TEMPORAL DISCOUNTING AND BODY MASS INDEX IN COLLEGE STUDENTS

A THESIS IN
Psychology

Presented to the Faculty of the University of Missouri-Kansas City in partial fulfillment of the requirements for the degree

MASTER OF PSYCHOLOGY

by
DANTHEA ALINE FERNANDEZ

B.A., University of Missouri-Kansas City, 2011

Kansas City, Missouri
2013
ABSTRACT

Overconsumption of food and drink can lead to overweight and obesity, which in turn can lead to chronic diseases such as heart disease and diabetes. Current data show that two-thirds of the adult population in the United States is overweight or obese. A research study was conducted at the University of Missouri–Kansas City with a sample of 148 students. The goal of the study was to examine the relationships between weight status, self-reported eating behavior, and temporal discounting. To assess these constructs, self-reported eating behavior measures and a temporal discounting measure (which assesses impulsivity and the ability to delay gratification) were used.

The first hypothesis proposed higher BMI would be significantly related with greater impulsivity as determined by temporal discounting rates. The second hypothesis proposed that higher BMI would be significantly related with increased eating-related disinhibition, decreased diet restricting, decreased healthful habits, and increased hunger-related behavior. The third hypothesis proposed that individuals with greater impulsivity would report increased eating-related disinhibition, decreased diet restricting, decreased healthful habits, and increased hunger-related behavior.
In evaluating the first hypothesis, the study results found no significant relationship between BMI and impulsivity (determined by temporal discounting rates) for this sample. However, for the second hypothesis, it was concluded that an increase in BMI was weakly related to an increase in dietary restraint (i.e., meal planning) and eating-related disinhibition (i.e., not being able to stop eating or keep oneself from eating). The study results for the third hypothesis also concluded that as impulsivity increase was weakly related to an increase in hunger-related behavior and feelings (i.e., feeling hungry; eating related to hunger).

Overall, it was expected that there would be stronger correlations between BMI, self-reported eating behavior, and temporal discounting rates. Further research is needed to understand better the relationship between obesity and temporal discounting.
ACKNOWLEDGEMENTS

I would like to express my profound gratitude to Dr. Amanda S. Bruce for giving me the opportunity to participate in exciting and compelling work. I would also like to thank her for her advice, assistance, patient guidance and encouragement. My grateful thanks to my research committee members, Dr. Jared Bruce and Dr. Jennifer D. Lundgren, for their useful critiques of this research.

I would like to express my very great appreciation to my wonderful lab partners, who have been along this journey with me from the beginning and were invaluable in my research, Bill Black and Janice Henry, and especially Brad Cherry for helping me with my main variable of interest. I would like to thank Audrey Wadood and Megan Haghnegahdar for helping me with data checking. I would like to offer my special thanks to Cathy Rawlings for helping me stay on top of important department deadlines.

Finally, I wish to thank my parents, Alicia and Fernando, and my boyfriend, Michael, for their support and encouragement throughout the long days and late nights over these past few years.
The faculty listed below, appointed by the Dean of Arts and Sciences, have examined a thesis titled “Temporal Discounting and Body Mass Index in College Students,” presented by Danthea Aline Fernandez, candidate for the Master of Arts degree, and certify that in their opinion it is worthy of acceptance.

Supervisory Committee

Amanda Bruce
Department of Psychology

Jared Bruce
Department of Psychology

Jennifer Lundgren
Department of Psychology
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CHAPTER 1

Introduction

Impact of Obesity

Globally, it is estimated that overweight and obesity affect approximately 500 million adults world-wide; this trend has drastically increased in the past 30 years (World Health Organization [WHO], 2012). Current data show that more than one-third of adults in the United States are overweight or obese, and of the children and adolescents living in the United States today, 17% of them are obese (Ogden, Carroll, Kit, & Flegal, 2012; Wojcicki & Heyman, 2010). The body mass index (BMI; kg/m²) is a ratio calculated from a person's weight and height, and is often used in clinical settings as a screening tool for obesity (Center for Disease Control and Prevention [CDC], 2011; Eknoyan, 2008; Quetelet, 1832). Individuals are considered underweight with a BMI less than 18.5 kg/m², healthy weight between 18.5 and 24.9 kg/m², and overweight between 25 and 29.9 kg/m². Obesity is now a leading cause of preventable death in the U.S., causing an estimated 200,000 deaths per year (Danaei et al., 2009). Obesity and its effects on the body have been linked to an increased risk of heart and cardiovascular disease (e.g., hypertension, atherosclerosis), diabetes mellitus type 2, and some forms of cancer, among other chronic ailments (Lawrence & Kopelman, 2004). This is of grave importance, foreshadowing health difficulties that may negatively affect millions in the decades to come. The effects of the current obesity trend may not only lead to skyrocketing healthcare costs at the individual, local, and national levels, but experts believe that this generation may even be the first in two generations to have a shorter life expectancy than their parents due to associated morbidity and mortality (Daniels, 2006;

**Causes of Obesity**

Studies have now shown that a chronic imbalance in energy expenditure and energy consumption (i.e., a lack of physical activity and over-consumption of calories) leads to weight gain (Fitch & Bock, 2009; Hill, Wyatt, & Peters, 2013; Okay, Jackson, Marcinkiewicz, & Papino, 2009; Webber, 2003). Psychological, physiological, and social factors play an important role in determining this energy imbalance. At points in human evolutionary history, there was a need to consume as many calories as possible because food was scarce (Laran & Salerno, 2013). The ancestors of modern-day humans needed to consume extra rations whenever possible in order to compensate for a lack of available food during periods in which conditions were less than ideal. A natural inclination towards high calorie food helped humans survive for hundreds of thousands of years (King, 2013). This proclivity, along with the obesogenic environment (i.e., abundance of sedentary periods and availability of calorically-dense foods), has contributed to the dramatic increase of obesity in today’s population (King, 2013; Laran & Salerno, 2013). In modern times, most societies have little need to gather and hunt for survival as food is prevalent and easily accessible.

Some of the factors that lead to obesity are well understood, for example, the relationship between income and unhealthy eating habits, as exemplified by a study conducted by researchers at the CDC and NCHS (Ogden et al., 2010). Namely, people with a lower socioeconomic status are at increased risk for poor health outcomes, have limited availability of fresh fruits and vegetables, and often have a higher BMI (Ogden et al., 2010). Other factors which are well understood include the majority of biological and physiological
processes related to hunger, eating, and digestion (Berenson, 2001; Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001). In an effort to understand the non-physiological (i.e., psychological, environmental, social, etc.) factors that lead to weight gain, new research is examining the relationships between food consumption, obesity, and choice.

