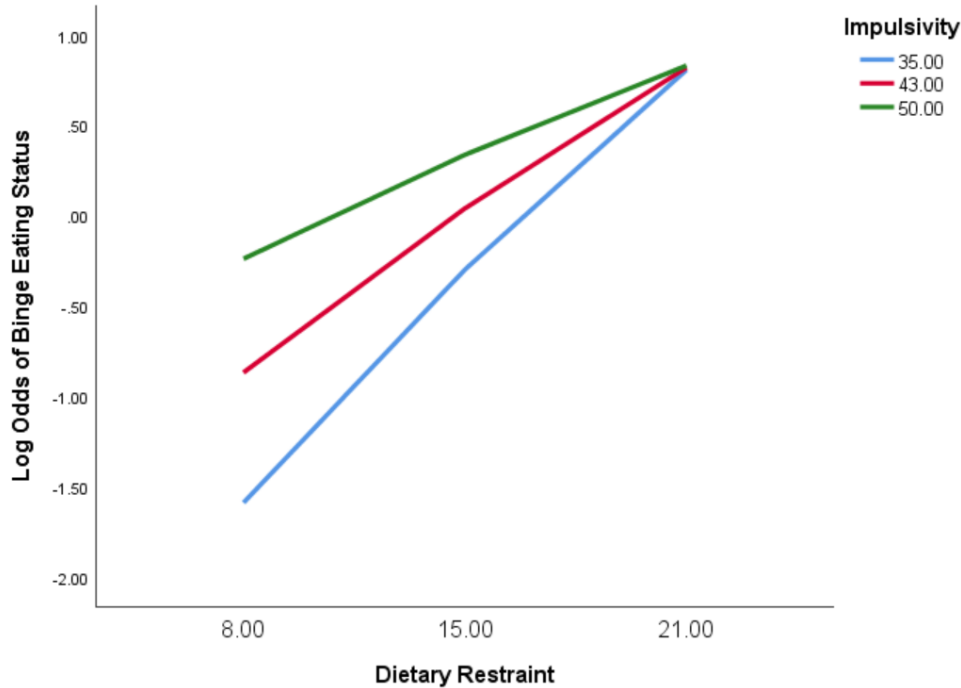
Figure 2, there was a significant interaction between dietary restraint and impulsivity ($B = -.007$, $se(B) = .003$, $p = .027$). The interaction suggested that participants scoring within the 16th and

Table 3: Moderation Analysis Predicting Binge Eating Status from the Interaction Between Dietary Restraint and Impulsivity.

Variable	Estimate	SE	95% CI		OR	<i>p</i>
			UL	LL		
Block 1						
Constant	-3.727	.823	--		.024	.000
Impulsivity	.044	.018	1.010	1.082	1.045	.011*
Dietary Restraint	.124	.022	1.083	1.182	1.132	.000***
Block 2						
Constant	-8.125	2.241	--		.000	.000
Impulsivity	.145	.050	1.048	1.274	1.156	.004**
Dietary Restraint	.423	.140	1.160	2.007	1.526	.003**
Dietary Restraint*Impulsivity	-.007	.003	.987	.999	.993	.027*

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 2: Conditional Effects of Dietary Restraint on Binge Eating Status as Moderated by Impulsivity.



50th percentiles of restraint were more likely to binge-eat as their level of impulsivity increased, but scores in the 84th percentile for restraint were more likely to engage in binge-eating regardless of impulsivity. This may be further interpreted as observing that impulsivity may be most important to consider in the relationship between dietary restraint and binge-eating status at lower levels of dietary restraint.

Notably, the main effects for dietary restraint ($B = .423$, $se(B) = .140$, $p = .003$) and impulsivity ($B = .145$, $se(B) = .050$, $p = .004$) were significant, such that as levels of dietary restraint or impulsivity increased, the odds of engaging in binge eating were greater. For every one-unit increase in dietary restraint, the odds of engaging in binge eating were greater by a factor of 1.526. Similarly, for every one-unit increase in impulsivity, individuals were 1.156 times more likely to binge-eat.

Finally, a Spearman Rho correlation was run to test the relationship between delay discounting and the number of reported binge-eating episodes. The relationship between the two variables was non-significant, indicating that the two variables were not related ($r_{(101)} = .07, p > .05$). See Table 4 for the correlation coefficients.

Table 4: Spearman Rho Correlation Between Binge Eating Episodes and Delay Discounting.

