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A Component Analysis of Mindful Eating on Delay Discounting for Food

by

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A thesis

submitted in partial fulfilment

of the requirements for the degree of

Master of Science in the Department of Psychology

Idaho State University

Spring 2022

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Acknowledgements

This thesis would not have been possible without the support and guidance of my advisor, Dr. Erin Rasmussen. Thank you for all of your time and patience with me. I would also like to thank my committee members, Dr. Steve Lawyer and Dr. Tony Seikle for their time and feedback on this project. Lastly, thank you to Morgan Musquez and Alam Alvarado for your support and always pushing me forward when things get difficult.

Table of Contents

List of Figures	vi
List of Tables	vii
Abstract	viii
Chapter 1: A Component Analysis of Mindful Eating on Delay Discounting for Food	1
Introduction.....	1
Method	5
Analyses	12
Results.....	14
Discussion	29
Chapter 2: Comprehensive Literature Review.....	36
References.....	51
Appendix A: Demographics	66
Appendix B: Subjective Hunger Questionnaire.....	70
Appendix C: Fagerstrom Test for Cigarette Dependence	71
Appendix D: Dowd Vaping Questionnaire.....	73
Appendix E: Drug Abuse Screening Test	74
Appendix F: Alcohol Use Disorders Identification Test-C	75

Appendix G: Philadelphia Mindfulness Scale	76
Appendix H: Blood Glucose Standard Operating Procedure	78
Appendix I: Money Choice Questionnaire	80
Appendix J: MCQ Item Values and Associated Discounting Rates	82
Appendix K: Food Choice Questionnaire	83
Appendix L: FCQ Item Values and Associated Discounting Rates	85
Appendix M: Consent Form	86
Appendix N: Blood Glucose Script	89
Appendix O: Mindful Eating Script.....	90
Appendix P: Recipes.....	92
Appendix Q: ANCOVAs for Small, Medium, and Large Food DD Magnitudes.....	102
Appendix R: ANCOVAs for Small and Medium Money DD Magnitudes	104
Appendix S: ANCOVAs for Small and Medium Money DD Consistency.....	105

List of Figures

Figure 1: Baseline Money Discounting as a Function of Ethnicity	18
Figure 2: Mean Delay Discounting Values as a Function of Magnitude.....	19
Figure 3: Consistent Responding as a Function of Magnitude	20
Figure 4: Omnibus Food Discounting as a Function of Group.....	22
Figure 5: Average Consistent Responding as a Function of Group.....	23
Figure 6: Average Consistence Responding as a Function of Group for all Magnitudes.....	24
Figure 7: Omnibus Money Discounting as a Function of Group.....	26
Figure 8: Large Magnitude Discounting as a Function of Group	27
Figure 9: Average Consistent Responding as a Function of Group.....	28
Figure 10: Average Consistent Responding for Medium Magnitude Discounting	29

List of Tables

Table 1: Participant Demographic and Health Information.....	15
Table 2: Correlations for Discounting, Health, and Demographic Variables.....	17

Thesis Abstract – Idaho State University (2022)

Mindful eating refers to a deliberate, objective verbal description of the eating experience, such as observations of visual, gustatory, olfactory, textural, and perceptual or responsiveness properties of the eating experience. Mindful eating (ME) has been shown to reduce delay discounting for food in which there is a devaluation of a reward as time to its receipt increases, but the mechanisms by which ME works remain unknown. The present study conducted a component analysis on ME, in which two potential mechanisms of eating mindfully-- eating slowly and active participation in a food-based activity-- were systematically isolated. One hundred and twenty-eight participants were randomly assigned to one of four groups: (1) a traditional ME intervention, (2) a time-based eating condition where participants slowed their eating, (3) a timing + active processing group where participants read recipes aloud, and (4) a timing + passive process group where participants watch a DVD on nutrition. All participants completed the Food Choice Questionnaire (FCQ) and the Money Choice Questionnaire (MCQ) as delay discounting tasks for food and money, respectively. The FCQ and MCQ contain choices between hypothetical smaller, sooner outcomes vs. larger delayed ones and there are three levels of magnitude in both measures. The FCQ and MCQ were completed pre-and post-intervention to determine changes in delay discounting both within and between the four groups. Results showed a magnitude effect of baseline food and money discounting, with smaller magnitudes showing the steepest discounting. There were no effects for group, including ME, on food or money discounting. This was the case across all magnitudes, except for large magnitude money discounting, where there was a significant increase in discounting for the timing group post-session.

