

**An Examination of How Self-Control and Impulsivity Influences Eating Habits and Alcohol Use**

by

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## Abstract

People frequently make decisions that might affect their health. Obesity and alcohol dependence are debilitating problems facing many adults and individual differences in self-control and impulsivity may contribute to the susceptibility of developing problematic and addictive behaviors. This study examined how preferences may contribute to obesity and alcohol dependence. In addition, this study investigated the impact of increasing cognitive demands on self-control when making health-related choices. Participants completed a choice task (i.e., choosing food and beverage preferences) under no time pressure and with a severe time pressure imposed. Measures of impulsivity and self-control were obtained using behavioral paradigms (i.e., Iowa Gambling Task and delay discounting) and self-report assessments (UPPS+P, AUDIT, The Self-Control Scale, and DIET-SE). Results indicated that participants who are more impulsive and have less self-control displayed strong preferences for choices that favor immediate satisfaction and less healthy choices, and that increased cognitive demands impaired the decision making processes. Furthermore, individual differences in self-control and impulsivity are predictive of food and beverage selections on a choice task. Implications for identifying individuals susceptible to developing problematic health behaviors and future directions to promote choices of healthy behavior for impulsive individuals are discussed.

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## **An Examination of How Self-Control and Impulsivity Influences Eating Habits and Alcohol Use**

Individuals are confronted with numerous decisions every day. Some decisions are complex such as choosing a career path while others are more simple or routine such as choosing what to have for breakfast. Understanding how individuals process information is important to understanding decision making. Two characteristics that may impact decision making are self-control and impulsiveness. People characterized with higher levels of self-control often exhibit superior academic achievement and intelligence (Rodriguez, Mischel, & Shoda, 1989), make better financial decisions (Wulfert, Block, Santa Ana, & Colman, 2002), and have greater success in controlling eating behavior (Kuijter, de Ridder, Ouwehand, Houx, & van den Bos, 2008). Whereas, people who have lower levels of self-control or higher impulsivity tend to engage in problematic behaviors associated with addiction (i.e., as alcoholism, drug-dependence, and excessive gambling: Bickel & Marsch, 2001; Kirby, Petry, & Bickel, 1999). Self-control and impulsivity are also related to eating behaviors. For instance, people with greater impulsivity have a stronger tendency to engage in unhealthy eating behavior and often neglect the healthy food choices (Jasinska et al., 2012). Engaging in unhealthy behaviors may be a contributing factor to the rise in alcohol dependence and obesity.

Alcohol addiction and obesity are some of the more debilitating problems facing numerous adults. The National Survey on Drug Use and Health reported in 2010 that an estimated 7.0% of the American population was dependent on alcohol (National Institute on Drug and Abuse, 2012). In 1990, the CDC reported obesity rates hovering around 12% in America (Menifield, Doty, & Fletcher, 2008) in comparison to reports from the CDC in 2012 indicating obesity levels have risen to an astonishing 35.7% in just a little over two decades

(Ogden, Carroll, Kit, & Flegal, 2012). However, not all adults who consume alcoholic beverages or unhealthy foods will develop such severe problems. Some individuals seem to be able to exercise restraint while others struggle to control actions that can potentially lead to behaviors that become problematic over time. Differences in self-control and impulsivity may contribute to the emergence of problematic behavior. Therefore, it is important to understanding how self-control and impulsivity affect decision making and subsequent choices, especially as it relates to eating and drinking behaviors.

The constructs of self-control and impulsivity are both complex with multiple definitions. Sometimes self-control is defined as simply as how it affects an individual's goal-directed behavior (Mukhopadhyay & Johar, 2005) or considered a limited resource which can be depleted over time (Muraven, Tice, & Baumeister, 1998). For the current research, self-control refers to the cognitive processes associated with exercising control over behaviors and emotions by evaluating the costs and benefits for a choice (Karoly, 1993). Similarly, impulsiveness can be characterized in a variety of ways, including inattention to presented stimuli (Patton, Stanford, & Barratt, 1995) or acting before gathering all information (Schachar & Logan, 1990). For the purposes of this study, impulsivity refers to seeking immediate rewards and an inability to delay gratification for long-term benefits (Mischel, Shoda, & Rodriguez, 1989). Research has shown self-control is necessary to delay behavior long enough to generate cognitive thought before acting while impulsive decisions are the result of a lack of self-control (Dickman, 1990). Self-control and impulsivity seem to have polarizing effects for decision making where higher levels of self-control leading to positive behaviors and higher levels of impulsivity leading to negative behaviors.



This study examined the relationship between self-control and impulsivity as it pertains to alcohol use and unhealthy eating preferences amongst college students. In the subsequent sections, a background on self-control and impulsivity as a framework for decision making is discussed as well as the appropriate methods to assess self-control and impulsivity. Next, the relationship between processing strategies for immediate and delayed rewards were examined. Lastly, a study which investigated the effects self-control and impulsivity differences have on alcohol use and eating behavior is described.

### **Self-Control and Decision Making**

The ability to engage in self-control may depend on different cognitive processes when making decisions. For instance, thinking or attending to an immediate reward led individuals to succumb to temptation. These individuals were not able to delay gratification compared to those individuals who used cognitive strategies that emphasized distracting oneself from thinking about the reward (Mischel, Ebbesen, & Raskoff Zeiss, 1972). Furthermore, previous research has demonstrated performance on delay gratification tasks is influenced by levels of self-control (Duckworth, Tsukayama, & Kirby, 2013). This is important in the context of eating behaviors, where research suggests that self-control is one of the strongest determinants of behavior when developing a healthy eating lifestyle (Sproesser, Strohbach, Schupp, & Renner, 2011). Individuals with lower self-control also appear more susceptible to unhealthy eating when presented more food choices consumed more food compared to individuals with higher self-control (Haws & Redden, 2013). Increasing cognitive demands or applying stressors when making decisions can also affect self-control for healthy behaviors. For instance, time pressure can have detrimental effects during decision making where individuals shift toward riskier decisions as pressure is intensified (Ben-Zur & Breznitz, 1981). As time pressure increases,

individuals often switch from deliberative processing strategies to automatic processes to compensate for the increased cognitive demands (Glöckner & Betsch, 2008). This is important because the use of conscious planning or deliberative strategies is effective for individuals who are successful in healthy eating behavior (Papies, Stroebe, & Aarts, 2008). Individuals characterized with low self-control were more likely to engage in unhealthy eating habits in the presence of a stressor (Jackson, Franco-Watkins, & Gillis, in preparation). Thus, increasing cognitive demands can also affect one's ability to maintain self-control, and this is an often overlooked aspect of decision making.

To support that different cognitive processes may underlie self-control and the ability to delay gratification, Bechara (2005) proposed a distinction between two systems (the reflective and impulsive systems) to suggest self-control may fail when an imbalance is created among the two systems leading some people to be more susceptible to poor choices and/or addictions. Bechara's proposal suggests the way individuals evaluate potential rewards may differ from the interaction between the reflective and impulsive systems, where the reflective systems is responsible for deliberative cognitive processing and the impulsive systems is responsible for automatic cognitive processing. Bechara described self-control as a top-down process, where increasing cognitive demands can affect one's ability to engage in deliberate processing which in turn can affect subsequent behavior. Neuroscience functional imagining studies have revealed associations in activity levels between structures in the prefrontal cortex with self-control, especially in regards to the ability to resist immediate rewards in lieu of beneficial delayed rewards (Diekoff & Gruber, 2010; Dixon, 2010). Specifically, people who reported themselves as having higher self-control demonstrated greater activity in the dorsolateral prefrontal cortex (DLPC) and ventromedial prefrontal cortex (VMPC: Hare, Camerer, & Rangel, 2009). The

VMPC in particular is considered the region of the prefrontal cortex that has the strongest influence evaluating rewards in decision making (Krawczyk, 2002). Studies have shown patients suffering from lesions on the VMPC exhibit cognitive deficits in decision making and make more impulsive choices on the Iowa Gambling Task (IGT: Manes et al., 2002). The IGT was developed to examine the reward valuation and immediate and future consequences in decision making in the laboratory (Bechara, Damasio, Damasio, & Anderson, 1994). Cognitive deficits appear to impact decision making and potentially lead people to make more impulsive choices or choices that favor immediate rewards, and these choices can lead to unhealthy or addictive behaviors for some individuals. Therefore, it is necessary to explore how self-control affects decisions on a behavioral level to establish connections for the cognitive processes involved in the evaluation of healthy choices in order to understand how decisions are being made.