**Obesity and Choice**

Daily choices that one makes have significant health ramifications. Specifically, food choices and eating behaviors can cumulatively have a great impact not only on one’s physical health but also one’s quality of life. In a search for answers questioning why there are vast individual BMI differences in our society, scientists have looked to behavior and decision-making. Recent efforts have been made to advance the science of human decision-making in obesity research. The seemingly simple act of choosing between an apple and a doughnut entails a process that most scientists, and even laypersons, acknowledge as very complex (Sobal & Bisogni, 2009). This process is often outside of one’s conscious awareness and, consequently, is a process that is often taken for granted. There are a multitude of variables that contribute to how an individual reaches conclusions about what they are going to eat and how those food choices will ultimately impact their health.

**Obesity and Delay of Gratification**

A resurgence of studies have focused their attention one’s ability to delay gratification. Delay of gratification is one’s ability to forego an immediate reward for a larger deferred reward. Delay of gratification plays a key role in the ability to make healthier choices in one’s daily life (e.g., forgoing daily desserts to prevent future weight gain).

As characterized by the conclusions of the Stanford marshmallow experiment (Mischel, Shoda, & Rodriguez, 1989), the ability to delay reward seems to provide a distinct
advantage in life. In the original study, which began in the late 1960s, Walter Mischel offered children between the ages of three and five the choice of one small reward (a marshmallow) immediately, or two small rewards if they waited until the return of an experimenter (a time span of 15 minutes). The researchers found that participants who were able to delay the eating of the marshmallow had better self-control and spontaneous self-regulatory strategies (Mischel, Shoda, & Rodriguez, 1989). Follow up studies, which revisited the children periodically into adulthood, found that those individuals who had waited for the “preferred reward” tended to have higher SAT scores, higher educational attainment, lower BMIs, more effective coping skills, better mental health, and better outcomes in a variety of other measures (i.e., divorce rate, incarceration, etc.) (Mischel, Shoda, & Peake, 1988; Schlam, Wilson, Shoda, Mischel, & Ayduk, 2012; Shoda, Mischel, & Peake, 1990). Although there is some debate as to whether innate self-control, probability for future reward, and/or the environment that the children grew up in were actually the determining factors (Kidd, Palmeri, & Aslin, 2013), an argument can be made for the importance of delaying gratification and engaging in deliberate, non-impulsive behaviors. Stemming in part from this work, additional models of decision making, such as temporal discounting, have also been proposed as mechanisms by which weight related decisions (e.g., what foods to eat and whether or not to exercise) are made (Epstein, Leddy, Temple, & Faith, 2007; Epstein, Salvy, Carr, Dearing, & Bickel, 2010).

**Temporal Discounting**

Temporal discounting is the devaluing of future outcomes relative to present outcomes. This means that, in general, humans are more inclined to choose a smaller, more immediate reward over a larger, more distant and less guaranteed reward (Kirby &
Marakovic, 1996). Similarly to delay of gratification, temporal discounting, evaluates length of time and impulsivity. The term “delay discounting” (a.k.a. temporal discounting) was coined around 1996 by Kris (Kirby & Marakovic, 1996), although researchers had already been testing theories in a related discounting, hyperbolic, for well over a decade before.

To better explain temporal discounting, consider the following example: Which is a more attractive proposal, “$20 dollars today, or $20 in one week?” Most respondents would likely opt for the former (Kirby & Marakovic, 1996). What if the offer becomes “$20 dollars now or $80 in a week?” Often, the intrinsic value given to material items (whether durable or perishable) when making decisions dictates one’s choices. When given the option between two equal amounts there is a stronger inclination, for most people, towards the more immediate reward due to the perceived depreciation of value the longer one must wait. However, when given the option to wait for a larger reward, many are willing to wait simply due to perceived increased value versus the immediate option, even though it will not be awarded for a period of time (Kirby & Marakovic, 1996). Typically, a person’s discounting of a reward falls very rapidly for shorter periods of time which, when graphed, creates a

![Hyperbolic Curve (Figure 1)](image)
characteristic backwards, J-shaped or hyperbolic curve (see Figure 1; Bickel, Odum, & Madden, 1999). As the periods of time grow longer, discounting shallows out, as does the curve. A greater discounting rate, or steeper curve, indicates greater impulsivity in an individual. As it pertains to obesity research, recent studies in temporal discounting have determined that obesity status can be related to greater temporal discounting, that is, a greater preference for immediate reward over larger delayed rewards (Fields, Sabet, Peal, & Reynolds, 2011; Ikeda, Kang, & Ohtake, 2010; Weller, Cook, Asvar, & Cox, 2008).

**Emerging Adulthood and Decision Making**

In conjunction with the growing body of research examining the relationships between temporal discounting and obesity, a sizeable amount of obesity-related research has centered on the age group of emerging and young adults and the choices they make. While definitions vary, it is typically understood that this particular period in a person’s life lies between the ages of 18 and 25, although a similar construct “young adult” can include individuals as old as 40 (Arnett, 2000). Emerging adulthood is usually characterized as the time span between adolescence and early adulthood. Emerging adults may not have children, may not live at home, and may not be fully financially independent (Arnett, 2000). It is also exemplified by formation of identity and instability (Arnett, 2000).

In modern society, most children have little control over what they eat on a daily basis and what food is kept in the home. Often times, physical activity is also dictated by living situation or a parent’s ability to offer active play time for their children (Sallis et al., 1992). For example, a child may not be allowed to go play at a park due to the parent’s perception of a lack of safety in their neighborhood, and thus may be kept inside watching television in excess. Emerging adults, however, are not subject to parental constraints in the
same ways a child or even young teen is. With autonomy over food choice, purchasing, and lifestyle, much experimentation can take place that may foster changes in old habits and eating behaviors or even bring forth new ones (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008).

**Emerging Adulthood and Health**

Aside from the social and physiological changes that occur during this period, emerging adulthood also deals with many behavioral and weight-related changes. The period of emerging adulthood is a time “when adolescents are developing long-term health behavior patterns that will affect their physical and mental well-being for years to come” (Nelson et al., 2008). The period of emerging adulthood is a critical period for the formation of unhealthy behaviors/attitudes and the development of obesity (Nelson et al., 2008). A study published in 2004 even states that “the greatest increase in excess body weight and obesity rates occur among 18-29 year old age group” (Gordon-Larsen, Adair, Nelson, & Popkin, 2004). Many studies have also shown that weight and body fat increases are the norm during these formative years (Anderson, Shapiro, & Lundgren, 2003; Edmonds et al., 2008; Gordon-Larsen et al., 2004; Hoffman, Policastro, Quick, & Lee, 2006; Nelson et al., 2008).