Key words: delay discounting, food, mindful eating, money

Chapter 1: A Component Analysis of Mindful Eating Effects on Delay Discounting for Food

Delay discounting (DD) refers to the devaluation of a reward as time to its receipt increases (Ainslie, 1975; Rachlin et al., 1991). Delay discounting (DD) procedures are arranged such that humans or non-human animals make a series of choices between smaller-sooner (SS) vs. larger-later (LL) rewards. For example, a human participant may be asked if they would hypothetically prefer \$10 now or \$15 in one day. The value of the LL reward is systematically decreased (or the value of the SS is increased) in subsequent choices until the participant shows a preference reversal, in which indifference (50% preference) for the SS and LL outcomes is determined. Indifference points are determined for at least four additional delays. The relation between these indifference points and delay to the LL is described as a hyperbolic decrease, with the subjective value of the LL (indifference point) plunging with delay to its receipt. The slope of the hyperbolic decay reflects one's sensitivity to delay; higher values indicate greater sensitivity and have been traditionally referred to as "impulsive" (However, see Strickland and Johnson, 2020 on why this term should no longer be applied).

Delay discounting has been examined as an individual difference variable with a number of health-related behaviors. For example, those who smoke or consume alcohol tend to have steeper money discounting (Bickel et al., 1999; see MacKillop et al., 2011 for meta-analysis; Petry, 2001). Similar effects have also been found with gambling, such that pathological gamblers tend to discount money more steeply in gambling contexts than other public locations (Dixon et al., 2006). Moreover, those who more steeply discount for sexual activity also tend to discount money more steeply and are less able to delay gratification for physically pleasurable events (Mahoney & Lawyer, 2018).

Delay discounting is also implicated in obesity. Obese individuals discount food and money more steeply than nonobese individuals in a variety of contexts (see Amlung et al., 2016 for meta-analysis; Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017; Rasmussen et al., 2010; Weller et al., 2008; Jarmolowicz et al., 2014; Fields et al., 2017). For example, Rasmussen et al. (2010) examined the relationship of discounting food and money-related outcomes with percent body fat (PBF). Results showed that individuals with a greater PBF had steeper DD rates for food, but no effects were found for money. Further, Weller et al. (2008) examined delay discounting (DD) differences between obese and non-obese participants. Results found that obese women made more impulsive decisions than non-obese women, though no difference was found in men. Given that the value of delayed commodities decreases more strongly with obese individuals, strategies and interventions that may help increase the value of delayed commodities have been developed.

One such strategy involves mindfulness. Mindfulness-based interventions have become increasingly prevalent in recent years for treatment of a variety of physical and psychological disorders including depression, anxiety, chronic pain, and substance use disorders (Hofmann et al., 2010; Kabat-Zinn, et al., 1985; Witkiewitz et al., 2010). Originally a core aspect of Buddhist meditation (Kabat-Zinn, 2003; Shapiro et al, 2006), mindfulness is often described as a practice of attention and present-centered awareness. Focusing an individual's attention to basic processes like breathing, individuals are encouraged to verbally acknowledge any stimuli such as emotions, senses, or other phenomenon that arise, and to assess them objectively while returning attention to the breathing and physical location (i.e., body part) in which the sensation is taking place (Bishop et al., 2006; Marlatt & Kristeller, 1999; Shapiro et al., 2006).

An extension of mindfulness has been applied to the phenomenon of mindful eating (ME). ME is generally characterized by eating with awareness through “active” decision-making as opposed to eating without awareness. ME is also attending to and recognizing (i.e., labeling) satiety cues and being aware of present-moment experiences while eating (Dalen et al., 2010; Kristeller et al., 2014). One study by Kristeller et al. (2014) found that when using a form of ME called Mindfulness-Based Eating Awareness Training (MB-EAT), where individuals are asked to focus on the taste of food and satiation cues, that binge eating participants binged less often and had reduced levels of depression compared to a wait-listed control group. Additionally, Dalen et al. (2010) examined the effects of a ME program on weight loss, eating behavior, and psychological outcomes (i.e., depression and anxiety) in obese individuals using a 6-week Mindful Eating and Living (MEAL) program. Findings revealed that participants had significant weight loss, a decrease in hunger and binge eating, as well as reduced psychological distress when comparing pre and post-test results.