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	1	2
1. Binge-eating episodes	296	2.25	3.20		.07
2. Delay discounting (k-value)	103	.06	.15		

* $p < .05$ ** $p < .001$

Exploratory Analysis

An exploratory analysis was conducted in order to observe whether there were any associations between intuitive eating, psychological flexibility, and mindful eating across the main study variables. According to the correlation matrix in Table 5, there were several significant correlations. Unsurprisingly, intuitive eating was significantly positively correlated with the abilities to rely on hunger and satiety cues, eat with awareness, and eat without distraction. However, the more interesting finding may have been that it was significantly negatively correlated with impulsivity, both rigid and flexible dietary control, dietary restraint, and psychological inflexibility. This indicates that an individual endorses engaging in intuitive

eating tends to exhibit less impulsivity, less rigid and flexible dietary control, less dietary restraint, and less psychological inflexibility.

Table 5. Descriptive Statistics and Pearson Correlation among Study Variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	<i>n</i>	<i>M</i>	<i>SD</i>
1. SUPPS-P		-.20**	.00	.06	.14*	.21*	.35**	-.07	-.11	-.20**	-.06	-.09	286	42.75	7.69
2. IES-2			-.29**	-.45**	-.60**	-.39**	-.41*	.06	.65**	.22**	.123*	.16	292	3.31	0.55
3. TFEQ-FC				.76**	.60**	.15*	.17**	.08	-.18**	-.04	-.03	-.06	288	6.14	3.34
4. TFEQ-RC					.73**	.26**	.19**	.04	-.30**	-.11	-.05	-.09	292	6.51	3.75
5. RS						.30**	.32**	.03	-.41**	-.13*	-.04	-.13	294	14.43	6.60
6. Binge Eating Episodes _a							.16**	-.11	-.32**	-.27**	-.14*	-.04	296	2.25	3.20
7. AAQ-2								.08	-.19**	-.21**	-.22**	-.10	290	21.92	10.52
8. MEBS-FE subscale									.31**	.21**	-.13*	.02	289	19.85	3.84
9. MEBS-HSC subscale										.07	-.09	.08	291	17.90	4.78
10. MEBS-EA subscale											.38**	.17	293	11.68	2.82
11. MEBS – ED subscale												.05	293	12.01	3.09
12. Discounting rate (<i>k</i>) _a													103	0.62	0.15

* $p < .05$, ** $p < .01$

_aScores were not normally distributed, therefore findings should not be interpreted.

AAQ-2 = Acceptance and Action Questionnaire-II, [MEBS]-EA = Eating with Awareness subscale, [MEB]-ED = Eating without Distraction subscale, [MEBS]-FE = Focused Eating subscale, IES-2 = Intuitive Eating Scale-2, MEBS = Mindful Eating Behaviour Scale, [MEBS]-HSC = Hunger and Satiety Cues subscale, RS = Revised Restraint Scale, SUPPS-P = Short UPPS-P Impulsive

Behavior Scale, TFEQ-FC = Three-Factor Eating Questionnaire – Flexible Control subscale, TFEQ-RC = Three-Factor Eating Questionnaire – Rigid Control subscale.

While many of these were weak correlations, intuitive eating was positively, strongly correlated with the ability to rely on hunger and satiety cues, and negatively and strongly or moderately strongly correlated with dietary restraint, rigid dietary control, and psychological inflexibility.

Similarly, the same relationships were observed between psychological inflexibility and the other study variables. For instance, higher psychological inflexibility was associated with higher impulsivity, higher levels of rigid and flexible dietary control, and higher dietary restraint. In contrast, lower psychological inflexibility was associated with higher reports of intuitive eating, and greater abilities to rely on hunger and satiety cues, eat with awareness, and eat without distraction. The associations were most strong between psychological inflexibility and intuitive eating and impulsivity.

4. SUMMARY AND CONCLUSIONS

The goals of the present study were to determine whether any differences in dietary restraint and binge eating behavior were seen in individuals engaging in intermittent fasting compared to those who were not or had only done it in the past, and whether or not dietary restraint, impulsivity, or delay discounting predicted reports of binge eating across the entire sample. College students from a large public university in Texas were recruited and completed the study online. Participants were asked questions about whether or not they were engaging in intermittent fasting, as well as their levels of dietary restraint from the Revised Restraint Scale (Polivy & Herman, 1975), dietary control using the Flexible Control and Rigid Control subscales within the Three-Factor Eating Questionnaire (Westenhoefer, 1991), binge-eating frequency within the last three months, which was measured using the Eating Disorder Diagnostic Scale for DSM-5 (Bohon & Stice, 2015), impulsivity using the Short UPPS-P Impulsive Behavior Scale (Lynam, 2013), and delay discounting using the 5-Trial Adjusting Delay Task (Koffarnus & Bickel, 2014). Additional measures, such as the Mindful Eating Behaviour Scale (Winkens et al., 2018), Intuitive Eating Scale 2 (Tylka & Kroon Van Diest, 2013), and the Acceptance and Action Questionnaire-II (Bond et al., 2011) were included in the study survey but were only included in an exploratory analysis, since they were not involved in the hypotheses.