**Reasons for Studying Emerging Adults**

There are many reasons for studying individuals during emerging adulthood. Studying individuals younger teens and children is not only difficult, but studies have also shown that individuals younger than 16 consistently show a preference for smaller more immediate rewards, are less future oriented, and are less likely to anticipate the consequences of their decisions (Steinberg et al., 2009). During the emerging adult period in a person’s life many unique transitions occur as well as the concretization of life habits (Nelson et al.,
During the period of emerging adulthood, many people leave the home for the first time, start families of their own, begin careers, and further their educations at institutes of higher learning (Arnett, 2000). It has also become the consensus of neuroscience that this time (late adolescence to mid-twenties) marks the finality of prefrontal cortex development, which in turn indicates a conclusion to the development of the executive functioning centers of the brain, which are in charge of decision making, planning, and self-control (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Johnson, Blum, & Giedd, 2009; Rubia et al., 2000; Sowell et al., 2003).

**Emerging Adults and Temporal Discounting**

According to published studies, temporal discounting may be an important factor for decision making when it comes to caloric intake, risk of obesity, and impulsivity. It also may impact the development of obesity in emerging adults (Applehans et al., 2012; Weller, Cook, Avsar, & Cox, 2008). Many studies have been conducted to determine whether temporal discounting (which is related to impulsivity and self-control) has a relationship with or could predict behaviors in certain populations. Early work in temporal discounting focused on substance abuse and addictive behaviors. Those studies, many of which sampled from populations of emerging adults, commonly reported that individuals who used substances were more likely to choose immediate rewards over delayed rewards when compared to controls (Bickel, Odum, & Madden, 1999; Madden, Petry, Badger, Bickel, 1997; Vuchinich & Simpson 1998). Within the past 5 years, however, a burgeoning number of studies on temporal discounting have focused exclusively on eating behavior, food choice, and weight status either in a correlational context or in a predictive context.
CHAPTER 2

Review of Literature

BMI and Temporal Discounting

An early study that attempted to find a relationship between temporal discounting and weight status was conducted by Nedernoom, Smulders, Havermans, Roefs, & Jansen (2006). This study did not yield any differences between the obese and control group in terms of temporal discounting. The authors posited that perhaps income or age differences had obscured the findings. Another study collected data on a sample of 147 participants, including 3 obese and 28 overweight, found no results between performance on temporal discounting and weight status (Yeomans, Leitch, & Mobini, 2008).

In 2008, Weller et al. was able to yield significant results for the relationship between weight status and temporal discounting. The researchers hypothesized that obese individuals would show greater temporal discounting than healthy weights. Specifically, they predicted that when compared to health weights, individuals with a BMI of 30 or greater would exhibit more impulsive behavior, more consistently choosing immediate rewards over delayed ones. The study included 55 obese (33 female, 22 male) participants and 57 healthy-weight controls (34 females, 22 males). Weller et al. determined that, after controlling for income, age, and IQ, obese women discounted more steeply than women who were in the non-obese control group. That is to say, obese women chose more immediate smaller rewards than their normal weight counterparts. They found no significant difference in temporal discounting for men.

A study published three years later by Fields, Sabet, Peal, & Reynolds (2011) examined the relationships between weight status and temporal discounting in young
cigarette smokers. No mention was made of whether overweight individuals were included in the study, however, the researchers included both healthy-weight and obese individuals in the study, as well as males. They concluded that individuals who were obese and smoked cigarettes discounted more steeply than their healthy weight counterparts. The researchers also surmised that there was an additive effect for smoking and obesity on impulsivity. Unlike many other studies, participants self-reported weight and height; the researchers stated this as their greatest limitation. This study also had a younger sample than previous studies, ranging 13 to 19 years of age. One confounding factor to the results may have been age, as previous literature has mentioned that younger individuals have steeper discounting curves (greater impulsivity) in general (Steinberg et al., 2009). The researchers did not control for age; no statistics for age group were given.

**Weight Status by Percent Body Fat and Temporal Discounting**

Rasmussen, Lawyer, & Reilly (2010) used percent body fat instead of BMI as a marker of weight status. They tested participants individually instead of in groups. Unlike the Weller et al. (2008) study, which tested temporal discounting using a hypothetical money (only) computer-based task, Rasmussen et al. used a computer-based food and money discounting task. They found that individuals, who had a higher percent body fat (PBF), had steeper discounting rates. Rasmussen et al. found no significant relationship between BMI and discounting for money or food. They proposed that perhaps the methodological differences between the two studies led to the discrepancy, and also mentioned that perhaps PBF, rather than BMI, was an important factor in food-and money-related decision making.

**Real-world Food-related Behavior and Temporal discounting**
An early work that attempted to find a relationship between temporal discounting and real-world food behavior and eating habits in different scenarios was the one conducted by Appelhans and colleagues (2012). The researchers in this study aimed to determine whether temporal discounting in women had any relationship to the intake of foods that the women consumed at home and in away-from-home or ready-to-eat settings (such as fast-food settings and restaurants or frozen meals). The study revealed that temporal discounting was not related to the frequency with which women consumed food in or outside the home; however, it did find that impulsive women consumed more calories than less impulsive women. Steeper discounting rates were found when eating situations included away-from-home and ready-to-eat meals. The study further underscored the line of thinking of temporal discounting as a “marker” of poor impulse control (Appelhans et al., 2012).

**Health Behaviors and Temporal Discounting**

To widen the scope of temporal discounting, Daugherty & Brase (2010), aimed to determine the validity of temporal discounting for a broad range of general health issues. This range included things such as health-related behaviors and safety. They also wanted to evaluate factors such as time perspective which was tested with the Consideration of Future Consequences Scale (CFCA; Strathman, Gleicher, Boninger, & Edwards, 1994) and the Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999). They determined that CFC and temporal discounting are similar but not redundant constructs. While the majority of their focus was on the validity of the MCQ and determining whether temporal discounting was independent of their other time perspective measures, they concluded that a greater amount of health-related habits and safety behaviors were related to a preference for larger delayed rewards (less-impulsivity).
A more recent work focused on health behaviors in general (Melanko & Larkin, 2013). The hypothesis was that individuals who engage in healthy, protective, preventative behaviors would be less impulsive than individuals who do not engage in those behaviors. These more impulsive individuals may find greater value in the immediacy of a reward (e.g. tanning, driving without a seatbelt, eating unhealthy foods). The majority of studies have focused on the use of self-reported hypothetical discounting tasks (be they on the computer or paper and pencil) Melanko & Larkin (2013) used a non-hypothetical behavioral discounting task. Participants were paid for their task performance (up to $10). The Melanko & Larkin (2013) task used both a discounting measure and an experiential discounting task, which adjusted the amount assessed during the delay discounting task in real-time. They found that participants who exhibited more impulsive behavior were less likely to engage in health behaviors and less likely to demonstrate temporal discounting. However, only the findings for the experiential discounting task were significant. They also noted that the findings did not translate across all of the examined health behaviors.