### **Impulsivity and Decision Making**

Behaviors that result from impulsiveness may fail to consider long-term consequences associated with decision making. Impulsivity has been described as bottom-up involuntary process (Bechara, 2005) where emotion regulation systems may affect conscious thought processes and heighten the risk for problematic behaviors such as addictions to develop (Schreiber, Grant, & O'dlaug, 2012) and may contribute to increased vulnerability for alcohol dependence and excessive unhealthy eating behaviors (cf. Bechara, 2005). Neuroscience studies demonstrated that a negative correlation may exist between impulsivity and prefrontal cortex activation (Brown, Manuck, Flory, & Hariri, 2006). This finding is consistent with Bechara's (2005) proposal that an imbalance may exist between emotion regulation and reward evaluation for individuals who are more susceptible to addiction. Specifically, more emotional and impulsive tendencies may limit deliberate thought processes which may contribute to the

development of addictive behavior. For instance, tasks examining impulsive decision making, such as the IGT, have demonstrated that addicted drug users (e.g. cocaine, alcohol, or opioids) preferred larger immediate rewards with long-term losses compared to smaller immediate rewards with longer-term gains (Verdejo-Garcia, Perales, Perez-Garcia, 2007). Impulsivity may also influence preferences in favor of immediate rewards when making food choices. For example, impulsiveness contributes to the consumption of unhealthy snacks; a positive correlation exists between impulsive snack consumption and attitudes toward unhealthy eating (Honkanen, Olsen, Verplanken, & Tuu, 2012). The current study examined whether the disruption of effortful thought processes leads to impulsive decision making for food and alcohol choices. For example, research has shown individuals switch from healthy food selections to unhealthy food selections when stressors disrupt deliberation (Jackson, Franco-Watkins, & Gillis, in preparation). Impulsivity is an important bottom-up process which tends to lack deliberative thought processes and favors immediate rewards.

### **Measuring Self-Control**

Measuring self-control and its associated behaviors has been a challenging task for many researchers. Much of the current literature relies on self-report measures to determine an individual's level of self-control. A meta-analysis revealed that questionnaires appear to be the most consistent and reliable form of measurement of self-control at present (Duckworth & Kern 2011). These measures include a general measure of the construct: The Self-Control Scale (Tangney, Baumeister, & Boone, 2004) as well as capturing more specific self-control behaviors such as eating habits: the Dieter's Inventory of Eating Temptations – Self Efficacy (DIET-SE: Stich, Knauper, & Tint, 2009). Because this study examined self-control associated with alcohol use, it was important to assess alcohol use and its associated long-term consequences, as

measured in the Alcohol Use Disorders Identification Test (AUDIT: Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). Individuals who reported less self-control for eating habits and reported greater tendencies for alcohol consumption on assessments might be more susceptible to engaging in problematic behaviors that contribute to unhealthy eating and alcohol dependence.

### **Measuring Impulsivity**

Measurements of impulsivity consist of both self-report questionnaires and behavioral lab tasks. A recent self-report measurement of impulsivity, the UPPS+P Impulsive Behavior Scale (Lynam, Smith, Cyders, Fischer, & Whiteside, 2007), assesses five facets of impulsivity: (negative) urgency, (lack of) premeditation, (lack of) perseverance, sensation seeking, and positive urgency. A second method to determine impulsivity uses behavioral choice paradigms such as delay discounting (Mazur, 1987; Baumann & Odum, 2012). Research indicates higher rates of delay discounting of rewards for individuals who have heavy alcohol use (Kollins, 2003; Moallem & Ray, 2012). Differences have also been found in the rate in which individuals discount potential rewards in comparison to potential costs, with rewards discounted more than costs (Murphy, Vuchinich, & Simpson, 2001). Additionally, higher discounting rates for costs occur for short delay periods compared to long delay periods (Thaler, 1981). Because rates of discounting differ when evaluating rewards and costs, it is necessary to measure discounting for each condition to examine health related behaviors, where eating and drinking preferences can have both costs and rewards. Because eating and drinking preferences are associated with trade-offs between costs and rewards, the differences shown in discounting for costs and rewards may be important to separate to understand how decisions are made for health related choices. The IGT is another method used to examine impulsivity (Bechara et al., 1994). Neuroscience studies have revealed reward valuation for monetary rewards are similar to reward valuation for drug

related rewards (Breiter, Aharon, Kahneman, Dale, & Shizgal, 2001; London, Ernst, Grant, Bonson, & Weinstein, 2000) indicating reward valuation occurs on a common scale. Therefore, performance on the IGT, which examines evaluation of monetary rewards, could possibly be generalized as evidence for reward valuation associated with addictive behaviors, such as alcohol dependence. It follows that the IGT performance might be a useful measurement to determine whether it is associated with impulsive choices related to food and alcohol use. Individuals who demonstrate more impulsive decision making on the IGT and delay discounting tasks could have a higher risk of selecting unhealthy food items and alcoholic beverages more frequently. Frequent selections of unhealthy food and alcoholic beverages can lead to consequences that affect long-term health.

### **The Relationship between the Deliberate and Automatic Processing**

Disruption of deliberative processes appears to impact an individual's ability to determine long-term consequences for decisions which may contribute to poor choices. Problems may arise when functioning of cognitive processes is disrupted. For instance, research has shown when VMPC activity is disrupted problems for goal-directed behavior becomes impaired allowing automatic sensory-driven behavior to emerge (Volkow, Fowler, & Wang, 2004). Previous research indicates neural activity of the VMPC during affective judgments is significantly correlated with overall performance on the IGT (Northoff et al., 2006). The relationship between the reflective and impulsive system may have implications on alcohol abuse. Specifically, substance-dependent individuals appear to neglect deliberative processing strategies in favor of automatic processes while performing the IGT and evaluating long-term consequences associated with their decisions (Tanabe et al., 2007). Automatic processing strategies appear to have implications when assessing the costs and benefits associated with

decisions as well. Patients with bilateral damage to the amygdala fail to trigger autonomic responses associated with gains or losses of significant amounts of money (Bechara, 2004) suggesting automatic processes may not be able to disrupt deliberative processes when making decisions under these circumstances. Cognitive processing strategies that influences the valuation of long-term consequences associated with monetary rewards are relevant because previous research has suggested the value for future rewards is assessed on a common scale (Montague & Berns, 2002). Thus, comparisons of the valuation of monetary rewards should extend to the valuation of food and alcohol use. Individuals who prefer immediate prospects and discount long-term consequences for monetary rewards may exhibit similar choice preferences when evaluating decisions related to healthy eating and alcohol use. If individuals struggle to appropriately evaluate long-term benefits for healthy eating or understand the negative implications associated with heavy alcohol use, then problematic behaviors could become exacerbated due to an inability to deliberate on the long-term consequences associated with health-related decisions.

### **Study Overview**

Previous research has demonstrated self-control and impulsivity can influence decision making (Verdejo-Garcia et al., 2007; Hare et al., 2009). Self-control and impulsivity were measured in this study using self-reported questionnaires (The Self-Control Scale and the UPPS+P impulsive behavior scale) and choice behavioral tasks (the IGT and delayed discounting task for rewards and costs). The current research bridges prior research by integrating both types of measures to identify if poor performance on the IGT or delay discounting is associated with alcohol use and unhealthy eating preferences amongst a college sample who might be susceptible to long-term consequences of poor health choices. Using performance on the IGT as a predictor

for alcohol use and eating habits could help identify people who may have a predisposition to develop unhealthy lifestyles and potentially addictive habits. Furthermore, participants completed a choice task for food and beverage preferences with two levels of time pressure: no time pressure and severe time pressure. Thus, decisions for food and beverage preferences in the presences of a stressor were examined to determine if differences in self-control and impulsivity influenced decisions under time pressure. Lastly, participants completed the DIET-SE and AUDIT questionnaires to examine self-reported eating habits and alcohol use, respectively. Performance on these tasks and self-reported questionnaires were used to determine if impulsivity and self-control influence behavior for food and alcohol choices.

### **Hypotheses**

Given that self-reported measures of impulsivity and self-control should correspond to behavioral tasks that measure these constructs, individuals who report greater impulsivity and less self-control should perform worse on behavioral tasks that require the evaluation of long-term consequences, such as the IGT and delay discounting tasks for costs and rewards.

Participants with greater self-control should learn to avoid the disadvantageous decks and therefore choose the decks with greater long-term rewards while individuals more impulsive should choose the disadvantageous decks more often because of the tendency to focus on the immediate reward without understanding long-term consequences associated with the choice.