It was first hypothesized that individuals engaging in intermittent fasting would be more likely to binge-eat than individuals who did not fast. While this hypothesis was originally intended to be tested using an ANOVA with binge eating frequency as the dependent variable and intermittent fasting status as the independent variable, the binge eating frequency was found to be not normally distributed. Thus, a chi-square test of independence with a dichotomous

binge eating variable was conducted. However, it was observed that a significantly higher proportion of individuals who were intermittent fasting were more likely to binge-eat than not, while individuals who were not fasting were significantly less likely to binge-eat.

While this analysis was not able to explain the temporal relationship between binge eating and intermittent fasting, this finding can be supported by other studies that have focused on Ramadan fasting (Akgül et al., 2014; Erol et al., 2008) and short-term fasting (Telch & Agras, 1996). For instance, Telch & Agras (1996) found that food deprivation for six hours was associated with subsequent increased consumption of calories. However, another study that instructed participants to fast for twenty-four hours did not find an increase in binge-eating episodes, although reports trended toward significance ($p = .05$) (Schaumberg et al., 2015). A 12-week trial of time-restricted feeding similarly did not lead to increased binge-eating behavior as compared to baseline measures (Gabel et al., 2019). While it was suggested by Akgül et al. (2014) that fasting exacerbates disordered eating symptoms rather than causes them, this has not been tested in a randomized controlled trial. Therefore, it is important that future research studies investigate pre- and post- intermittent fasting intervention reports of binge-eating behaviors in healthy individuals with no prior history of an eating disorder.

Next, it was hypothesized that individuals engaging in intermittent fasting would exhibit higher levels of dietary restraint. As expected, both groups of individuals who were currently fasting and those who had fasted in the past reported significantly higher dietary restraint than those who had never engaged in intermittent fasting. However, while individuals currently fasting also reported higher levels of dietary restraint than the group who had fasted in the past, the difference was not statistically significant. This may suggest that there is a lasting impact of intermittent fasting on heightened levels of dietary restraint, given that those who had fasted in

the past still reported significantly greater dietary restraint than the group that had not fasted. While intermittent fasting implies dietary restriction, the importance of this finding is that it further confirms a relationship between fasting and dietary restraint, which has previously been discovered to be predictive of disordered eating patterns (Dalle Grave, 2020; Polivy, 1996). However, it is also known that dietary restraint does not universally predict binge eating (Schaumberg & Anderson, 2016). Therefore, other variables such as impulsivity and delay discounting were considered in the other analyses in order to determine whether they contributed to, or explained, the association between dietary restraint and binge eating behaviors.

For instance, the second hypothesis tested whether the likelihood of binge eating could be predicted based on the interaction between “rigid” and/or “flexible” dietary restraint styles and delay discounting. In addition, the fourth hypothesis proposed that a significant, positive correlation would exist between delay discounting and binge eating episodes. However, both hypotheses were not supported. This was surprising, given that prior evidence exists to support a relationship between delay discounting and binge eating (Davis et al., 2010; Steward et al., 2017). It is possible that the lack of significant findings can be attributed to other factors. For instance, some studies have suggested that the positive relationship between delay of gratification and binge eating may be dependent on or confounded by other factors, such as obesity and level of education (Davis et al., 2010). For example, individuals who are obese tend to have a more difficult time delaying gratification (Mole et al., 2015; Weller et al., 2008), and Davis et al. (2010) further found that the difference between average-weight and obese individuals on a delay discounting task was no longer significant after accounting for education level. Since the present sample consisted of primarily average to slightly overweight individuals in a secondary education setting, perhaps this played a role in the lack of variation of the data,

and consequently the lack of significant findings. More research may need to be conducted with individuals with a wider range of education level and weight status.

Despite this, the interaction between delay discounting and rigid dietary control was marginally significant. While the analysis included a sample size that produced sufficient power to see a medium-sized effect, it may be worth attempting to replicate or reproduce these results with a slightly larger sample. In addition, it may be worth noting that the delay discounting task was presented at the end of the study. Therefore, it is possible that participants were plagued by fatigue and may have been less invested in the discounting task, thus performing unlike how they would typically. Yet, the entire study was pre-tested by an undergraduate research assistant and confirmed to only take approximately fifteen minutes in total to complete. Thus, while fatigue may have played a role, it is not likely that it substantially affected data collection.