**Functional Magnetic Resonance Imaging (fMRI) and Temporal Discounting**

Kishinevsky et al. (2012) was interested in the reactivity of the brain during temporal discounting tasks. They only recruited obese, non-smoking women for the study due to the findings of the previous Weller et al., (2008) study which found between group differences in females. Brain activation during temporal discounting tasks predicted greater rates of weight gain over a subsequent timespan of 1.3-2.9 years. Unlike the Weller et al. (2008) study, however, this study concluded that there was no cross-sectional relationship between weight status and temporal discounting.
Conclusions

Overall, findings related to BMI and discounting rates are mixed. While some research shows significant relationships between BMI and temporal discounting rates, not all do. Weller et al. (2008) had extremely rigorous and controlled procedures for testing their participants, and perhaps this scenario influenced the results they attained. The rigorous way in which the data was collected may have influenced the results. Each participant was tested individually, also quite a few mitigating factors had to be controlled for in analyses. While most other studies obtained information for age and income, only two other studies—Kishinevsky et al. (2012) and Melanko & Larkin (2013)—assessed IQ, and even then did not explicitly state whether they had controlled for age, income, and IQ during their analyses. The findings may not be generalizable. Interestingly, almost no studies (particularly ones that were studying weight gain and presumably eating behavior) reported having used an eating behavior measure, and of the one that did (Appelhans et al, 2012), no results were reported. Another thing that must be mentioned is that almost every study used a different measure in data collection. Some were created by the research teams themselves, others were adapted from existing discounting takes, while still others were the original measures. The measurement of temporal discounting could have impacted study results. The relationship between BMI and discounting is still unclear.

Rationale for Present Study

Understanding what underlying psychological factors influence decision-making and motivational states that lead to obesity and what allows other individuals to maintain a consistent healthy weight throughout life will allow healthcare professionals and advocates to better help in the care and wellbeing of those in their community. The present study aimed to
evaluate whether there were any significant relationships between eating behaviors, temporal 
discounting, and weight status.

Hypotheses

Based on the findings of similar experimental studies, and to build upon the 
knowledge acquired, the present study proposed the following hypotheses: (1) Higher BMI 
would be significantly correlated with greater discounting rates (increased impulsivity). (2) 
Higher BMI would be significantly associated with increased eating-related disinhibition, 
decreased diet restricting, decreased healthful habits, and increased hunger-related behavior 
as measured by the Eating Behavior Inventory and Three-Factor Eating Questionnaire. (3) 
Individuals with greater discounting rates (increased impulsivity) would report increased 
eating-related disinhibition, decreased diet restricting, decreased healthful habits, and 
increased hunger-related behavior as measured by the Eating Behavior Inventory and Three-
Factor Eating Questionnaire.
CHAPTER 3

Methods

Recruitment and Inclusion Criteria

The study procedures and protocols (UMKC SS IRB# SS12-130) were approved by the University of Missouri-Kansas City’s Social Sciences Institutional Review Board on August 29, 2012. The participants in total (N = 148) were recruited through the University of Missouri-Kansas City’s online participant recruitment system (Psych Pool). Inclusion criteria for the study required that participants be between 18 and 40 years of age and that they be enrolled in at least one college credit hour at UMKC. Participants were not excluded based on a chronic health condition (e.g. diabetes mellitus, hypertension, eczema, etc.). Participants were asked to report to group data collection sessions held between October 2012 and April 2013 which consisted of up to 18 participants per session.

Consent and Procedures

Participants were tested in a group setting in a computer lab in Cherry Hall on the University of Missouri—Kansas City campus. Participants were not asked to refrain from taking medication that improved attention or concentration (e.g. Adderall, Ritalin, etc.). The researcher also provided dividers on alternate collection sessions to ensure that participants were not being distracted by other participants. The researcher, prior to data collection, had all participants review their consent forms then sign and date them. A copy was provided for each participant at the end of the collection session. As part of the larger study, each participant was asked to complete two stages of the data collection beginning with either a participant packet or the delay discounting task. All participants completed the 16 inventories within the packet.
Concluding participation, all individuals received two credits in Psych Pool, which in many class sections could be used towards extra credit. Per the requirements of Psych Pool participants who had not presented for the session were listed as absent.

**Measures**

**Anthropometric.** Data was collected to estimate weight status by taking measurements of height and weight, then calculating the BMI. Height and weight were measured with a Cardinal Detecto eye-level beam Scale and stadiometer, model No. 438. Participants were weighed in lightweight clothing without shoes. Body mass (kg/m$^2$) was computed from measured weight and height. Participants were not directed which way to face (backwards or forwards) while on the scale, as such, most participants had full view of their weight while measured.

**Self-report psychological measures.** Participants completed a demographics questionnaire designed for this study (see Appendix pages 31-33). Participants reported on their grocery shopping habits, eating habits, health and lifestyle habits, age, ethnicity, sex, sexual orientation, income, whether they received a High School diploma or completed the GED, high and/or college GPA, and year in school. Smoking behavior and alcohol consumption were also assessed, while use of non-smoked tobacco products and recreational drug use were not.

**TFEQ and EBI.** In this study, self-report eating behavior was evaluated using two measures: Stunkard’s Three-Factor Eating Inventory (TFEQ or EI; Stunkard & Messick, 1985) and the Eating Behavior Inventory (EBI; O’Neil et al., 1979).

The TFEQ is a 51-item questionnaire, and is the most commonly used measure of eating behavior. The TFEQ is split into two parts, the first part (true/false) being coded on a
2-point scale (example: “When I’m anxious, I find myself eating.”), and the second part being coded on a 4-point scale (choices changed; example: “How conscious are you of what you are eating?”), with the final question being coded on a 5-point scale, such that the highest score represents total food restraint and the lowest no food restrain whatsoever. It measures three dimensions of human eating behavior: cognitive restraint of eating, disinhibition, and hunger. Higher scores in each category indicate an increased proclivity towards each behavior. For example, increased dietary restraint could be associated with an increased likelihood to watch what one eats, while increased hunger indicates an increase in periods of the day when one feels hungry. The scores were averaged across for dimension totals.