**Hypothesis 1:** Participants who report greater impulsivity on the UPPS+P questionnaire and lower self-control on the Self-Control Scale will discount at a higher rate for costs and rewards on delay discounting tasks and have more difficulty learning to select the more profitable and advantageous decks on the IGT.



If the IGT and delay discounting tasks are related to impulsive decision making and greater discounting of long-term consequences when making decisions, then these tasks should predict how individuals evaluate costs and benefits for health-related preferences.

**Hypothesis 2:** Performance on the IGT and delay discounting tasks will predict preferences on a choice task for food and beverages. Specifically, participants who demonstrate preferences for immediate rewards on the IGT and delayed discounting tasks will choose a higher proportion of unhealthy foods and alcoholic beverages.

If impulsivity and self-control predict how an individual examines long-term consequences for eating behavior and alcohol use, then individuals who report greater impulsivity and lower self-control should be more likely to also report greater alcohol use and unhealthy eating habits. Additionally, these measures of alcohol use and eating behavior should also be consistent with choice preferences for beverages and food.

**Hypothesis 3a:** Participants who report greater impulsivity on the UPPS+P questionnaire and less self-control on the Self-Control Scale will also report greater alcohol use on the AUDIT. Similarly, participants who report greater impulsivity on the UPPS+P questionnaire and less self-control on the Self-Control Scale will also report healthier eating behavior on the DIET-SE.

**Hypothesis 3b:** Participants reporting greater impulsivity on the UPPS+P, less self-control on the Self-Control Scale, unhealthy eating behavior on the DIET-SE, and greater alcohol use on the AUDIT will choose a higher proportion of alcoholic beverages and a higher proportion of unhealthy foods on a choice task for preferences.

Increasing cognitive demands should disrupt deliberate thought processes and lead to more automatic processing strategies. Time pressure can create additional cognitive demands that would shift individuals from deliberate to automatic processing when making decisions

regarding health. The shift in strategies while making a decision should influence their preferences on a choice task involving food and beverages.

**Hypothesis 4:** Participants will be able to deliberate on choices more effectively and choose a higher proportion of healthy foods and higher proportion of non-alcoholic beverages under no time pressure compared to under severe time pressure which disrupts deliberative processes leading to a higher proportion of unhealthy foods and alcoholic beverages selected.

## Method

### Participants

One hundred ten undergraduate students from Auburn University recruited from the Department of Psychology Research Participant Pool completed the study. Each participant was compensated with extra credit towards a psychology course. Ten participants were removed entirely from analyses as a result of incomplete data<sup>1</sup>. Thus, the analyses are based on 100 participants (19 males and 81 females). Participants' Body Mass Index (BMI) was collected and was not a significant factor in the results.

Table 1. Participant demographic and BMI information

(n = 100)	
<hr/> <i>Gender</i>	
Male	19%
Female	81%
<hr/> <i>Age (years)</i>	
17	1%
18	53%

<sup>1</sup> Participants were removed due to power outage, program crash, vision issues with the computer screen, failing to complete the study in adequate time or finishing too quickly.

19	16%
20	10%
21	12%
22 or older	8%

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***Class Standing***

Freshmen	64%
Sophomore	7%
Junior	10%
Senior	19%

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***BMI***

Underweight	4%
Normal	74%
Overweight	16%
Obese	6%

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**Design**

A within-subjects design was used for the study. All participants completed the IGT and delay discounting tasks for rewards and costs as behavioral tasks to assess levels of impulsivity and the ability to evaluate the consequences associated with short-term and long-term choices. Additionally, participants completed a choice task to examine healthy and unhealthy eating and drinking preferences. The choice task was completed twice: with no time pressure and with severe time pressure. Self-reported questionnaires (UPPS+P, AUDIT, Self-Control Scale, and

DIET-SE) were collected to measure impulsivity, alcohol use behavior, self-control, and eating habits, respectively.

## **Materials**

### ***Iowa Gambling Task***

Participants completed the computerized IGT (developed by Grasman & Wagenmakers, 2005 to be analogous to Bechara's IGT task: see Appendix A.1 for sample screen shots for the selection of an advantageous deck and disadvantageous deck). The IGT consists of four decks of cards (A, B, C, & D), and participants made a total of 100 card selections. Each of the four decks was associated with different rewards (i.e., monetary gains) and costs (i.e., monetary losses). For example, cards from decks A and B typically awarded \$100 monetary gain per selection, accompanied with a 10% probability of more severe monetary losses of \$1250. Cards from decks C and D typically awarded \$50 monetary gain per selection, accompanied with a 10% probability of modest monetary losses of \$250. Cards from decks C and D were advantageous to cards from decks A and B in the long-term. Advantageous and disadvantageous card decks in the computerized IGT were counter balanced for participants. Scoring was determined by the overall net gain or loss over the 100 card selection period as well as examining the frequency in which decks (advantageous or disadvantageous) were selected in blocks of 20 selections to assess if participants adjusted preferences as the task progressed.

### ***Delay Discounting Task***

Participants completed two delay discounting tasks (rewards and costs) where they indicated preferences for immediate or delayed monetary amounts. Each trial pair consisted of an immediate and delayed option. The immediate option was always presented on the left side of the computer screen and the delayed option on the right side of the computer screen (See

Appendix A.2 and A.3 for sample screen shots of trial pairs for each version of the task). Participants indicated their preferences by using the number pad on the keyboard. Participants pressed the “1” key for the immediate option or the “2” for the delayed option. The time of the delay varied with 5 total delay periods for all trial pairs (1 month, 6 months, 1 year, 5 years, and 10 years). For the rewards task, immediate rewards varied (\$20, \$30, \$40, \$50, \$60, \$70, \$80, or \$90) and delayed rewards remained fixed (\$100) for each trial pair. For the costs task, immediate costs varied (-\$20, -\$30, -\$40, -\$50, -\$60, -\$70, -\$80, or -\$90) and delayed costs remained fixed (-\$100) for each trial pair. All delay periods were presented with all immediate amounts for both tasks, resulting in 40 trial pairs per task. All trial pairs were randomly presented to participants. Participants choices were examined by calculating discounting rates for delayed reward which is based on the hyperbolic function  $V_d = V/(1+kd)$ , where  $V_d$  is the subjective value of the delayed reward,  $V$  is represented by the delayed reward amount,  $d$  is the delay duration, and  $k$  is the constant proportional of the degree of discounting (Mazur, 1987). In addition to calculating discounting rate ( $k$  in the above equation), preferences for immediate options were examined for each delay period to examine choice behavior across time.

### ***Choice Task***

*Food Items.* Participants completed a choice task where they indicated preferences for food items (See Appendix A.4 for a sample screen shot of a food trial pair). Trial pairs were created from a combination of 30 different food items (15 healthy and 15 unhealthy). To verify healthy and unhealthy items, items were independently rated on the level of healthiness responding on a Likert scale with 1 indicating an extremely unhealthy item and 10 indicating an extremely healthy item. Each trial pair consisted of one healthy item paired with one unhealthy item and healthy and unhealthy items were counterbalanced between left and right position on

the computer screen. Each item appeared in 7 trial pairs for a total of 105 trial pairs. Items paired were determined using a random number generator to create the trial pairs. All trial pairs were randomly presented to participants.

*Beverage Items.* Participants completed a choice task where they indicated preferences for beverage items (See Appendix A.4 for a sample screen shot of a beverage trial pair). Trial pairs were created from a combination of 30 different beverage items (15 alcoholic and 15 non-alcoholic). Each trial pair consisted of one alcoholic item paired with one non-alcoholic item and alcoholic and non-alcoholic items were counterbalanced between left and right position on the computer screen. Each item appeared in 7 trial pairs for a total of 105 trial pairs. Items paired were determined using a random number generator to create the trial pairs. All trial pairs were randomly presented to participants. Items were independently rated on the level of healthiness responding on a Likert scale with 1 indicating an extremely unhealthy item and 10 indicating an extremely healthy item.

*Time Pressure.* The choice task had two conditions of time pressure: no time pressure and severe time pressure. Participants could take as much time as necessary to make a decision during the no time pressure condition. Specifically, each person's average time to respond in the no time pressure condition was computed and the severe time pressure was 60% of each person's average response time under no time pressure. Previous research has shown effective levels of pressure at 900 ms (Jackson, Franco-Watkins, & Gillis, in preparation). Results from a pilot study revealed average response time under no time pressure was 1600 ms. Therefore, implementing severe time pressure at 60% of each person's average response time under no time pressure was determined to be an appropriate adjustment based on previous findings. For the severe time pressure condition, if a decision was not made within the allotted time the task

immediately proceeded to the next trial pair without an opportunity to respond. Participants indicated responses using the number pad on the keyboard. Participants pressed the “1” key for the option on the left or the “2” for the option on the right. Responses and reaction times were recorded. Omissions were removed from the data due to time restrictions limiting the ability to respond to all trial pairs. Therefore, analyses under time pressure resulted in fewer trials pairs examined for each participant depending on total responses indicated on the task.