Another interesting, yet exploratory, finding was that a “rigid”, but not “flexible”, dietary style was predictive of binge-eating in the regression model. This replicates other findings that also support a relationship between a more “rigid” style of eating and overeating or bingeing (Westenhoefer et al., 1991; Westenhoefer et al., 1994; Stewart et al., 2002). While “flexible” dietary control is characterized by a more gradual approach to dieting, rigid restraint is associated with a dichotomous, “all or nothing”, pattern. In fact, cognitive-behavioral theories postulate that dichotomous thinking, which is often seen in individuals with a “rigid” style of dieting, may serve to perpetuate binge eating (Fairburn et al., 2003). It is thought that it contributes to a cycle where, for one reason or another, an individual engages in severe or controlled dietary restraint, which leads to binge eating, followed by negative thoughts and reactions to the dietary “slip” (e.g., dichotomous thinking), which then restart the ineffective cycle to be repeated continuously. In summary, the presence of rigid dieting may predict the

likelihood of binge eating, but the causal or mediating effect needs to be further tested in a randomized controlled trial or longitudinal study.

One of the more interesting findings from this study was that impulsivity was a significant moderator in the relationship between dietary restraint and binge-eating status. Yet, dietary restraint and impulsivity were also individually predictive of binge-eating status, such that higher dietary restraint and higher impulsivity independently indicated a greater likelihood to binge. The moderating effect of impulsivity leveled off once an individual was considered “high” or in the upper percentile of dietary restraint, such that impulsivity no longer increased the strength of the effect. This finding that impulsivity moderated the relationship between dietary restraint and binge eating status was not surprising, but it was interesting given that delay discounting, which is often similarly placed into the definitional category of decision-making, did not correlate with or predict binge eating status. However, Manwaring et al. (2011) has suggested that impulsivity and delay discounting indeed tap into different facets of decision-making. Since the SUPPS-P measures behaviors and thought patterns such as positive and negative urgency, lack of premeditation, sensation-seeking, and lack of perseverance, it may be prudent to conclude that these aspects of impulsivity may have more of a direct association with the occurrence of binge eating than the behavior of delaying or not significantly delaying monetary rewards.

Furthermore, while impulsivity significantly moderated the relationship between dietary restraint and binge-eating status, there were also significant main effects for both impulsivity and dietary restraint. When examined further, both appeared to positively predict the likelihood of binge eating, such that as impulsivity increased or dietary restraint heightened, individuals were more likely to endorse one or more binge episodes. Both of these variables have been

extensively studied and similarly found to be significant factors in the development and/or maintenance of binge-eating behaviors (Fairburn et al., 1993; Mason et al., 2016; Mushquash et al., 2019). This finding may be particularly important to consider for the etiology and treatment of subthreshold binge-eating behaviors, given that the data was collected from a non-clinical sample.

Lastly, the exploratory analysis which consisted of generating a correlation matrix with all the study variables showed promise for relationships between psychological flexibility and intuitive eating, impulsivity, dietary control, and dietary restraint. There is a need to further investigate the relationship between psychological flexibility and intuitive eating, especially in relation to disordered eating behaviors. For instance, Sairanen & colleagues (2015) discovered that general psychological flexibility, along with mindful eating, similarly and uniquely contribute to variance in intuitive eating. This work could further replicate those findings by examining the relationships between psychological inflexibility, mindful eating, intuitive eating and disordered eating behaviors. There is some evidence that eating with awareness and eating without distraction are significantly, negatively related to emotional eating (Winkens, 2018), and individuals who report intuitive eating behaviors are less likely to engage in chronic dieting and binge eating (Denny et al., 2013).

Notably, intuitive eating, psychological flexibility, and eating with awareness were negatively associated with impulsivity. It would be interesting to explore how each of these may interact with impulsivity and dietary restraint, and whether they could potentially be incorporated into standard treatment interventions. While there is limited evidence to suggest that intuitive eating is effective as an intervention tool in reducing disordered eating behaviors, mindfulness-

based interventions have been shown to aid in the treatment of binge eating and emotional eating behaviors (Warren et al., 2017).

Summary

Results from the study indicated that college students engaging in intermittent fasting were more likely than those not fasting to be higher in dietary restraint and were more likely than not report episodes of binge eating. Students who had engaged in intermittent fasting in the past were also significantly higher in dietary restraint than those had never fasted, and were more likely than not to engage in binge eating. Further, in the entire sample, a rigid dietary style was predictive of binge eating. However, contrary to the second hypothesis, there was no direct, significant relationship between delay discounting and binge eating. However, impulsivity significantly moderated the relationship between dietary restraint and binge eating. In addition, high impulsivity and high dietary restraint also independently increased the odds of binge eating.