The Eating Behavior Inventory (EBI; O’Neil et al., 1979) is a 26-item questionnaire used to assess behavior related to weight loss and weight management. Participants were coded on a scale from 1-5 (from “never” to “always”). It assesses both positive and negative eating behaviors. Item examples included: “I keep a graph of my weight.” and “I eat when I’m not really hungry.”

**MCQ.** The researcher used the 27-item Kirby Delay-Discounting Rate Monetary Choice Questionnaire (MCQ; Kirby & Marakovic 1996) to measure the temporal discounting rate of each participant. The MCQ offers two hypothetical choices between smaller immediate monetary rewards and larger delayed monetary rewards for the 27 items. The MCQ gives 4 scores that are estimates of discounting rates for small, large, and medium rewards, as well as the geometric mean of all three rewards. Item examples include: “Which would you prefer $55 today or $75 in 61 days?” and “Which would you prefer $30 today, or $35 in 50 days?” Because research suggests that discount rates are not dramatically affected...
by hypothetical rewards versus real rewards, no actual monetary rewards were used in the study (Johnson & Bickel, 2002; Madden, Begotka, Raiff, & Kastern 2003).
CHAPTER 4

Results

A series of analyses were performed to assess demographic information for the sample and relationships between the scores of the TFEQ and EBI, which assessed increased eating-related disinhibition, decreased diet restricting, decreased healthful habits, and increased hunger-related behavior, as well as temporal discounting and BMI.

Participant Characteristics

Data from 148 was collected for this study. Of the 148, data for nine participants were not used in the analysis of discounting rates or self-reported eating behavior due to failure to follow instructions and complete the measures as directed. Data for 139 participants were analyzed in this study. First, frequency and descriptive analyses were conducted (see Table 1). When assessing for self-reported ethnicity, 64 (46.0%) reported White/European, 21 (15.1%) reported Black, 13 (9.4%) reported Hispanic, 18 (13.0%) reported Asian, South Asian, or Middle Eastern, and the remaining 18 (12.9%) participants reported Other or Mixed. When assessing for participant self-reported sex, 34 (24.5%) reported Male, while 105 (75.5%) reported Female. When assessing for participant BMI (participant height and weight were measured at the time of data collection), it was found that 4 (2.9%) presented as underweight, 73 (23.7%) presented as healthy weight, 33 (23.7%) presented as overweight, and 29 (20.9%) presented as obese. The sample ranged from 18-39 years of age ($M_{age}=22.27$, $SD=4.63$).
Table 1

*Frequency and Descriptive Data for Sex, Ethnicity, Weight Status, and Age (N=139)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percent (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>34</td>
<td>24.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>105</td>
<td>75.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>64</td>
<td>46.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>21</td>
<td>15.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>13</td>
<td>9.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/South Asian/Middle Eastern</td>
<td>22</td>
<td>14.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other/Mixed</td>
<td>18</td>
<td>12.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td>26.11</td>
<td>6.53</td>
</tr>
<tr>
<td>Underweight</td>
<td>4</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy Weight</td>
<td>73</td>
<td>52.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>33</td>
<td>23.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>29</td>
<td>20.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>22.27</td>
<td>4.63</td>
</tr>
</tbody>
</table>

**Demographic Variables**

Preliminary analyses were conducted to compare the demographic variables of age, sex, and parental income with BMI, temporal discounting, TFEQ subscale scores, and EBI–total scores and to screen for confounding variables (see Table 2). Age was found to have positive correlations with TFEQ–restraint, $r(130)=.185, p=.034$, TFEQ–hunger, $r(134)=-$
.180, \( p = .034 \), and EBI–total, \( r(137) = .245, p = .004 \). There were no significant correlations between family income (income of parents while participant was living at home) and any of the variables of interest. Chi-square analyses were conducted to assess significance between sexes and the variables of interest, and yielded no significant results. Another one-way between subjects ANOVA determined that there were no statistically significant differences between males and females on BMI and temporal discounting rates. Exploratory analyses were conducted to assess whether there were significant correlations between the weight categories for age and family income. A one-way between groups ANOVA yielded non-significant results.

**Measure Statistics**

**TFEQ.** The scores of the subscales were averaged across the sample for restraint \((M=8.99, SD=5.03, range=20.00)\), disinhibition \((M=6.42, SD=3.61, range=15.00)\), and
hunger ($M=5.36$, $SD=3.28$, range=13.00). Cronbach’s alpha (an estimate of internal consistency) was .872, .783, and .790, respectively, for the subscales in the present study. Internal consistency determined for factor I ($\alpha=0.93$), factor II ($\alpha=0.91$), and factor III ($\alpha=0.85$) separately for a sample 98 individuals. Adequate levels of test-retest reliability were acquired for a period of one month in a sample of 17 individuals for factor I ($r=0.93$), factor II ($r=0.80$), and factor III ($r=0.83$) (Stunkard & Messick, 1985).

**EBI.** The scores for the EBI were averaged across participants, $M=73.43$, $SD=8.59$, range=44.57. Cronbach’s alpha was .659 for the present study. Adequate levels of test-retest reliability ($r=0.74$) and internal consistency ($\alpha=0.62$) of the EBI have been established for a sample of 234 individuals (O’Neil et al., 1979). The author reported that that while evaluating validity was difficult and varied; there was sufficient support of the “overall appropriateness” for the EBI in evaluating eating patterns (O’Neil et al., 1979).

**MCQ.** The mean for k-total of the MCQ for this sample was .02989 ($SD=.05293$; range=.2484). Cronbach’s alpha was .927 for the present study. Adequate levels of 5-week test-retest reliability were established ($r=.77$) for a sample of 81 individuals (Kirby, 2009). Statistics for validity and internal reliability were not given. Research suggests the scores on the MCQ are temporally stable (Kirby, 2009).

**Correlational Analyses between BMI, Temporal Discounting, TFEQ, and EBI**

The first hypothesis proposed that higher BMI would be significantly correlated with greater discounting rates (increased impulsivity). As has been done in previous studies due to the inherent skewness of temporal discounting rate curves, a natural log transformation was performed to normalize the data (Kirby, Petry, & Bickel, 1999). A correlational analysis
was conducted and yielded no significant results (see Table 3). Due to these results this hypothesis was rejected.

The second hypothesis proposed that higher BMI would be significantly related with increased eating-related disinhibition, decreased diet restricting, decreased healthful habits, and increased hunger-related behavior as measured by the Eating Behavior Inventory and Three-Factor Eating Questionnaire. Correlational analyses were implemented to evaluate the relationships. BMI was found to have significant, positive, weak correlations with TFEQ-restraint, $r(130)=.172$, $p =.048$, and TFEQ-disinhibition, $r(134)=.236$, $p =.005$. All other correlations resulted in non-significant results (see Table 3). Due to these findings the second hypothesis was also rejected.