### ***UPPS+P Impulsive Behavior Scale***

The UPPS+P Impulsive Behavior Scale (Lynam, Smith, Cyders, Fischer, & Whiteside, 2007) consisted of 59 statements designed to assess impulsivity. Participants responded using a Likert rating scale for each statement (see Appendix B for items and response scale). Scores were calculated by summing response scores with higher numbers indicating greater levels of impulsivity. Overall, reliability was strongest for the entire scale ( $\alpha = .93$ ) with a mean response of 117.69 ( $SD = 21.63$ ) and a range of 73.00 to 166.00.

### ***AUDIT***

The AUDIT questionnaire (Saunders et al., 1993) consisted of 10 questions designed to assess alcohol use and problems associated with use (see Appendix C for items and response scale). Scores were calculated by summing response scores with higher numbers indicating greater levels of alcohol use and alcohol-related problems. Reliability was strong for the measure ( $\alpha = .80$ ) with a mean response of 3.06 ( $SD = 3.77$ ) and a range of 3.00 to 20.00.

### ***Self-Control Scale***

The Self-Control Scale (Tangney, Baumeister, & Boone, 2004) consisted of 36 statements that assessed self-control. Participants responded to each statement on a Likert scale (see Appendix D for items and response scale). Scoring was determined by a summation of the

responses with higher totals indicating greater levels of self-control. The measure produced strong reliability ( $\alpha = .88$ ) with a mean of 125.18 ( $SD = 18.17$ ) and a range of 80.00 to 165.00.

### ***Dieter's Inventory of Eating Temptations – Self-Efficacy***

The DIET-SE (Stich, Knauper, & Tint, 2009) consisted of 11 scenario based questions designed to assess eating behaviors. Participants responded to each scenario using a Likert scale (see Appendix E for items and response scale). Scoring was determined by a summation of the responses with higher totals indicating greater levels of self-control. The reliability of the measure was strong ( $\alpha = .82$ ) with a mean of 22.27 ( $SD = 8.45$ ) and a range of 3.00 to 43.00.

### **Procedure**

Participants completed the study in one session with all behavioral tasks completed prior to self-report measures. All participants first completed the IGT. Participants were instructed that the goal of the IGT was to maximize profits (ibucks) and they were free to choose from any deck of cards at any time with no time restrictions imposed. Next, participants performed the choice task for food and beverage preferences under no time pressure. Participants were instructed to make a preference choice between two items presented on the computer screen. Participants had unlimited time to make their choice. Participants then completed the delay discounting task for rewards followed by the delay discounting task for costs on the computer. Participants were instructed to choose between two options presented on the computer screen for immediate or delayed rewards/costs during the tasks. Participants had unlimited time to make their choice. Lastly, participants performed the choice task for food and beverage preferences under severe time pressure. Participants were again instructed to make a preference choice between two items presented on the computer screen. Participants had 60% of their average response time under no time pressure to make a choice.



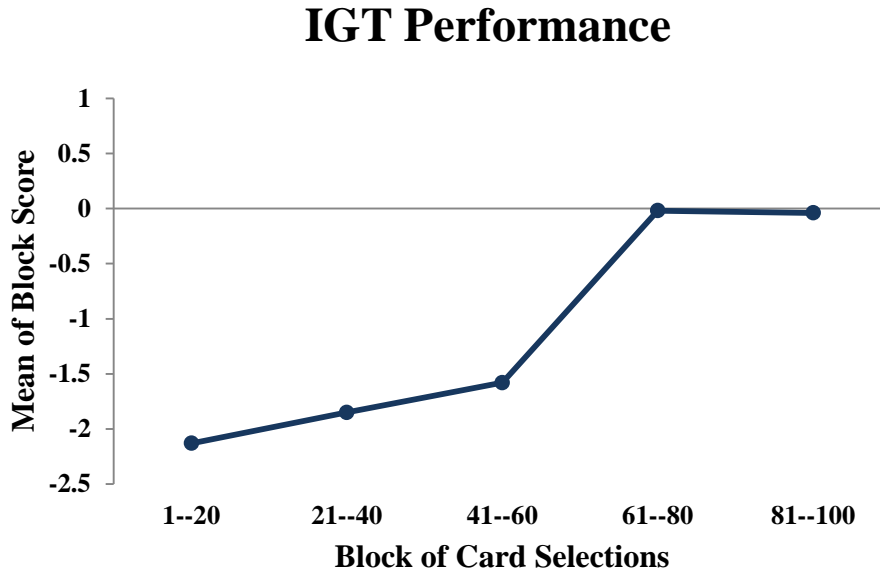
After completion of all behavioral tasks, participants responded to a series of questionnaires (In order: UPPS+P Impulsive Behavior Scale, the Self-Control Scale, AUDIT questionnaire, and the DIET-SE scale). Specific instructions for each questionnaire were provided on the screen. Participants were instructed to read each statement or question carefully, and indicated their response using the scale provided. A research assistant was in the room with the participant at all times to answer any questions the participant may have had during any task or self-reported measure administered during the study.

## **Results**

### ***IGT***

Analyses for IGT results included only 96 of the total participants collected in the study. Four participants were removed from analyses using the IGT due to familiarity with the task, but these participants' data was retained for all other tasks and self-reported measures. Performance on IGT revealed participants had a mean net score of 1706.69 ( $SD = 858.64$ ) ibucks. Furthermore, participants were more likely to select advantageous decks in later task trials compared to early task trials, which indicates learning about the contingencies associated with each deck. A repeated measures ANOVA was conducted to assess differences in selections over the course of the task in blocks of 20 selections. Results revealed significant differences in selections on the IGT over the course of the task,  $F(4, 380) = 2.61, p < 0.05, \eta^2_p = 0.03$ .

Figure 1. The number of advantageous decks minus the number of disadvantageous decks selected over the course of the task in blocks of 20 selections.

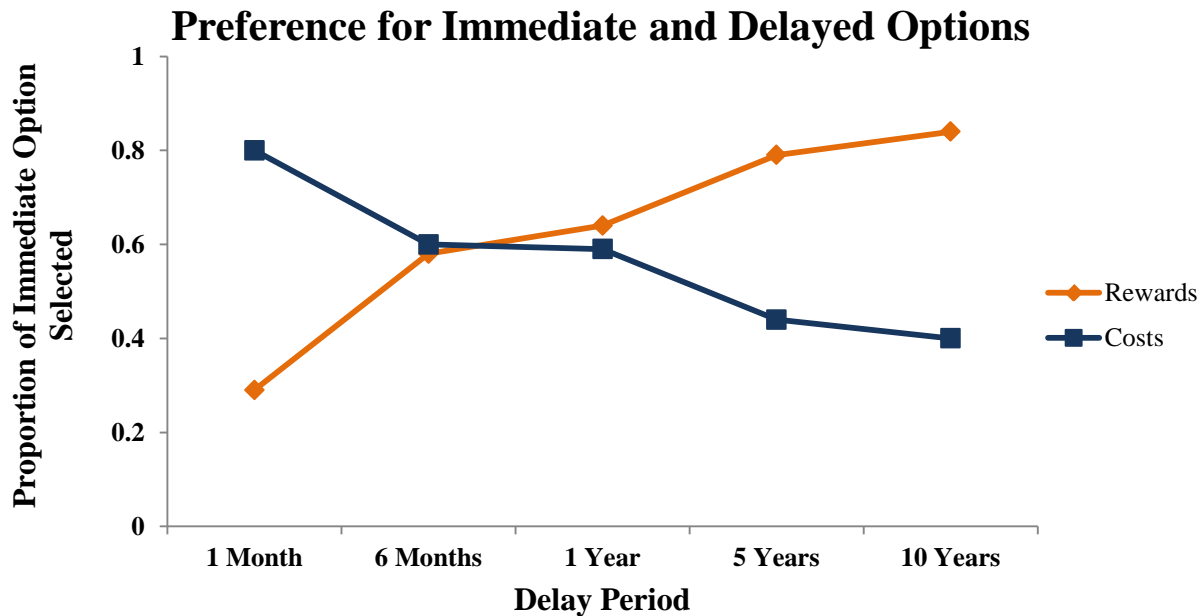


### *Delay Discounting*

Results revealed the mean proportion of immediate options selected was 0.63 ( $SD = 0.25$ ) and the mean best fit of  $k$  for participants was 0.76 ( $SD = .87$ ) for rewards. In the costs version of the task, the mean proportion of immediate options selected was 0.57 ( $SD = 0.30$ ) and the mean best fit of  $k$  for participants was 0.76 ( $SD = 1.18$ ). Proportion of immediate options selected was significantly correlated with  $k$  ( $r = 0.69, p < 0.01$  for rewards;  $r = 0.66, p < 0.01$  for costs). Proportion of immediate options selected was also examined for each delay period to determine how delay length affects discounting for rewards and costs. Responses over delay periods were typical where costs were discounted greater in shorter delay periods and discounted less in longer delay periods while rewards were discounted greater in longer delay periods and discounted less in shorter delay periods. A repeated measures ANOVA was conducted to assess differences in responses for delay discounting rewards and costs over the delay periods. Results

revealed a significant interaction between task type and delay periods,  $F(4, 396) = 198.22, p < 0.01, \eta^2_p = 0.67$ . Furthermore, there was a significant main effect of delay periods,  $F(4, 396) = 7.19, p < 0.01, \eta^2_p = 0.07$ .