Limitations

There were several limitations in this study. This study recruited college students who were primarily psychology majors at a large, public university, which led to the inclusion of primarily young, educated, high-income, female students. Additionally, most of the participants identified as Caucasian/White. As such, the results of this study may not necessarily generalize to other populations. Secondly, the number of participants in the group of individuals who were not currently fasting but had fasted in the past was lower ($n = 48$) than recommended by Cohen (1992) for statistical analyses examining three groups ($n = 52$), thereby reducing the power for the analysis supporting the first hypothesis. Therefore, the findings of the first hypothesis should be interpreted with caution.

Thirdly, the frequency of binge-eating episodes was transformed into a dichotomous variable (“Yes-binge” or “No-binge”) due to the non-normal distribution of the data, where approximately half of the participants did not report a single binge episode in the past three months. While this was to be expected in a relatively healthy, college student population, it led to using alternative data analytic strategies, including running a chi-square test rather than ANOVA, which, on one hand, is not as sensitive to outliers or non-normally distributed data, but on the other hand may not provide as meaningful results. Future studies may seek to increase the intended sample size in order to have a better chance at seeing a wider range of binge behaviors, or purposely recruit individuals endorsing binge-eating behaviors.

Additionally, due to the cross-sectional nature of this study, the temporal relationships between variables cannot be established. In other words, it is not clear at what point in time dietary style and impulsivity interact to increase the likelihood of binge eating, or whether engaging in intermittent fasting causes dietary restraint and/or binge eating. It could be the other way around, such that individuals who are higher in dietary restraint or more prone to binge eating tend to engage in fad diets such as intermittent fasting, or perhaps there is a larger contribution from a third variable beyond the scope of this study.

Implications

The results from this study suggest several important considerations. Firstly, individuals who are engaging in intermittent fasting may be more likely to binge eat. In addition, these individuals are more likely to be restrained eaters, which is known to be associated with binge eating. Further, a rigid dietary style of eating was found to increase the odds of binge eating across the entire sample, while an interaction between delay discounting and rigid dietary control was marginally significant in predicting binge eating. Similarly scoring high in dietary restraint

and impulsivity led to increased odds of binge eating, with the addition of impulsivity serving to strengthen the positive relationship between dietary restraint and the occurrence of binge eating. Additionally, preliminary findings indicating significant relationships between intuitive eating, psychological flexibility, eating with awareness, and impulsivity may be worth investigating. Future studies should seek to confirm these effects by implementing a longitudinal design. In addition, the use of randomized controlled trials will be needed to explain the temporal relationships between the variables.

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APPENDIX A
DEMOGRAPHICS

1. What is your gender?
 - Male
 - Female
 - Other (specify)

2. What is your age?
 - 18
 - 19
 - 20
 - 21
 - 22
 - 23-25
 - 25+

3. What is your race? Select all that apply
 - African American
 - White
 - American Indian or Alaska native
 - Asian
 - Native Hawaiian or Pacific Islander
 - Other (please specify)

4. What is your ethnicity?

- Hispanic or Latino
 - Not Hispanic or Latino
5. What school classification are you?
- Freshman
 - Sophomore
 - Junior
 - Senior
 - Other (please specify)
6. Are you an international student?
- Yes
 - No
7. What is your religious affiliation?
- Christianity
 - Catholicism
 - Judaism
 - Mormonism/Church of Jesus Christ of Latter Day Saints
 - Buddhism
 - Hinduism
 - Muslim
 - Other (please specify)
 - Prefer not to say
8. Please provide an estimate of your gross annual income. If you are financially dependent on your parents, please select an estimate of their income.

- \$0-10,000
- \$10,000-20,000
- \$20,000-30,000
- \$30,000-50,000
- \$50,000-100,000
- \$100,000+
- I don't know
- Prefer not to say

9. What is your current living situation?

- Dorm or apartment on-campus
- Apartment off-campus
- House (renting or bought)
- Home (with family)
- Other (please specify)

10. Do you live alone or with roommates/spouse/family? (multiple choice answer)

- Alone
- With roommates
- With spouse
- With family

APPENDIX B

INTERMITTENT FASTING QUESTIONS

1. In regards to your eating behaviors, how would you classify yourself?
 - Vegetarian
 - Vegan
 - I do not limit the types of food I eat.
 - Other (please specify)
2. In regards to your eating *patterns*, how would you classify yourself?
 - Currently dieting
 - Dieted in the past
 - Never dieted
 - I don't know
3. Are you currently engaging in intermittent fasting, or have you attempted it in the past?
 - Yes, I am currently engaging in intermittent fasting
 - No, I am not currently engaging in intermittent fasting
 - I have attempted intermittent fasting in the past, but have since stopped doing it.
4. (If they answered "I have attempted intermittent fasting in the past, but have since stopped doing it) Why did you decide to discontinue intermittent fasting? Please explain in your own words