Mindful eating has also been shown to reduce delay discounting for food (Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017; but see its application to women with food insecurity: Rasmussen et al., 2022). In these studies, participants were systematically presented with small bites of food to eat and were asked to verbally describe their experiences using their senses, i.e., observing, touching, smelling, and tasting and to also use proprioceptive cues in their descriptions (e.g., salivation flow, the feel of the food moving down their esophagus, feeling fuller). Participants were asked to focus on the present moment and describe their experiences objectively, using non-judgmental language. Hendrickson & Rasmussen (2013) randomly assigned participants into two groups, where one group received a ME intervention, and the other group received a DVD control. Both before and after the interventions, participants were asked

to complete a discounting task with both monetary and food rewards. Results showed that individuals in the ME group had lower discounting with food outcomes, but not monetary outcomes, whereas the control group had similar discounting rates compared to baseline. This finding was replicated by Hendrickson & Rasmussen (2017) with both adolescents and adults, where participants were once again randomly assigned to either a ME intervention, a DVD control group, or a second control group that did nothing. Completing a DD task with both food and monetary outcomes before and after the intervention, researchers again found that those in the ME condition discounted food, but not money, less steeply compared to baseline; discounting did not change in the two control groups.

While there is evidence that ME reduces delay discounting for food (Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017), the mechanisms for how ME works is uncertain. One speculation is that ME slows the pace of eating. Some evidence shows that when individuals slow their pace of eating in a sitting, they are more likely to eat less (Andrade et al., 2008; Zhu & Hollis, 2013), which may serve as a form of delay training, in which pausing before a reward is delivered is required to get access to the reward. Delay training indeed reduces delay discounting (Marshall et. al., 2014; Panfil et al., 2020; Peterson & Kirkpatrick, 2016; Smith et al., 2015).

ME may also reduce discounting because *any active behavioral process* (overt or covert) may reduce discounting. Describing the experience of eating is an active process, as opposed to more passively eating. In the Hendrickson and Rasmussen studies, individuals who passively watched a DVD about nutrition and ate food did not show a reduction in food DD, so it seems that watching a video about food, a fairly passive process, does not affect food DD processes. Conversely, a number of other studies show that active processes, such as working memory

training, Acceptance and Commitment Therapy (ACT), and episodic future thinking can also suppress discounting (Hue et al., 2017; Morrison et al., 2014; Peters & Buchel, 2010). It should be noted, however, that none of these studies have been conducted with food.

Because ME reduces food DD, and the mechanism for it is unclear, the present study was designed to replicate the findings of Hendrickson & Rasmussen (2013) and (2017) and extend this literature by performing a component analysis of ME to determine the mechanism by which it functions. In this study two key components of the ME intervention were isolated: 1) slowing the pace of eating and 2) engaging in an active process. The experiment consisted of randomly assigning participants to one of four groups: 1) a timing group where participants slowed their eating through waiting for bites of food, 2) a timing-plus-active processing group where participants waited for bites of food while reading recipes aloud, 3) a timing-plus-passive processing group where participants waited for bites of food while passively watching a DVD on nutrition, and 4) the ME training, which contained both aspects of timing and active processes.

We hypothesized that there would be a significant reduction in discounting for food (but not money) in the ME group compared to baseline, such that participants will discount less steeply post-session, replicating the findings of Hendrickson & Rasmussen (2013; 2017). It was hypothesized that the timing, timing plus passive processing, and timing plus active processing may also affect food DD, but the degree to which they would was uncertain.

Method

Participants

Undergraduate psychology students were recruited from lower-division psychology courses at Idaho State University via SONA, an online research database. A power analysis for a

2 X 4 ANCOVA with a repeated measures design, four groups, and three covariates was used to determine sample size. To determine a medium effect size ($f = 0.3$) at an alpha of 0.05, β was set to 0.85. The power analysis yielded a suggested sample size of 128 with 32 participants in each group.

Participants were required to be at least 18 years of age and fluent in English to be included in the study. Exclusion criteria included pregnancy, a diagnosis of an eating disorder, a food allergy, or an unwillingness to eat the offered foods for the study. Participants were also asked not to eat or drink anything two hours before arriving to the laboratory to control for food deprivation.

Measures and Materials

All measures were presented on a Dell Latitude E5570 Laptop using Qualtrics®.