Figure 2. The average responses for rewards and costs over all delay periods.



### *Self-Reported Measures and Behavioral Tasks*

Hypothesis 1 predicted that participants who reported greater impulsivity on the UPPS+P and less self-control on the Self-Control Scale would display preferences for immediate options on the IGT and the delay discounting tasks compared to participants who reported less impulsivity and greater self-control to determine if self-reported measures correspond to behavioral tasks for these constructs. Analyses revealed no significant correlation between the IGT and delayed discounting tasks with the UPPS+P or the Self-Control scale.

Table 2. Correlation matrix between behavioral tasks and self-reported measures.

	2	3	4	5
1. Iowa Gambling Task	.02	.16	.03	-.03
2. Delay Discounting : Rewards	-	-.21*	-.12	-.03
3. Delay Discounting: Costs		-	.07	-.02
4. The Self-Control Scale			-	-.66**
5. UPPS+P				-

Note: \*\* p < .01, \* p < .05

Because hypothesis 1 was based on finding a relationship between these measures and no relationship was present, therefore, it would not be appropriate to conduct a multivariate regression between self-reported behavior and behavioral tasks. Instead, a series of simple linear regression analyses were conducted where the Self-Control Scale and the UPPS+P were each used as the predictor variables for the IGT and delay discounting tasks separately. Nonetheless, none of the regression models were significant indicating a lack of a predictable relationship between these self-reports with the IGT and delay discounting tasks. Thus, hypothesis 1 was not supported.

### ***Behavioral Tasks and Choice Task***

Hypothesis 2 predicted that participants who preferred immediate rewards on behavioral tasks would be more likely to select unhealthy food items and alcoholic beverages on the choice task. Analyses revealed no significant correlations between the IGT and the delayed discounting tasks with the choice task for either beverages or food items under no time pressure.

Table 3. Correlation matrix between the choice task for food and beverages with performance on the IGT and delay discounting tasks.

	2	3	4	5
1. Iowa Gambling Task	.02	.16	.16	.17
2. Delay Discounting : Rewards	-	-.21*	-.01	.01
3. Delay Discounting: Costs		-	.14	.16
4. Choice Task: Food			-	.89**
5. Choice Task: Beverages				-

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

Simple linear regressions were conducted, where each delay discounting task and the IGT were used as the predictor variable with the selection of foods or beverages on the choice task.

Results revealed no significant relationship between these measures. Therefore, predictions for the selection of unhealthy food items and alcohol items could not be made from performance on the IGT and delay discounting tasks. Thus, hypothesis 2 is not supported.

### ***Self-Control, Impulsivity, and Unhealthy Habits***

Correlation analyses was conducted between self-reported measures and selections for foods and beverages on the choice task and revealed strong relationships between the each of the measures.

Table 4. Correlation matrix between the UPPS+P, the Self-Control Scale, the AUDIT, the DIET-SE, the two choice tasks: foods and beverages.

	2	3	4	5	6
1. UPPS+P	-.66**	-.2*	.37**	-.32**	-.38**
2. Self-Control Scale	-	.34**	-.28**	.22*	.27**
3. DIET-SE		-	-.04	.21*	.23*
4. AUDIT			-	-.41**	-.46**
5. Choice Task: Food				-	.89**
6. Choice Task: Beverages					-

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

Hypothesis 3a predicted that higher scores of impulsivity on the UPPS+P and lower scores of self-control on the Self-Control Scale would predict higher scores of alcohol use on the AUDIT. While the UPPS+P and the Self-Control Scale were both significantly correlated with the AUDIT, multiple regression analysis revealed only the UPPS+P ( $b = 0.06$ ,  $t(97) = 2.61$ ,  $p < 0.05$ ) as a significant predictor for reports of alcohol use on the AUDIT. Self-reported measures of impulsivity also explained a significant amount of variance in self-reported measures of alcohol use ( $R^2 = 0.14$ ,  $F(2, 97) = 7.88$ ,  $p < 0.01$ ). A possible explanation as to why the Self-Control Scale was not considered a significant predictor is likely due to a multicollinearity effect between this scale and the UPPS+P. As a result, the UPPS+P accounted for the majority of the variance leaving the Self-Control Scale little or no variance to predict when introduced in the model.

Additionally, self-reported behavior for impulsivity and self-control was used to examine the relationship with self-reported eating habits. It was hypothesized that higher scores of

impulsivity on the UPPS+P and lower scores of self-control on the Self-Control Scale would predict lower scores for restraining eating behavior on the DIET-SE. As expected, the UPPS+P and the Self-Control Scale were both significantly correlated with the DIET-SE. However, multiple regression analysis revealed only the Self-Control Scale ( $b = 0.17, t(97) = 2.86, p < 0.01$ ) as a significant predictor for restraining eating behavior on the DIET-SE. Self-reported measures of self-control also explained a significant amount of variance in self-reported measures of eating behavior ( $R^2 = 0.11, F(2, 97) = 6.22, p < 0.01$ ). A possible explanation as to why the UPPS+P was not considered a significant predictor is likely due to a multicollinearity effect between this scale and the Self-Control Scale. As a result, the Self-Control Scale accounted for the majority of the variance leaving the UPPS+P little or no variance to predict when introduced in the model.

Hypothesis 3b predicted that greater impulsivity, lower self-control, unhealthy eating habits, and high alcoholic habits would predict a higher proportion of unhealthy foods and a higher proportion of alcoholic beverages selected on the choice task. As expected, all questionnaires were significantly correlated with the choice task for food and beverages. Multiple regression analysis revealed the UPPS+P ( $b = -0.001, t(96) = -2.16, p < 0.05$ ), the AUDIT ( $b = -0.015, t(96) = -4.06, p < 0.01$ ), and the DIET-SE ( $b = 0.003, t(96) = 2.00, p < 0.05$ ) were significant predictors for the proportion of non-alcoholic beverages selected on the choice task. Self-reported measures of impulsivity, alcohol use, and eating habits also explained a significant amount of the variance in the selection of non-alcoholic beverages ( $R^2 = 0.29, F(3, 96) = 13.09, p < 0.01$ ). For the food part of the task, multiple regression revealed the DIETSE ( $b = 0.003, t(97) = 2.14, p < 0.05$ ) and the AUDIT ( $b = -0.015, t(97) = -4.38, p < 0.01$ ) were significant predictors for the proportion of healthy foods selected on the choice task. Self-

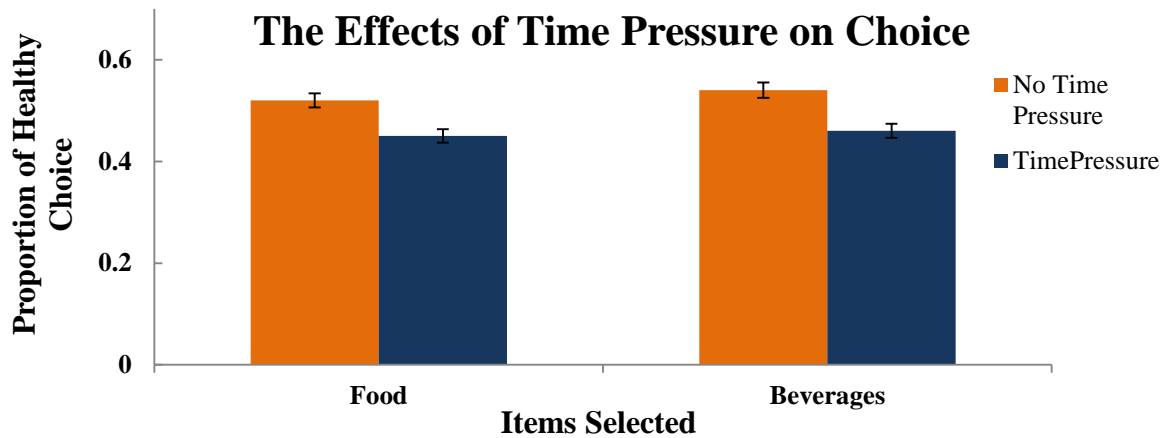
reported measures on alcohol use and eating habits also explained a significant amount of the variance in the selection of healthy foods ( $R^2 = 0.20$ ,  $F(2, 97) = 12.26$ ,  $p < 0.01$ ). Therefore, self-reported measures used to assess eating and drinking habits appear to be the most useful predictors of preferences for food and beverages on the choice task.