5. (If they answered “Yes, I am currently engaging in intermittent fasting”) If you are currently engaging in intermittent fasting, please select the chose below that most closely resembles your own feeding schedule or regimen.
- a. Alternate-day fasting, or completely restricting all caloric intake for approximately 24 hours, typically with the exception of sugar-free and energy-free beverages or items including coffee, tea, gum, and water. Typically, you eat normally, or ad-libitum, the next day before fasting again on the following day.
 - b. Modified alternate-day fasting (also known as the 5:2 diet), which consists of restricting energy or caloric intake to 25% of your typical intake on two non-consecutive days during the week. This means consuming approximately 300-500 calories across 24 hours. During the other five days of the week, you typically eat normally, or ad-libitum.
 - c. Time-restricted fasting (also known as the 16/8 diet), which involves restricting your daily caloric intake to a window of time each day (e.g., skipping breakfast or restricting caloric intake from 12-8pm; or, only eating after 6pm), but with no restrictions on the types or amount of food that is eaten during that block of time.
 - d. None of these sound similar at all to what I do (please specify)
 - e. I am not currently participating in intermittent fasting
6. (If they answered “Yes, I am currently engaging in intermittent fasting”) What is your initial reason for pursuing intermittent fasting?
- Religious purposes
 - Weight loss/weight change
 - Lifestyle change

- Treatment for chronic illness or other physical health condition
 - Other (please specify)
7. (If they answered “Yes, I am currently engaging in intermittent fasting”) Are close peers or family members also fasting with you? Select all that apply
- Friends
 - Roommates
 - Family members
 - No, I am not fasting with anyone else
 - Other (please specify)
8. (If they answered “Yes, I am currently engaging in intermittent fasting”) How long have you been engaged in intermittent fasting?
- Less than one week
 - 1-3 weeks
 - 3-6 weeks
 - 6-8 weeks
 - 2-6 months
 - 6-12 months
 - Other (please specify)
9. (If they answered “Yes, I am currently engaging in intermittent fasting”) How successful do you consider yourself to be at maintaining this diet regimen?
- 1 - Not at all successful
 - 2 - Slightly successful
 - 3 – Mostly successful

- 4 – Always successful

APPENDIX C

SHORT UPPS-P IMPULSIVE BEHAVIOR SCALE (SUPPS-P)

1. I generally like to see things through to the end.
 - Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
2. My thinking is usually careful and purposeful.
 - Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
3. When I am in a great mood, I tend to get into situations that could cause me problems.
 - Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
4. Unfinished tasks really bother me.
 - Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree

5. I like to stop and think things over before I do them.
- Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
6. When I feel bad, I will often do things I later regret in order to make myself feel better now.
- Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
7. Once I get going on something I hate to stop.
- Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
8. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.
- Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
9. I quite enjoy taking risks.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

10. I tend to lose control when I am in a great mood.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

11. I finish what I start.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

12. I tend to value and follow a rational, “sensible” approach to things.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

13. When I am upset I often act without thinking.

- Strongly agree
- Somewhat agree
- Somewhat disagree

- Strongly disagree

14. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

15. When I feel rejected, I will often say things that I later regret.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

16. I would like to learn how to fly an airplane.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

17. Others are shocked or worried about the things I do when I am feeling very excited.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

18. I would enjoy the sensation of skiing very fast down a high mountain slope.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

19. I usually think carefully before doing anything.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

20. I tend to act without thinking when I am really excited.

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

APPENDIX D

5-TRIAL ADJUSTING DELAY TASK

“You will now be presented with a series of decision situations relating to [money/lbs lost/servings of your favorite food]. These are hypothetical, but please choose your answer as if you will receive the [money/lose the indicated weight (in lbs)/servings of your favorite food]. in the time frame selected. Please pay close attention to the amount and time frame of each option, and choose accordingly. There are no right or wrong answers in this task. Please take your time.”