Demographics (Appendix A): The demographics questionnaire queries participants for basic demographic information, such as age, sex, ethnicity, income, health-related information (food and exercise habits) and education.

Subjective Hunger Questionnaire (SHQ; $\alpha=0.23$; Appendix B): The SHQ is a three-item questionnaire which measures self-reported hunger. This measure asks participants how many hours since their last meal and snack, along with a self-rating of hunger on a scale from 0 to 100. This measure controls for hunger levels while completing food DD tasks (Hendrickson & Rasmussen, 2013; 2017).

Fagerstrom Test for Cigarette Dependence (FND; Appendix C): The FND is a 12-item measure that evaluates the quantity, the compulsion to use, and dependence with cigarettes and vaping products (Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The higher the total

FTND score, the greater the dependence on cigarettes. This measure is used to control for cigarette use, which has been shown to be positively related to discounting rates (Sweitzer et al., 2008; Johnson et al, 2007).

Dowd Vaping Questionnaire (DVQ; Appendix D): The Dowd vaping questionnaire is an 11-item measure that evaluates desire, intention, and positive outcome (i.e., reinforcement) from vaping on a 7-item Likert scale (Dowd et al., 2018). This measure is used to control for vaping use, given that previous studies have shown a relation between nicotine and discounting rates (Sweitzer et al., 2008; Johnson et al, 2007).

Drug Abuse Screening Test (DAST-10; Appendix E): The DAST-10 is a 10-item measure of problematic drug use, which excludes alcohol. The response options are coded as “yes” or “no” yielding a total score ranging from 0 to 10. This measure is used to control for substance use, which has been shown to be associated with steeper discounting (Bickel et. al, 1999; Johnson et. al, 2007, Kollins, 2003; Odum & Rainaud, 2003; Petry, 2001).

Alcohol Use Disorders Identification Test-C (AUDIT-C; Appendix F): The AUDIT-C is a 3-item measure for problematic alcohol use (Bush et al., 1998). Each question has five response options and a total score ranging from 0 to 12. The higher the score, the more problematic the drinking behavior is, with regards to well-being and/or safety. The AUDIT-C is a condensed version of the AUDIT and has similar accuracy rates (Reinert & Allen, 2007). This measure will be used to control for problematic drinking, which is correlated with steeper discounting (Petry, 2001; Kollins, 2003).

Philadelphia Mindfulness Scale (PHLMS; Appendix G): The Philadelphia mindfulness scale is a 20-item measure of trait mindfulness (Cardaciotto et al., 2008). Each question is scored

on a 5-point Likert scale ranging from 1 (never) to 5 (very often). Ten of the 20 questions measure participants' awareness and the remaining 10 measure acceptance. This measure was used to control for potential mindfulness of the timing group (see below), as it is possible that participants may be practicing mindfulness while sitting in silence.

Biometrics

Blood Glucose: Blood glucose levels were taken with a blood-glucose monitor (Accu-Check ® Compact Plus) to ensure that participants have not consumed food or beverages, besides water, for at least two hours prior to the experiment. The participant's finger was sterilized with an alcohol wipe and then pricked to obtain a small drop of blood for a test strip. The test strip was inserted into the glucose monitor to determine the blood glucose level. The needle and test strip were discarded in a SHARPS container and the gloves and alcohol wipe were discarded in a bin. See lab Standard Operating Procedure (Appendix H) for more detail.

Body Mass Index (BMI) and Percent Body Fat (PBF): Weight (kg) and percent body fat were measured by a Tanita 2201 Body Fat Scale. Height was quantified in meters squared (m^2), so that BMI could be calculated by dividing the participant's weight by height. BMI was based on the Center for Disease Control (CDC, 2020) standard BMI categories. Underweight is defined at <18.5 , normal is $18.5 - <25$, overweight is $25 - <30$, and obesity is categorized by 30 or higher.

Waist circumference: Waist circumference in cm was determined using a measuring tape. Participants stood upright, facing away from the PI or research assistant, and raised their clothing just above navel-height to allow proper measuring. The CDC (2020) reports that for adults, a waist circumference greater than 35 inches for women or 40 inches for men suggest risk for obesity-related health complications.