The third hypothesis proposed that individuals with greater discounting rates (increased impulsivity) would report increased eating-related disinhibition, decreased diet

| Table 3
<p>| Correlations Matrix for TFEQ Subscale Scores, EBI-total Scores, BMI, and Temporal Discounting (K-total) Scores (N=139) |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td></td>
<td>-.037</td>
<td>.079</td>
<td>.172*</td>
<td>.237**</td>
<td>-.022</td>
</tr>
<tr>
<td>K–Total ln</td>
<td></td>
<td></td>
<td>-.039</td>
<td>-.083</td>
<td>-.076</td>
<td>.180*</td>
</tr>
<tr>
<td>EBI–Total</td>
<td></td>
<td></td>
<td></td>
<td>.573**</td>
<td>-.233**</td>
<td>-.457**</td>
</tr>
<tr>
<td>TFEQ–Cognitive Restraint</td>
<td></td>
<td></td>
<td></td>
<td>.233**</td>
<td></td>
<td>-.135</td>
</tr>
<tr>
<td>TFEQ–Disinhibition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.511**</td>
<td></td>
</tr>
<tr>
<td>TFEQ–Hunger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *p<.05, **p<.01
restricting, decreased healthful habits, and increased hunger-related behavior as measured by the Eating Behavior Inventory and Three-Factor Eating Questionnaire. Correlational analyses were conducted to examine the relationships, and found the greater temporal discounting rates were significantly associated with higher scores on the TFEQ-hunger subscale, \( r(137) = .180, p = .034 \). All other correlations were non-significant (see Table 3). These findings lead to rejection of the third hypothesis.

Due to the lack of significance and strength of correlations for the main variables of interest, no further data analyses were conducted.
CHAPTER 5

Discussion

Summary

The goal of the present study was to examine the relationships between weight status, self-reported eating behavior, and temporal discounting. The first hypothesis proposed higher BMI would be significantly related with greater impulsivity (as determined by temporal discounting rates). The second hypothesis proposed that higher BMI would be significantly related with increased eating-related disinhibition, decreased diet restricting, decreased healthful habits, and increased hunger-related behavior as measured by the Eating Behavior Inventory and Three-Factor Eating Questionnaire. The third hypothesis proposed that individuals with greater impulsivity would report increased eating-related disinhibition, decreased diet restricting, decreased healthful habits, and increased hunger-related behavior as measured by the Eating Behavior Inventory and Three-Factor Eating Questionnaire.

In evaluating the first hypothesis, the study results found no significant relationship between BMI and impulsivity (determined by temporal discounting rates) for this sample. However, for the second hypothesis, it was concluded that an increase in BMI was weakly related to an increase in dietary restraint (e.g., meal planning) and eating-related disinhibition (e.g., not being able to stop eating or keep oneself from eating). The study results for the third hypothesis also concluded that as impulsivity increase was weakly related to an increase in hunger-related behavior and feelings (e.g., feeling hungry; eating related to hunger).

Importance of Findings

While many in this field of temporal discounting research feel that the relationship between BMI and temporal discounting is well founded, these finding suggest that in studies
focusing on eating behavior, weight status may only have a weak or even non-existent association with how an individual discounts. The findings for the relationship between BMI and discounting rates are similar to the conclusions of a few previous studies (Applehans et al., 2012; Kishinevsky et al., 2012; Rasmussen et al., 2010; Yeomans et al., 2008; Nedernoom et al., 2006).

The findings suggest that perhaps the relationship between BMI and temporal discounting is not translatable across all health behaviors. Food choice and eating behavior studies that incorporate temporal discounting, in particular, do not seem to enjoy the same robustness in their correlations as in addiction studies. It is also interesting that gender did not have as significant an effect in this study as it had had in some other studies. A few studies selected only female participants, others, such as the Weller et al. study (2008) found difference in only females. In those that selected out, the decision was made, perhaps, due to the lack of significance for the relationship between BMI and discounting rates in men. However, findings like the ones of this study suggest gender may not be as influential of a factor as has been suggested.

**Limitations**

There were several limitations to the current study. One was the method in which data was collected. The majority of studies collected data from participants in single-participant sessions, this may have been due to a procedural decision, research member availability, fund allocation, or even time. The current study, nonetheless, collected data in groups. In some cases there groups were as large as 18 individuals with only one researcher. This most certainly could have hindered the ability of the researcher to individualize attention to each participant and ensure that measures were being completed properly. In this
instance, nine participants failed to follow directions, and did not complete the measures as asked. It is also possible that testing fatigue influenced the results, as each data collection session took two hours to complete. Perhaps participants were not paying attention or did not give care to their answers. The research also did not perform an IQ test. This could have affected the results, as previous studies have suggested that IQ plays a role in temporal discounting and have controlled for this factor (de Wit, Flory, Acheson, McCloskey, & Manuck, 2007). Other limitations worth mentioning included no screening of participants in regards to attention enhancing medications or asking participants to refrain from eating food. Times also varied at which data collection was held.

**Future Directions**

This study raises more questions than it answers, many of which could lead to future research. It is possible that the results from this study were due to confounding factors that were not accounted for. It is logical to think that the measures for temporal discounting would translate from a single participant data collection setting to a group setting. However, the results of the present study do not necessarily support this notion. In this study, it is possible that perceived social pressure may have influenced individuals to answer differently than they would have if alone. Hunger could have also altered the responses.

Based on the findings of previous studies, and those concluded from this study, we are left to conclude that temporal discounting may not be strongly related to weight, but may still be an excellent “marker” of poor impulse control as Appelhans et al. (2012) concluded (i.e., eating, safety, preventative health, and addictive behaviors). In previous studies, the relationship between BMI and temporal discounting is, for the most part, only evident in women. This may indicate exceptions to its usage or a lack of generalizability.
It is possible that food choice and eating behavior work on a slightly different appraisal mechanism from that of other gratification-dependent activities (i.e., smoking, drug usage, gambling, sex). It is also possible that the hypothetical discounting tasks does not adequately assess or measure temporal discounting in a capacity that relates to the full gamut of eating behaviors, or perhaps eating behaviors delve into less future-oriented thinking, an area of study that has not much been examined. It is also not known whether hypothetical versus naturalistic decision, eating behavior, tasks would better assess the relationship. If this is the case, it would mean that tapping into temporal discounting, when it comes to eating behavior or food choice, would have to be done in a less “sterile” laboratory environment or with real food.