Monetary Discounting Task (64 possible trials, only 5 trials displayed per participant)

Example:

1. Which would you rather have?

\$100 in 3 weeks \$50 now

Weight Discounting Task (64 possible trials, only 5 trials displayed per participant)

Example:

1. Which would you rather have?

5 lbs lost now 10 lbs lost in 3 weeks

Food Discounting Task (64 possible trials, only 5 trials displayed per participant)

Example:

1. Which would you rather have?

3 servings of your favorite food in 3 weeks 1.5 servings of your favorite food now

APPENDIX E

INTUITIVE EATING SCALE-2 (IES-2)

For each item, the following response scale should be used: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

1. I try to avoid certain foods high in fat, carbohydrates, or calories.
2. I find myself eating when I'm feeling emotional (e.g., anxious, depressed, sad), even when I'm not physically hungry.
3. If I am craving a certain food, I allow myself to have it.
4. I get mad at myself for eating something unhealthy.
5. I find myself eating when I am lonely, even when I'm not physically hungry.
6. I trust my body to tell me when to eat.
7. I trust my body to tell me what to eat.
8. I trust my body to tell me how much to eat.
9. I have forbidden foods that I don't allow myself to eat.
10. I use food to help me soothe my negative emotions.
11. I find myself eating when I am stressed out, even when I'm not physically hungry.
12. I am able to cope with my negative emotions (e.g., anxiety, sadness) without turning to food for comfort.
13. When I am bored, I do NOT eat just for something to do.
14. When I am lonely, I do NOT turn to food for comfort.
15. I find other ways to cope with stress and anxiety than by eating.
16. I allow myself to eat what food I desire at the moment.

17. I do NOT follow eating rules or dieting plans that dictate what, when, and/or how much to eat.
18. Most of the time, I desire to eat nutritious foods.
19. I mostly eat foods that make my body perform efficiently (well).
20. I mostly eat foods that give my body energy and stamina.
21. I rely on my hunger signals to tell me when to eat.
22. I rely on my fullness (satiety) signals to tell me when to stop eating.
23. I trust my body to tell me when to stop eating.

APPENDIX F

RIGID CONTROL AND FLEXIBLE CONTROL SUBSCALES FROM THE THREE- FACTOR EATING QUESTIONNAIRE (TFEQ)

Flexible Control (FC12)

1. When I have eaten my quota of calories, I am usually good about not eating any more (true – false)
2. I deliberately take small helpings as a means of weight control (true – false)
3. While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it (true – false)
4. I consciously hold back at meals in order not to gain weight (true – false)
5. I pay a great deal of attention to changes in my figure (true – false)
6. How conscious are you of what you are eating? (not at all – slightly – moderately – extremely)
7. How likely are you to consciously eat less than you want? (unlikely – slightly unlikely – moderately likely – very likely)
8. If I eat a little bit more on one day, I make up for it the next day (true – false)
9. I pay attention to my figure, but I still enjoy a variety of foods (true – false)
10. I prefer light foods that are not fattening (true – false)
11. If I eat a little bit more during one meal, I make up for it at the next meal (true – false)
12. Do you deliberately restrict your intake during meals even though you would like to eat more? (always – often – rarely - never)

Rigid Control (RC16)

1. I have a pretty good idea of the number of calories in common food (true – false)
2. I count calories as a conscious means of controlling my weight (true – false)
3. How often are you dieting in a conscious effort to control your weight? (rarely – sometimes – usually – always)
4. Would a weight fluctuation of 5 lb affect the way you live your life? (not at all – slightly – moderately – very much)
5. Do feelings of guilt about overeating help you to control your food intake? (never – rarely – often – always)
6. How frequently do you avoid “stocking up” on tempting foods? (almost never – seldom – usually – almost always)
7. How likely are you to shop for low calorie foods? (unlikely – slightly unlikely – moderately likely – very likely)
8. I eat diet foods, even if they do not taste very good (true – false)
9. A diet would be too boring a way for me to lose weight (true – false)
10. I would rather skip a meal than stop eating in the middle of one (true – false)
11. I alternate between times when I diet strictly and times when I don’t pay much attention to what and how much I eat (true – false)
12. Sometimes I skip meals to avoid gaining weight (true – false)
13. I avoid some foods on principle even though I like them (true – false)
14. I try to stick to a plan when I lose weight (true – false)
15. Without a diet plan, I wouldn’t know how to control my weight (true – false)
16. Quick success is most important for me during a diet (true – false)

APPENDIX G

REVISED RESTRAINT SCALE

1. How often are you dieting?

- Never
- Rarely
- Sometimes
- Usually
- Always

2. What is the maximum amount of weight (in pounds) you have ever lost within one month?

- 0 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20+

3. What is your maximum weight gain within a week?

- 0 - 1
- 1.1 - 2
- 2.1 - 3
- 3.1 - 5
- 5.1+

4. In a typical week, how much does your weight fluctuate?

- 0 - 1
- 1.1 - 2
- 2.1 - 3
- 3.1 - 5
- 5.1+

5. Would a weight fluctuation of five pounds affect the way you live your life?

- Not at all
- Slightly
- Moderately
- Extremely

6. Do you eat sensibly in front of others and splurge alone?

- Never
- Rarely
- Often
- Always

7. Do you give too much time and thought to food?

- Never
- Rarely
- Often
- Always

8. Do you have feelings of guilt after overeating?

- Never
- Rarely
- Often
- Always

9. How conscious are you of what you are eating?

- Not at all
- Slightly
- Moderately
- Extremely

10. How many pounds over your desired weight were you at your maximum weight?

- 0 – 1
- 1 – 5
- 6 – 10
- 11 – 20
- 21+

APPENDIX H

EATING DISORDER DIAGNOSTIC SCALE-DSM-5 VERSION (EDDS-5)

Please carefully complete all questions, choosing NO or 0 for questions that do not apply.