Discounting Measures

Monetary Choice Questionnaire (MCQ; Kirby & Maraković, 1999; see Appendix I) The MCQ measures monetary delay discounting. It poses 27 questions in which participants are asked to choose between smaller sooner monetary rewards vs. larger delayed rewards (e.g., “Would you prefer \$1 now or \$10 in 2 days?”). This measure has three different reward magnitudes: small (\$25-35), medium (\$55-65) and large (\$75-85) over 23 different time points (7- 186 days). The MCQ provides four measures of discounting: one for each magnitude and an omnibus measure for each participant by taking the average k values at each magnitude. See Appendix J for values and associated discount rates. Higher values refer to steeper discounting. The MCQ provides four different measures of discounting: one for each magnitude and three omnibus measures for each participant.

Food Choice Questionnaire (FCQ; Hendrickson, et al 2015; see Appendix K): The FCQ is a 27-item modified version of the MCQ which uses hypothetical bites of food instead of monetary outcomes (Hendrickson, 2013). Bites of food are standardized by first presenting a 5/8” cube and asking the participant to imagine the cube as one bite of their favorite type of food. Participants are asked to make choices between two hypothetical food rewards (e.g., “Would you like 15 bites now or 30 bites in five hours?”). There are three different magnitudes: small (8- 13 bites), medium (25- 35 bites), and large. (40-50 bites) and delays between 0.5 to 24 hours. See Appendix L for values and associated discount rates. Higher values refer to steeper discounting. The FCQ provides four different measures of discounting: one for each magnitude and three omnibus measures for each participant.

Procedure:

Participants were recruited and scheduled to participate in a single session. After arriving in the laboratory, participants were asked if they have eaten or drunk anything within the last two hours. If so, they were rescheduled. After receiving informed consent form (see Appendix M), participants were read a script and had their blood glucose (Appendix N) taken to ensure that they had not consumed food or beverages for at least two hours before participating in the study. If the participant's blood glucose was over 180 (suggesting they were not food deprived), they were asked to reschedule. Participants then filled out the following measures: demographics, SHQ, FND, DVQ, DAST, and AUDIT-C on a computer before completing the MCQ and the FCQ as baseline measures of food and money discounting, respectively. While participants completed these measures, they were randomly assigned to one of four groups:

Mindful Eating (ME; See Appendix O): Participants in this group attended an individual session for a 50-minute ME workshop. Using a modified version of Kabat-Zinn's (1994) "Raisin Exercise," the researcher read the ME script and give the participant choices between four types of food: fruit (a blackberry or a red grape), vegetable (a baby carrot or piece of broccoli), cracker (a Triscuit or wheat thin), and sweet (Hershey's® milk chocolate square or a Reese's® pieces). Participants were asked by the ME instructor to examine the food slowly and deliberately using the senses of sight, touch, smell, and taste, and prompted to attend to how the body responds to the food as they eat it (e.g., to notice their salivation while chewing food). To ensure they are engaging in the ME, participants are asked to record their observations while eating the four foods. The ME script is timed so that it takes the participants about 10 minutes to eat each piece of food mindfully. At the end of the 40 minutes, the researcher leads the participant in a

discussion about how they felt about the experience, what they noticed, as well as the benefits of ME (e.g., decreased calorie consumption from eating slowly).

Timing Group (T): Participants were given the same choices of foods as the ME group. Given that the ME script is timed so that participants eat bites of food at the same times, participants in this group took a bite of these foods at the same time points as the ME group; that is, the prompt to eat a bite is yoked to the ME group. For the T group, the research assistant presented the bite of food at each cue and ask the participant to eat it. Mirroring that of the ME group, four total bites of different foods were taken at 8, 18, 28, and 38 minutes. Between bites, participants sat quietly and were not allowed to engage in other activities while waiting. Once all the bites have been eaten, the participant engaged in an experimenter-lead discussion about the experience and asked how they felt about the activity.

Active Reading (AR; See appendix P) Group: This group was given the same four food options to eat and instructed to read recipes aloud. Recipes were chosen because they are textual representations of food. Recipes were read every 5 minutes, matching the speed of which the script would be read in the ME group. Similar to the timing group, participants were instructed to take a bite at the 8, 18, 28, and 38-minute points in the session. Participants read recipes aloud for the entire duration of the 50-minute activity.

Timing + Passive Process (T+PP): Participants in the passive process group watched a 50-minute educational video on nutrition, titled “Learn Nutrition”. Participants were given the same four pieces of food as the other groups and received them at the 8, 18, 28, and 38-minute mark. The movie is not interactive and does not contain suggestions on how to lose weight. Participants watched the DVD for the entire duration of the 50-minute activity.