### ***Choice Task and Time Pressure***

Hypothesis 4 predicted that participants would choose a higher proportion of unhealthy food items and alcoholic beverages in the presence of time pressure. Due to the implementation of severe time restriction, 32 participants were unable to respond to the choice task under severe time pressure and were removed from analyses. Therefore, analyses of time pressure resulted in 68 total participants. As predicted, participants selected a greater proportion of healthy food items ( $M = 0.52$ ,  $SD = 0.14$ ) and non-alcoholic beverages ( $M = 0.54$ ,  $SD = 0.15$ ) under no time pressure compared to the proportion of healthy food items ( $M = 0.45$ ,  $SD = 0.11$ ) and non-alcoholic beverages ( $M = 0.46$ ,  $SD = 0.12$ ) under severe time pressure. Because of the decreased number of viable participants, the effects of time pressure on choice was examined using a repeated measures ANCOVA with UPPS+P as the covariate, the proportion of choice was the dependent variable, and time pressure was the independent variable. Results revealed UPPS+P score was a significant predictor of choice,  $F(1, 66) = 6.28$ ,  $p < 0.05$ ,  $\eta^2_p = 0.09$ . Furthermore, there was a significant main effect of time pressure  $F(1, 66) = 8.30$ ,  $p < 0.01$ ,  $\eta^2_p = 0.12$ . Additionally, an interaction between UPPS+P score and time pressure was approaching significance,  $F(1, 67) = 3.76$ ,  $p = 0.06$ ,  $\eta^2_p = 0.05$ .



Figure 3. Proportion of healthy foods selected and non-alcoholic beverages selected under conditions of no time pressure and time pressure.



However, because the severity of time restrictions affected nonresponses for one third of the participants, there is not enough evidence to conclusively support the hypothesis that time pressure disrupts deliberation and affects choices. It is possible the time pressure was so severe, that those participants who attempted to respond were forced to respond randomly under the severe time pressure. Therefore, we conclude with confidence that increasing cognitive demands negatively impacted decision making for foods and beverages because of weaknesses in the design for the choice task with time pressure.

### Discussion

The prevalence of obesity and alcohol dependence has been on the rise in the United States (Ogden et al., 2012; National Institute on Drug and Abuse, 2012) in recent years. Eating and drinking preferences are factors contributing to the deterioration of healthy living. Previous work has established differences in self-control and impulsivity can influence eating and drinking behavior (Jasinska et al., 2012). However, measurements for self-control and impulsivity vary when describing behavior. The current study attempted to establish multiple methods to measure each construct for eating and drinking behavior. Findings demonstrated

behavioral tasks, such as the IGT and delayed discounting task, resulted in inconclusive evidence to establish a predictive relationship with selections for food and beverages on a choice task. However, it should be noted task results for the IGT and delay discounting tasks demonstrated similar response patterns as in previous studies, indicating participant performance on each task was as expected. Thus, it is important to consider the IGT and delayed discounting tasks may not always be sufficient measures of self-control and impulsive behaviors for all domains, where both tasks emphasize preferences associated with monetary rewards and costs. Therefore, it is possible the tasks simply do not transition effectively for behaviors reflecting health choices as they do for financial decisions. One reason for this could be financial gains and losses are often very explicit, whereas evaluating long-term implications for health are less clear. Because of this it may be difficult to predict future eating and drinking habits with tasks unrelated to health. Additionally, it is important to consider previous research using the IGT often involved participants with a history of substance abuse or brain damage (Tanabe et al., 2007; Verdejo-Garcia et al., 2007; Bechara & Martin, 2004; Grant, Contoreggi, & London, 2000). Therefore, it appears healthy participants respond to immediate rewards on the IGT differently compared to more extreme populations. Each task certainly has its own utility in the evaluation of potential rewards; however these tasks may not simply be the most adequate measures to predict preferences for immediate rewards in foods and beverages among a healthy population.

Although the IGT and delay discounting tasks were inadequate predictors of self-control and impulsive behaviors for health in this study, self-reported measures for self-control and impulsivity were successful establishing a relationship with preferences for eating and drinking behaviors. Specifically, self-reported measures designed to identify eating (e.g. the DIET-SE; Stich et al., 2009) or drinking (e.g. the AUDIT; Saunders et al., 1993) behaviors were found to

be the most successful indicators of selection preferences. Results indicated measures from the DIET-SE and the AUDIT were strongly correlated with self-reported impulsivity (e.g. UPPS+P; Duckworth & Kern 2011) and self-control (e.g. The Self-Control Scale; Tangney et al., 2004). Additionally, high self-control on The Self-Control Scale and greater impulsivity on the UPPS+P self-report were both significantly correlated with preferences for food and beverages on the choice task. Therefore, individuals' health preferences are influenced by self-control and impulsivity, where greater impulsivity and less self-control results in unhealthier food preferences and alcohol selections more frequently. Over time, frequent selections of unhealthy food and alcoholic beverages could be a contributing factor in the development of obesity and alcoholism. Thus, it is reasonable to assume differences in self-control and impulsivity can have long-term health consequences for an individual.

However, it is imperative to acknowledge people rarely make selections for food and beverages under optimal conditions. Previous studies involving food and beverages selections on a choice task has shown people encounter significantly greater difficulty processing the long-term health benefits of items (Jackson, Franco-Watkins, & Gillis, in preparation). Despite previous findings, time restrictions imposed in this study were so severe we cannot conclude differences in preferences for food and beverages under cognitive demands between individuals who vary in self-control. Improvements to the design of the task need to be implemented in future research to fully understand the effects cognitive demands can have on self-control for food and beverages. Based on previous research, cognitive effort should still be considered an integral component to establish a consistent pattern of selections for healthy items that provide long-term benefits for an individual and evidence of this exists in previous work that has demonstrated conscious planning strategies facilitate success in healthy eating (Papies, Stroebe,

& Aarts, 2008). However, there is no clear indication conscious planning would remain successful under pressure. Future research could determine if effortful planning for food and beverage preferences can mitigate some of the effects cognitive demands have on decision making.

In conclusion, individual differences in self-control and impulsivity, as identified through self-reported measures, can predict preferences for food and beverages where more impulsive individuals are more likely to select options that include immediate rewards while potentially neglecting the long-term consequences for health. Such findings suggest that impulsive individuals may be more susceptible to health problems, where frequently selecting unhealthy food and alcoholic beverages could contribute to developing obesity or alcohol dependence. Furthermore, this study was unable to determine the extent high cognitive demands can impact decision making processes for food and beverage preferences. Notwithstanding, understanding how self-control and impulsivity influence food and beverages selections is an important consideration to address the problem of obesity and alcohol dependence in the United States. Future research examining the use of effortful planning strategies could determine if preferences for healthy food and beverages are less affected by high cognitive demands allowing for better decision making and improvements in health.