Conclusions

The results of this study leave more questions than answers. It had been expected that there would be a significant results between temporal discounting rates and BMI at the least. However, something about the measure selection, the sample of emerging adults, or research setting led results to deviate from expectation. There are many veins of research that could stem from this study; if nothing else, to fine-tune the methodology of future studies to attain the most accurate data.
DEMOGRAPHIC INFO

Date: ________________________________

FOR RESEARCHER USE ONLY

Researcher Name: ________________________________

Height: ___________ Weight: ___________

PARTICIPANT #: __________________________

Age: ___________ Ethnicity: ________________________________

Sexual Orientation: Straight Other

If other, please specify: ________________________________

Gender: Male Female Other

If other, please specify: ________________________________

1. Do you smoke? YES NO

If yes, how long? ___________ If yes, how much? ___________

If yes, how often? ________________________________

2. How many days a week do you eat the following meals? Write the number of days and the usual time in the spaces provided.

   a. breakfast _______ days a week time: _______

   b. morning snack _______ days a week time: _______

   c. lunch _______ days a week time: _______

   d. afternoon snack _______ days a week time: _______

   e. dinner _______ days a week time: _______

   f. evening snack _______ days a week time: _______

3. How often do you prepare meals at home? once a three more never week times a times a week
4. How often do you use cafeteria or food services on campus?  
   - Once a week
   - Three times a week
   - More than 3 times a week
   - Never

5. How often do you eat fast food? (i.e., drive thru and convenience store, McDonald's, Wendy's Burger King, etc.)  
   - Every day
   - Once a week
   - Three times a week
   - More than 3 times a week
   - Never

6. Do you typically eat more than one fast food meal per day?  
   - Yes
   - No

7. How often do you eat at sit down restaurants or order take out?  
   - Every day
   - Once a week
   - Three times a week
   - More than 3 times a week
   - Never

8. Do you typically eat more than one sit down restaurant or take out meal per day?  
   - Yes
   - No

9. How many fast food/convenience stores do you have within a one mile radius of where you live?  
   - Less than 3
   - Between 3 and 5
   - More than 5

10. How many grocery stores do you have within a one mile radius of where you live?  
    - One
    - Two
    - More than 2

11. How often do you eat fruits and vegetables?  
    - 4-5 times a day
    - Once a day
    - More than 3 times a week
    - Three times a week
    - Never

12. Do you have food allergies?  
    - Yes
    - No

    If yes, please specify: ____________________________________________________________

13. Please specify the amount (in cups, 8 oz.) of the following fluids you typically drink a day:

   - Skim milk
   - Low fat milk
   - Whole milk
   - Club soda/seltzer
   - Beer
   - Water
   - Fruit juice
   - Diet soda
   - Tea
   - Coffee
   - Other
   - Regular soda
   - Wine
   - Hard liquor

30
14. Do you live... on campus off campus apartment off campus house with parents

15. Do you live near a park? YES NO

16. Do you live near safe, walkable sidewalks? YES NO

17. Do you live near a gym or other workout facility? YES NO

18. Please circle any of the following locations you have used for physical activity within the last month. a park your neighborhood a gym a place in streets/sidewalks your house

19. How often do you use any of these locations for physical activity? one time a week three times a week more than three times a week never

20. Growing up would you have considered the household yearly income to be...

- $23,100 or less
- $23,100 but greater than $76,000
- $76,000 but greater than $150,000
- $150,000 or greater

21. Are you employed? YES NO

22. If yes, are you... part-time full-time

23. If yes, what is your yearly income? $10,000 or less $10,000 to $15,000 $15,000 to $20,000 more than $20,000

24. Are you a... Freshman Sophomore Junior Senior Other

   Please state how many credits you have: ___________________________ I don’t know

25. Did you receive a... High school diploma GED

26. What was/is your high school and college GPA? High School _______ I don’t know

   College _______ I don’t know
For each statement, please circle the number that best describes your behavior during the last 6 months.

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I carefully watch the quantity of food that I eat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>I eat foods that I believe will aid me in losing weight.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>I keep 1 or 2 raw vegetables available for snacks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>I record the type and quantity of food which I eat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>I weigh myself daily.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>I refuse food offered to me by others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>I eat quickly compared to most other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>I consciously try to slow down my eating rate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>I eat at only one place in my home.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>I use the same placement and other utensils for each meal.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>I eat and just can’t seem to stop.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>I eat in the middle of the night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>I snack after supper.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>My emotions cause me to eat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>I buy ready-to-eat snack foods myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>I shop when I’m hungry.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>I shop from a list.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>I leave food on my plate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>I serve food family style (serve from bowls on table).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>I watch TV, read, work, or do other things while I eat.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21</td>
<td>If I’m served too much, I leave food on my plate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
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<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Generally, while I’m at home, I leave the table as soon as I finish eating.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23.</td>
<td>I keep a graph of my weight.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24.</td>
<td>I eat when I’m not really hungry.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>25.</td>
<td>I store food in containers where it is not readily visible or in a closed cupboard.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26.</td>
<td>I decide ahead of time what I will eat for meals and snacks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
MONETARY-CHOICE QUESTIONNAIRE

For each of the next 27 choices, please indicate which reward you would prefer: the smaller reward today, or the larger reward in the specified number of days.

1. Would you prefer $54 today, or $55 in 117 days?
2. Would you prefer $55 today, or $75 in 61 days?
3. Would you prefer $19 today, or $25 in 53 days?
4. Would you prefer $31 today, or $85 in 7 days?
5. Would you prefer $14 today, or $25 in 19 days?
6. Would you prefer $47 today, or $50 in 160 days?
7. Would you prefer $15 today, or $35 in 13 days?
8. Would you prefer $25 today, or $60 in 14 days?
9. Would you prefer $78 today, or $80 in 162 days?
10. Would you prefer $40 today, or $55 in 62 days?
11. Would you prefer $11 today, or $30 in 7 days?
12. Would you prefer $67 today, or $75 in 119 days?
13. Would you prefer $34 today, or $35 in 186 days?
14. Would you prefer $27 today, or $50 in 21 days?
15. Would you prefer $69 today, or $85 in 91 days?
16. Would you prefer $49 today, or $60 in 89 days?
17. Would you prefer $80 today, or $85 in 157 days?
18. Would you prefer $24 today, or $35 in 29 days?
19. Would you prefer $33 today, or $80 in 14 days?
20. Would you prefer $28 today, or $30 in 179 days?
21. Would you prefer $34 today, or $50 in 30 days?
22. Would you prefer $25 today, or $30 in 80 days?
23. Would you prefer $41 today, or $75 in 20 days?
24. Would you prefer $54 today, or $60 in 111 days?
25. Would you prefer $54 today, or $80 in 30 days?
26. Would you prefer $22 today, or $25 in 136 days?
27. Would you prefer $20 today, or $55 in 7 days?
### Three-Factor Eating Questionnaire