After participating in the activities of group to which they were assigned, participants once again completed the MCQ and FCQ as post-treatment measures in addition to the PHLMS. Once completed, the participant's height, weight, waist circumference, and body fat percentage were recorded.

Analyses

Data were analyzed using SPSS 27.0 statistical software.

Discounting patterns for the MCQ and FCQ were scored across each discounting magnitude (i.e., small, medium, and large) within each questionnaire according to the methods used in Kirby and Marakovic (1996) and Hendrickson et al, (2015), respectively. They will be summarized here. For the MCQ, each magnitude has nine questions (27 questions total) and each question has a predetermined discounting value associated with it which is the value associated with indifference (if the two choices are equally valued). For example, the second question of the large magnitude for money asks participants if they would prefer \$33 now or \$80 in 14 days and has a predetermined discounting value of 0.10; If the participant chooses the LL reward of \$80, their discounting value would be < 0.10 . On the next question, which asks if the participant would prefer \$41 now or \$75 in 20 days, if the participant shows a preference reversal and chooses the SS reward of \$41 instead of the LL (what was chosen on the last question), their discounting value would be > 0.042 . Therefore, the individual's discounting rate should fall between 0.10 and 0.042, and we would determine the geometric mean of these two values. For example, 0.065 is the geometric of 0.10 and 0.042. If multiple preference reversals occurred, the geometric mean of both rates were taken. Three discounting values were calculated for each magnitude for each participant. Higher discounting values are described as more "impulsive"

(but see Strickland & Johnson, 2020), while lower values are considered more self-controlled (Voon et al., 2010).

Consistency in choices across a discounting task is an important variable to examine, given that random patterns of responding from participants can potentially affect the validity of discounting values (see Craft et al., 2022). The percent of consistent responders was identified to determine the extent to which participants made choices consistent with a single discounting value. Consistent responding is that in which one preference reversal or less is observed between the series of LL vs SS outcomes; inconsistent responding refers to >1 preference reversals. When responding is inconsistent, a single discounting value cannot be assigned and instead the value that is most consistent with the participant's choices is used. For instance, if a participant shows two preference reversals between \$41 now or \$75 in 20 days, and \$69 now or \$85 in 91 days, the discounting value could potentially be assigned as 0.065 or 0.0039. Given that there are 10 potential discounting values to be assigned and nine questions for each magnitude, seven out of the nine preferences would be consistent with a discounting value of 0.065 (i.e., two LL choices before the first preference reversal, and five out of seven SS choices after), and this participant would be 78% consistent (7/9) with this discounting value. Similarly, this participant would be consistent with eight out of nine (89%) choices for the 0.0039 discounting value (i.e., four out of five LL choices before the preference reversal and four SS choices after) and would be assigned this value as it is larger than the previous option. If there was more than one discounting value the participant was consistent with, the geometric mean of those values was taken. Inconsistent responding is important to identify, as it is reflective of a lack of attention or possible confusion from the participant (Kirby, 1996, 1997, 2000; Smith et al., 2018).

Given that a consistency score is given for each magnitude, each participant receives three consistency values. To measure overall consistency across the discounting questionnaire, the average of the three consistency scores were taken. These scores were compared across magnitude and also examined across group pre- and post-treatment.

Correlations were run to determine if demographic data, subjective hunger, substance use data, nicotine use, alcohol consumption, and trait mindfulness were related to discounting values and therefore needed to be controlled statistically. The dependent variables in this study were small, medium, large, discounting values derived from MCQ for money and FCQ for food. Omnibus values were also examined, which were the geometric means of the three discounting values across magnitude. The independent variables were session (pre- vs. post-) and group (ME vs. time-based vs active reading vs DVD control). Therefore, a 2x4 mixed-model ANCOVA with up to 3 covariates was used to compare discounting values of the FCQ and MCQ of the four groups (group as between-subjects variable and pre- and post-treatment as within-subjects variable).

Results

A total of 128 participants completed the study. Four participants indicated a possible eating disorder within the last 2 years and were excluded from analyses. Therefore, the remaining participants were included in the analysis (total $n = 124$). Table 1 shows the number of participants in each group as well as demographic and health information across group. ANOVAs revealed no differences between any listed variable. The sample was mostly white (83%) and female (80%) with an average age of 20.23 years.