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## Appendix A



### Screenshots of Behavioral Tasks


**A.1 - Iowa Gambling Task:** selection of disadvantageous deck (top panel) and advantageous deck (bottom panel)

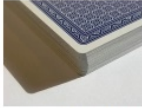
#### Iowa Gambling Test

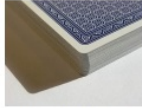
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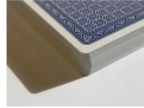
Previous Total: 2150  
Current Total: 1000

total gains:	
total losses:	

  
Choose Deck 1

  
Choose Deck 2

  
Choose Deck 3

  
Choose Deck 4

Gain: **+100**  
Loss: **-1250**

Click here to continue



Cards obtained thus far: 48 of 100


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#### Iowa Gambling Test


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Previous Total: 850  
Current Total: 900

total gains:	
total losses:	

  
Choose Deck 1

  
Choose Deck 2

  
Choose Deck 3

  
Choose Deck 4

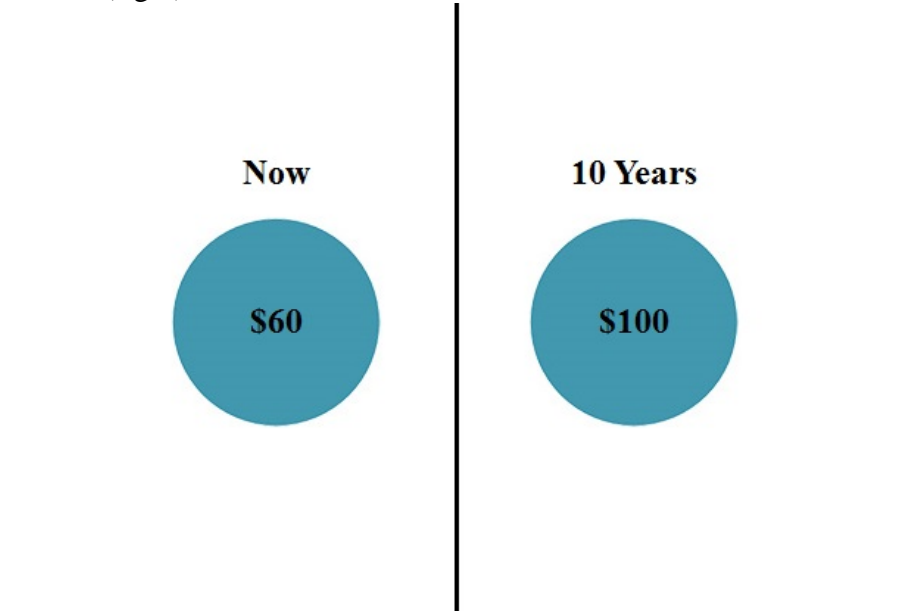
Gain: **+50**  
Loss: **0**

Click here to continue

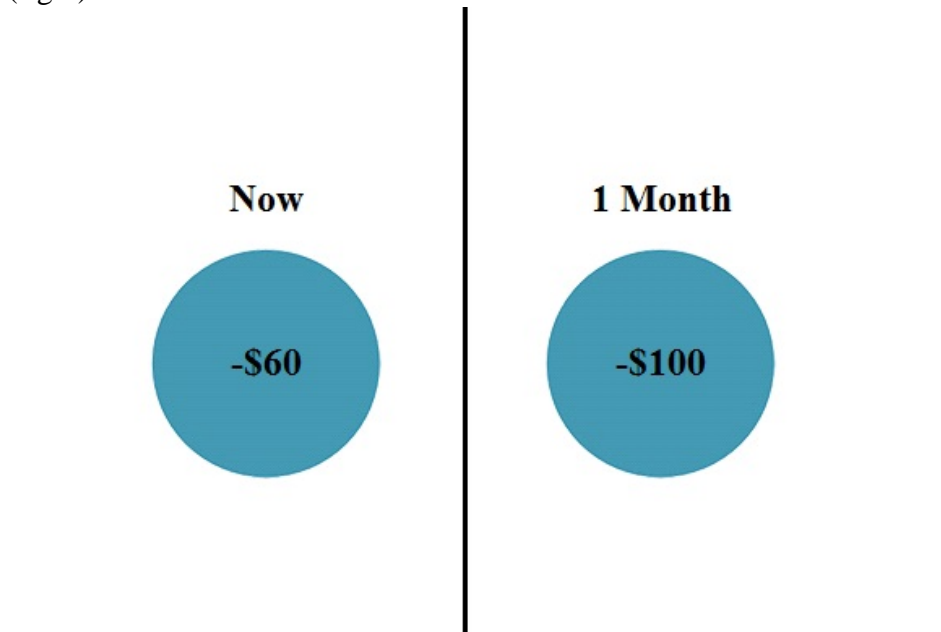
Cards obtained thus far: 51 of 100

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**A.2 - Delay Discounting Rewards:** selection between an immediate reward (left) and a delayed reward (right)



**A.3 - Delay Discounting Costs:** selection between an immediate cost (left) and a delayed cost (right)



**A.4 - Choice Task Examples:** selection of food items (top panel) and beverage items (bottom panel)

**Option 1**



**Option 2**



**Option 1**



**Option 2**





## Appendix B

### **UPPS+P Impulsive Behavior Scale**

**Instructions:** You will read a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement.

1. I have a reserved and cautious attitude toward life.
2. I have trouble controlling my impulses.
3. I generally seek new and exciting experiences and sensations.
4. I generally like to see things through to the end.
5. When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.
6. My thinking is usually careful and purposeful.
7. I have trouble resisting my cravings (for food, cigarettes, etc.).
8. I'll try anything once.
9. I tend to give up easily.
10. When I am in great mood, I tend to get into situations that could cause me problems.
11. I am not one of those people who blurt out things without thinking.
12. I often get involved in things I later wish I could get out of.
13. I like sports and games in which you have to choose your next move very quickly.
14. Unfinished tasks really bother me.
15. When I am very happy, I tend to do things that may cause problems in my life.
16. I like to stop and think things over before I do them.
17. When I feel bad, I will often do things I later regret in order to make myself feel better now.
18. I would enjoy water skiing.
19. Once I get going on something I hate to stop.
20. I tend to lose control when I am in a great mood.
21. I don't like to start a project until I know exactly how to proceed

22. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.
23. I quite enjoy taking risks.
24. I concentrate easily.
25. When I am really ecstatic, I tend to get out of control.
26. I would enjoy parachute jumping.
27. I finish what I start.
28. I tend to value and follow a rational, "sensible" approach to things.
29. When I am upset I often act without thinking.
30. Others would say I make bad choices when I am extremely happy about something.
31. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.
32. I am able to pace myself so as to get things done on time.
33. I usually make up my mind through careful reasoning.
34. When I feel rejected, I will often say things that I later regret.
35. Others are shocked or worried about the things I do when I am feeling very excited.
36. I would like to learn to fly an airplane.
37. I am a person who always gets the job done.
38. I am a cautious person.
39. It is hard for me to resist acting on my feelings.
40. When I get really happy about something, I tend to do things that can have bad consequences.
41. I sometimes like doing things that are a bit frightening.
42. I almost always finish projects that I start.
43. Before I get into a new situation I like to find out what to expect from it.
44. I often make matters worse because I act without thinking when I am upset.
45. When overjoyed, I feel like I can't stop myself from going overboard.
46. I would enjoy the sensation of skiing very fast down a high mountain slope.



47. Sometimes there are so many little things to be done that I just ignore them all.
48. I usually think carefully before doing anything.
49. Before making up my mind, I consider all the advantages and disadvantages.
50. When I am really excited, I tend not to think of the consequences of my actions.
51. In the heat of an argument, I will often say things that I later regret.
52. I would like to go scuba diving.
53. I tend to act without thinking when I am really excited.
54. I always keep my feelings under control.
55. When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.
56. I would enjoy fast driving.
57. When I am very happy, I feel like it is ok to give in to cravings or overindulge.
58. Sometimes I do impulsive things that I later regret.
59. I am surprised at the things I do while in a great mood.

Participants respond with the following scale: 1 = strongly agree, 2 = somewhat agree, 3 = somewhat disagree, and 4= strongly disagree

(Negative) Urgency (all items except 1 are reversed)

items 2 (R), 7(R), 12 (R), 17 (R), 22 (R), 29 (R), 34 (R), 39 (R), 44 (R), 51 (R), 54, 58 (R)

(lack of) Premeditation (no items are reversed)

items 1, 6, 11, 16, 21, 28, 33, 38, 43, 48, 49.

(lack of) Perseverance (two items are reversed)

items 4, 9 (R), 14, 19, 24, 27, 32, 37, 42, 47 (R)

Sensation Seeking (all items are reversed)

items 3 (R), 8 (R), 13 (R), 18 (R), 23 (R), 26 (R), 31 (R), 36 (R), 41 (R), 46 (R), 52 (R), 56 (R)

Positive Urgency (all items are reversed)

items 5 (R), 10 (R), 15 (R), 20 (R), 25 (R), 30 (R), 35 (R), 40 (R), 45 (R), 50 (R), 53 (R), 55 (R), 57 (R), 59 (R)

(R) indicates the item needs to be reverse scored such 1=4, 2=3, 3=2, and 4=1.