**Part I**

1. When I smell a sizzling steak or see a juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal.  
   - T  
   - F

2. I usually eat too much at social occasions, like parties and picnics.  
   - T  
   - F

3. I am usually so hungry that I eat more than three times a day.  
   - T  
   - F

4. When I have eaten my quota of calories, I am usually good about not eating any more.  
   - T  
   - F

5. Dieting is so hard for me because I just get too hungry.  
   - T  
   - F

6. I deliberately take small helpings as a means of controlling my weight.  
   - T  
   - F

7. Sometimes things just taste so good that I keep on eating even when I am no longer hungry.  
   - T  
   - F

8. Since I am often hungry, I sometimes wish that while I am eating, an expert would tell me that I have had enough or that I can have something more to eat.  
   - T  
   - F

9. When I feel anxious, I find myself eating.  
   - T  
   - F

10. Life is too short to worry about dieting.  
    - T  
    - F

11. Since my weight goes up and down, I have gone on reducing diets more than once.  
    - T  
    - F

12. I often feel so hungry that I just have to eat something.  
    - T  
    - F

13. When I am with someone who is overeating, I usually overeat too.  
    - T  
    - F

14. I have a pretty good idea of the number of calories in common food.  
    - T  
    - F

15. Sometimes when I start eating, I just can’t seem to stop.  
    - T  
    - F

16. It is not difficult for me to leave something on my plate.  
    - T  
    - F

17. At certain times of the day, I get hungry because I have gotten used to eating then.  
    - T  
    - F

18. 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.  
    - T  
    - F

19. Being with someone who is eating often makes me hungry enough to eat also.  
    - T  
    - F

20. When I feel blue, I often overeat.  
    - T  
    - F

21. I enjoy eating too much to spoil it by counting calories or watching my weight.  
    - T  
    - F

22. When I see a real delicacy, I often get so hungry that I have to eat right away.  
    - T  
    - F

23. I often stop eating when I am not really full as a conscious means of limiting the amount that I eat.  
    - T  
    - F

24. I get so hungry that my stomach often seems like a bottomless pit.  
    - T  
    - F

25. My weight has hardly changed at all in the last ten years.  
    - T  
    - F
26. I am always hungry so it is hard for me to stop eating before I finish the food on my plate.  

   T  F

27. When I feel lonely, I console myself by eating.  

   T  F

28. I consciously hold back at meals in order not to gain weight.  

   T  F

29. I sometimes get very hungry late in the evening or at night.  

   T  F

30. I eat anything I want, any time I want.  

   T  F

31. Without even thinking about it, I take a long time to eat.  

   T  F

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

   T  F

33. I do not eat some foods because they make me fat.  

   T  F

34. I am always hungry enough to eat at any time.  

   T  F

35. I pay a great deal of attention to changes in my figure.  

   T  F

36. While on a diet, if I eat a food that is not allowed, I often then splurge and eat other high calorie foods.  

   T  F

Part II

Directions: Please answer the following questions by circling the number above the response that is appropriate to you.

<table>
<thead>
<tr>
<th></th>
<th>1 rarely</th>
<th>2 sometimes</th>
<th>3 usually</th>
<th>4 always</th>
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</thead>
<tbody>
<tr>
<td>37. How often are you dieting in a conscious effort to control your weight?</td>
<td></td>
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<td>38. Would a weight fluctuation of 5 lbs affect the way you live your life?</td>
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<td>39. How often do you feel hungry?</td>
<td></td>
<td></td>
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<tr>
<td>40. Do your feelings of guilt about overeating help you to control your food intake?</td>
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<tr>
<td>41. How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours?</td>
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<tr>
<td>42. How conscious are you of what you are eating?</td>
<td></td>
<td></td>
<td></td>
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<td>43. How frequently do you avoid ‘stocking up’ on tempting foods?</td>
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<td></td>
<td></td>
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<tr>
<td>Question</td>
<td>Scale</td>
<td>Rating Options</td>
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<td>--------------------------------------------------------------------------</td>
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<tr>
<td>How likely are you to shop for low calorie foods?</td>
<td>1: unlikely</td>
<td>2: slightly unlikely 3: moderately likely 4: very likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you eat sensibly in front of others and splurge alone?</td>
<td>1: never</td>
<td>2: rarely 3: often 4: always</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How likely are you to consciously eat slowly in order to cut down on how much you eat?</td>
<td>1: unlikely</td>
<td>2: slightly unlikely 3: moderately likely 4: very likely</td>
<td></td>
<td></td>
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<tr>
<td>How frequently do you skip dessert because you are no longer hungry?</td>
<td>1: almost never 2: seldom 3: at least once a week 4: almost everyday</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>How likely are you to consciously eat less than you want?</td>
<td>1: unlikely</td>
<td>2: slightly likely 3: moderately likely 4: very likely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you go on eating binges though you are not hungry?</td>
<td>1: never</td>
<td>2: rarely 3: sometimes 4: at least once a week</td>
<td></td>
<td></td>
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<tr>
<td>To what extent does this statement describe your eating behavior?</td>
<td>1: not like me 2: little like me 3: pretty good description of me 4: describes me perfectly</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>On a scale of 0 to 4, where 0 means no restraint in eating (eating whatever you want, whenever you want it) and 4 means total restraint (constantly limiting food intake and never ‘giving in’), what number would you give yourself?</td>
<td>0: eat whatever you want, whenever you want it 1: usually eat whatever you want, whenever you want it 2: often eat whatever you want, whenever you want it 3: often limit food intake, but often ‘give in’ 4: constantly limiting food intake, never ‘giving in’</td>
<td></td>
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</table>
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Danthea Aline Fernandez was born on March 9, 1989, in St. Joseph, Missouri. She was educated at St. Charles Catholic School for her primary school education, and graduated from St. Pius X High School in 2007. She graduated in 2011 from the University of Missouri—Kansas City (UMKC) with a double degree. Her degrees were a Bachelor of Arts in Art and a Bachelor of Arts in Psychology.

In 2011, during her last semester as an undergrad at UMKC, Ms. Fernandez volunteered as a lab assistant for Dr. Amanda Bruce. She was accepted into the Master’s Program in the Department of Psychology that coming Fall under the mentorship of Dr. Amanda Bruce.

Ms. Fernandez is a pediatric health educator on the North Kansas City Hospital Campus. She is a member of Psi Chi which is the International Honor Society in Psychology. She was awarded the Building Bridges award in 2008 for her involvement with diverse groups on UMKC’s campus.