Table 1*Table 1. Participant demographic and health information*

Variable	Total n=124 M(S.E.)	Timing n=30 M(S.E.)	AR n=31 M(S.E.)	T + PP n=32 M(S.E.)	ME n=31 M(S.E.)
Age	20.23(0.36)	20.57(0.72)	20.29(0.76)	20.94(0.90)	19.13(0.32)
% Female#	80%	80%	81%	75%	87%
% White #	83%	73%	87%	94%	77%
Income					
<\$10,000	4.8%	3.2%	3.2%	3.1%	3.3%
\$10,000-\$20,000	8.90%	9.6%	12.9%	6.25%	6.7%
\$20,000-\$30,000	7.3%	3.2%	6.5%	9.4%	10%
\$30,000-\$40,000	11.3%	16.1%	12.9%	9.4%	6.7%
\$40,000-\$50,000	12.9%	16.1%	12.9%	15.6%	6.7%
\$50,000-\$60,000	12.9%	16.1%	16.1%	9.4%	10%
\$60,000-\$70,000	8.1%	6.5%	12.9%	6.5%	6.7%
>\$70,000	33.9%	29%	22.6%	34.4%	50%
BMI	24.71(0.47)	24.34(0.99)	25.62(1.04)	24.52(0.77)	24.35(1.01)
PBF	28.19(0.84)	28.27(1.65)	29.29(1.77)	27.58(1.63)	27.66(1.77)
Sub Hung	48.42(2.38)	52.67(4.59)	53.19(4.57)	42.81(4.56)	45.32(5.19)
DAST	0.17(0.05)	0.13(0.08)	0.06(0.04)	0.31(0.15)	0.16(0.07)
FND	0.065(0.065)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.161(0.0161)
DOWD	1.24(0.38)	1.00(0.74)	0.74(0.52)	1.53(0.87)	1.68(0.84)
AUDIT	1.08(0.14)	0.93(0.26)	0.68(0.25)	1.44(0.31)	1.25(0.32)
Mindfulness	25.31(0.41)	25.77(0.90)	25.13(0.59)	26.06(0.88)	24.26(0.91)

Note. * $p \leq 0.05$, #Largest group by percentage, S.E. =standard error; PBF=Percent body fat; BMI=Body mass index, Sub Hung=subjective hunger, DAST= Drug Abuse Screening Test, FND= Fagerstrom Test for Cigarette Dependence, DVQ = Dowd Vaping Questionnaire, AUDIT= Alcohol Use Disorders Identification Test-C, Mindfulness=Trait mindfulness

Correlations of Health and Demographic Variables with Delay Discounting

Because discounting values were skewed, which is consistent with previous discounting research (e.g., Beck & Triplett, 2009; Johnson & Bickel 2002), values were transformed for normality. Food DD was normalized with a square root transformation, which was run by taking the square root of each value. Money discounting was normalized with a log-transformation, which was done by taking the log of each value. Scores were considered normal if they had a skewness was between -0.5 to +0.5.

A number of participants did not make a single preference-reversal for food or money discounting (i.e., chose all SS or LL rewards). This number was totaled for both pre- and post-session DD. For the FCQ, 13 (10% of sample) participants responded with all one choice during the baseline and 18 (14%) during the second FCQ. For money, six participants (5%) chose all one option during the first questionnaire and eight (6%) did at follow-up.

Table 2 shows correlations for transformed pre- and post-session discounting for food and money with demographic information, substance use, subjective hunger, and trait mindfulness. Baseline and post-session food DD were positively correlated [$r(0.488)$, $p<.001$]. Baseline food DD was also positively correlated with baseline money DD [$r(0.310)$, $p<.001$], and post-session money DD [$r(0.360)$, $p<.001$], in addition to subjective hunger [$r(0.188)$, $p=0.037$] and time since last meal [$r(0.225)$, $p=0.012$]. Post-session discounting was negatively correlated with baseline money DD [$r(0.461)$, $p<.001$], post-session money DD [$r(0.476)$, $p<.001$], and income [$r(-0.203)$, $p=0.023$]. No other correlations were significant for pre- or post-discounting.