## Appendix C

### AUDIT

**Instructions:** Please select the answer that is correct for you.

1. How often do you have a drink containing alcohol?

- 0. Never
- 1. Monthly or less
- 2. 2-4 times a month
- 3. 2-3 times a week
- 4. 4 or more times a week

2. How many standard drinks containing alcohol do you have on a typical day when drinking?

- 0. 1 or 2
- 1. 3 or 4
- 2. 5 or 6
- 3. 7 to 9
- 4. 10 or more

3. How often do you have six or more drinks on one occasion?

- 0. Never
- 1. Less than monthly
- 2. Monthly
- 3. Weekly
- 4. Daily or almost daily

4. During the past year, how often have you found that you were not able to stop drinking once you had started?

- 0. Never
- 1. Less than monthly
- 2. Monthly
- 3. Weekly
- 4. Daily or almost daily

5. During the past year, how often have you failed to do what was normally expected of you because of drinking?

- 0. Never
- 1. Less than monthly
- 2. Monthly
- 3. Weekly
- 4. Daily or almost daily

6. During the past year, how often have you needed a drink in the morning to get yourself going after a heavy drinking session?

- 0. Never
- 1. Less than monthly
- 2. Monthly
- 3. Weekly
- 4. Daily or almost daily

7. During the past year, how often have you had a feeling of guilt or remorse after drinking?

- 0. Never
- 1. Less than monthly
- 2. Monthly
- 3. Weekly
- 4. Daily or almost daily

8. During the past year, have you been unable to remember what happened the night before because you had been drinking?

- 0. Never
- 1. Less than monthly
- 2. Monthly
- 3. Weekly
- 4. Daily or almost daily

9. Have you or someone else been injured as a result of your drinking?

- 0. No
- 2. Yes, but not in the past year
- 4. Yes, during the past year

10. Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested you cut down?

- 0. No
- 2. Yes, but not in the past year
- 4. Yes, during the past year

## Appendix D

### Self-Control Scale

**Instructions:** Please indicate how much each of the following statements reflects how you typically are.

1. I am good at resisting temptation.
2. I have a hard time breaking bad habits. (R)
3. I am lazy. (R)
4. I say inappropriate things. (R)
- 5 I never allow myself to lose control.
6. I do certain things that are bad for me, if they are fun. (R)
7. People can count on me to keep on schedule.
8. Getting up in the morning is hard for me. (R)
9. I have trouble saying no. (R)
10. I change my mind fairly often. (R)
11. I blurt out whatever is on my mind. (R)
12. People would describe me as impulsive. (R)
13. I refuse things that are bad for me.
14. I spend too much money. (R)
15. I keep everything neat.
16. I am self-indulgent at times. (R)
17. I wish I had more self-discipline. (R)
- 18 I am reliable.
19. I get carried away by my feelings. (R)
20. I do many things on the spur of the moment. (R)
21. I don't keep secrets very well. (R)
22. People would say that I have iron self- discipline.
23. I have worked or studied all night at the last minute. (R)
24. I'm not easily discouraged.

25. I'd be better off if I stopped to think before acting. (R)
26. I engage in healthy practices.
27. I eat healthy foods.
28. Pleasure and fun sometimes keep me from getting work done. (R)
29. I have trouble concentrating. (R)
30. I am able to work effectively toward long-term goals.
31. Sometimes I can't stop myself from doing something, even if I know it is wrong. (R)
32. I often act without thinking through all the alternatives. (R)
33. I lose my temper too easily. (R)
- 34 I often interrupt people. (R)
35. I sometimes drink or use drugs to excess. (R)
36. I am always on time.

(R) Reversed Items

Participants respond with the following scale: 1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, and 5 = strongly agree

## Appendix E

### **The DIET-SE**

**Instructions:** Please imagine yourself in each of the following situations and rate how confident you are that you could overcome them, using the 5-point scale below. Completely fill in the circle that best indicates how confident you feel that you could overcome the situation.

1. You are having dinner with your family and your favorite meal has been prepared. You finish the first helping and someone says, "Why don't you have some more?" How confident are you that you would turn down a second helping?
2. You often overeat at supper because you are tired and hungry when you get home. How confident are you that you would not overeat at supper?
3. There is a party at work for a coworker and someone offers you a piece of cake. How confident are you that you would turn it down?
4. You just had an upsetting argument with a family member. You are standing in front of the refrigerator and you feel like eating everything in sight. How confident are you that you would find some other way to make yourself feel better?
5. You are invited to someone's house for dinner and your host is an excellent cook. You often overeat because the food tastes so good. How confident are you that you would not overeat as a dinner guest?
6. You finished your meal and you still feel hungry. There are cakes and fruits available. How confident are you that you would choose the fruits?
7. You are at a friend's house and your friend offers you a delicious looking pastry. How confident are you that you would refuse this offer?
8. You are having a hard day at work and you are anxious and upset. You feel like getting a candy bar. How confident are you that you would find a more constructive way to calm down and cope with your feelings?
9. You feel like celebrating. You are going out with friends to a good restaurant. How confident are you that you would celebrate without overeating?

10. You are out with a friend at lunch time and your friend suggests that you stop and get some ice cream. How confident are you that you would resist the temptation?

11. You just had an argument with your boyfriend or girlfriend. You are upset, angry, and you feel like eating something. How confident are you that you would talk the situation over with someone or go for a walk instead of eating?

Participants respond with the following scale: 0 = Not at all confident, 1 = A little confident, 2 = Moderately confident, 3 = Quite confident, and 4 = Very confident











## Appendix F

### Food Item Health Ratings

Item	Item Type	Rating
 Apple	Healthy	9.00
 Carrots	Healthy	9.00
 Fruit Plate	Healthy	8.62
 Salmon	Healthy	8.62
 Almonds	Healthy	8.08
 Grilled Chicken	Healthy	8.00
 Shrimp	Healthy	8.00
 Greek Yogurt	Healthy	7.46











 <p>Beans</p>	Healthy	7.23
 <p>Eggs</p>	Healthy	6.92
 <p>Peanut Butter</p>	Healthy	6.77
 <p>Brown Rice</p>	Healthy	6.77
 <p>Cottage Cheese</p>	Healthy	6.31
 <p>Pretzels</p>	Healthy	6.00
 <p>Dark Chocolate</p>	Healthy	5.23
 <p>Alfredo Pasta</p>	Unhealthy	4.15
 <p>Tacos</p>	Unhealthy	3.46

 Hamburger	Unhealthy	3.15
 Waffles	Unhealthy	3.15
 Fried Chicken and Fries	Unhealthy	3.08
 Apple Pie	Unhealthy	3.00
 Wings	Unhealthy	2.92
 Cheesesteak	Unhealthy	2.77
 Cookies	Unhealthy	2.54
 Cheese Sticks	Unhealthy	2.15
 Pizza	Unhealthy	2.15
 	Unhealthy	1.85

Nachos		
 Snickers	Unhealthy	1.85
 Brownies	Unhealthy	1.77
 Doughnuts	Unhealthy	1.54

## Appendix G

### Beverage Items Health Ratings

Item		Rating
 Water	Non-alcoholic	9.85
 V8	Non-alcoholic	8.54
 Milk	Non-alcoholic	8.34
 Orange Juice	Non-alcoholic	7.77
 Apple Juice	Non-alcoholic	7.31
 Gatorade	Non-alcoholic	6.54
 Lemonade	Non-alcoholic	5.85
 Red Wine	Alcoholic	5.62

 Sweet Tea	Non-alcoholic	5.31
 White Wine	Alcoholic	5.31
 Coffee	Non-alcoholic	4.38
 Sprite	Non-alcoholic	3.84
 Non- Alcoholic Beer	Non-alcoholic	3.69
 Coke	Non-alcoholic	3.62
 Champagne	Alcoholic	3.54
 Daiquiri	Alcoholic	3.08

 Milkshake	Non-alcoholic	3.08
 Red Bull	Non-alcoholic	2.85
 Root Beer Float	Non-alcoholic	2.77
 Bud Light	Alcoholic	2.69
 Blue Lagoon	Alcoholic	2.62
 Baileys	Alcoholic	2.54
 Brandy	Alcoholic	2.54
 Martini	Alcoholic	2.54

 <p>Margarita</p>	<p>Alcoholic</p>	<p>2.46</p>
 <p>Smirnoff</p>	<p>Alcoholic</p>	<p>2.46</p>
 <p>Lager</p>	<p>Alcoholic</p>	<p>2.38</p>
 <p>Mojito</p>	<p>Alcoholic</p>	<p>2.38</p>
 <p>Tequila Sunrise</p>	<p>Alcoholic</p>	<p>2.31</p>
 <p>Pina Colada</p>	<p>Alcoholic</p>	<p>2.08</p>