Over the past <u>3 months</u>...	Not at all	Slightly	Moderately	Extremely			
1. Have you felt fat?.....	0	1	2	3	4	5	6
2. Have you had a definite fear that you might gain weight or become fat?.....	0	1	2	3	4	5	6
3. Has your weight or shape influenced how you judge yourself as a person?.....	0	1	2	3	4	5	6
4. During the past <u>3 months</u> , have there been times when you felt you have eaten what other people would regard as an unusually large amount of food (e.g., a pint of ice cream) given the circumstances?							
<ul style="list-style-type: none"> ○ Yes ○ No 							
5. During the times when you ate an unusually large amount food, did you experience a loss of control? (e.g., felt you couldn't stop eating or control what or how much you were eating)							
<ul style="list-style-type: none"> ○ Yes ○ No 							

6. How many times per month on average over the past 3 months have you eaten an unusually large amount of food and experienced a loss of control?

0 – 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10 – 11 – 12 – 13 – 14 – 15 – 16+

During these episodes of overeating with a loss of control, did you...

7. Eat much more rapidly than normal?.....Yes.....No

8. Eat until you felt uncomfortably full?.....Yes.....No

9. Eat large amounts of food when you didn't feel physically hungry?.....Yes.....No

10. Eat alone because you were embarrassed by how much you were eating?..Yes.....No

11. Feel disgusted with yourself, depressed, or very guilty after overeating?....Yes.....No

12. If you have episodes of uncontrollable overeating, does it make you very upset?...Yes..No

In order to prevent weight gain or counteract the effects of eating, how many times per month on average over the past 3 months have you:

13. Made yourself vomit?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16+

14. Used laxatives or diuretics?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16+

15. Fasted (skipped at least two meals in a row)?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16+

16. Engaged in more intense exercise specifically to counteract the effects of overeating?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16+

17. How many times per month on average over the past 3 months have you eaten after awakening from sleep or eaten an unusually large amount of food after your evening meal and felt distressed by the night eating?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16+

18. How much do eating or body image problems impact your relationships with friends and family, work performance, and school performance?

Not at all Slightly Moderately Extremely

0 1 2 3 4 5 6

19. How much do you weigh? If uncertain, please give your best estimate. ____ lbs

20. How tall are you? ____ ft ____ in.

21. What is your highest weight at your current height? ____ lbs

APPENDIX I

ACCEPTANCE AND ACTION QUESTIONNAIRE II (AAQ-II)

Below you will find a list of statements. Please rate how true each statement is for you by selecting a number next to it. Use the following scale to make your choice: 1= never true, 2 = very seldom true, 3 = seldom true, 4 = sometimes true, 5 = frequently true, 6 = almost always true, 7 = always true

1. My painful experiences and memories make it difficult for me to live a life that I would value.
2. I'm afraid of my feelings.
3. I worry about not being able to control my worries and feelings.
4. My painful memories prevent me from having a fulfilling life.
5. Emotions cause problems in my life.
6. It seems like most people are handling their lives better than I am.
7. Worries get in the way of my success.

APPENDIX J

MINDFUL EATING BEHAVIOUR SCALE (MEBS)

Please choose from the following response scale when answering items: Never, Seldom, Sometimes, Often, Very Often

1. I notice flavors and textures when I'm eating my food.
2. I stay aware of my food while eating.
3. I notice how my food looks.
4. I notice the smells and aromas of food.
5. It is easy for me to concentrate on what I eat.
6. I trust my body to tell me when to eat.
7. I trust my body to tell me what to eat.
8. I trust my body to tell me how much to eat.
9. I rely on my hunger signals to tell me when to eat.
10. I rely on my fullness signals to tell me when to stop eating.
11. I snack without being aware that I am eating.
12. I eat automatically without being aware of what I eat.
13. I eat sometimes without really being aware of it.
14. My thoughts tend to wander while I am eating.
15. I think about things I need to do while I am eating.
16. I multitask while I am eating.
17. I read while I am eating.