Pre- and post-session money DD was positively correlated [$r(0.781)$, $p<.001$]. Pre-session money discounting was negatively correlated with income [$r(-0.187)$, $p=0.037$]. Ethnicity also predicted money DD, as a one-way ANOVA (see Figure 1) revealed significant differences between ethnicity groups [$F(3,119)=2.95$, $p=0.036$, $\eta_p^2=0.069$] such that participants identifying as “other” ($n = 2$) discounted more steeply than White/Caucasian ($p=.007$) and Hispanic/Latino ($p=.017$) participants; this effect is based on an underpowered sample, however, especially in the “other” category, so we caution against a robust interpretation. There was only one Black/African American participant in the sample. Post-session money DD was positively correlated with alcohol use [$r(0.219)$, $p=0.015$]. No other correlations for pre- or post-session discounting were significant.

Table 2

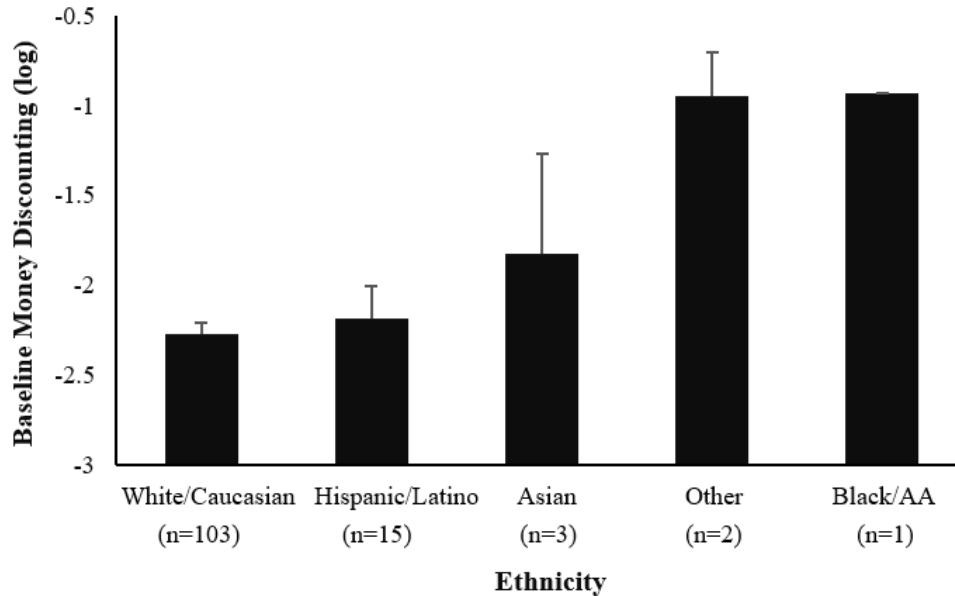
Correlations between pre- and post-session transformed discounting, demographics, substance use, and mindfulness for food and money discounting

Variable	1	2	3	4	5	6	7	8	9	10	11
1.BL Food DD	-	0.488**	0.310**	0.360**	-0.068	0.188*	0.059	0.066	0.091	0.085	-0.037
2.Post Food DD	0.488**	-	0.461**	0.476**	-0.203*	0.018	0.075	-0.023	0.06	-0.036	-0.087
3.BL Money DD	0.310**	0.461*	-	0.781**	-0.187*	-0.002	0.046	0.077	0.145	-0.016	-0.071
4.Post Money DD	0.360**	0.476**	0.781**	-	-0.117	0.012	-0.059	0.092	0.219*	-0.017	-0.026
5.Income	-0.068	-0.203*	-0.187*	-0.117	-	0.048	-0.063	-0.149	0.031	-0.196*	0.051
6.Subj hunger	0.188*	0.018	-0.002	0.012	0.048	-	-0.166	-0.051	-0.166	0.06	0.019
7.Cigarette Use	0.059	0.075	0.046	-0.059	-0.063	-0.166	-	0.233**	0.223*	0.14	-0.214*
8.Vape Use	0.066	-0.023	0.077	0.092	-0.149	-0.051	0.233**	-	0.410**	0.232**	-0.015
9.Alcohol Use	0.091	0.06	0.145	0.219*	0.031	-0.166	0.223*	0.410**	-	0.321**	-0.065
10.Drug Use	0.085	-0.036	-0.016	-0.017	-0.196*	0.06	0.14	0.232**	0.321*	-	0.15
11.Mindful	-0.037	-0.087	-0.071	-0.026	0.051	0.019	-0.214*	-0.015	-0.065	0.15	-

Note. * $p\leq 0.05$, ** $p\leq 0.001$

Figure 1

Baseline money discounting as a function of ethnicity.



Error bars = 1 SEM

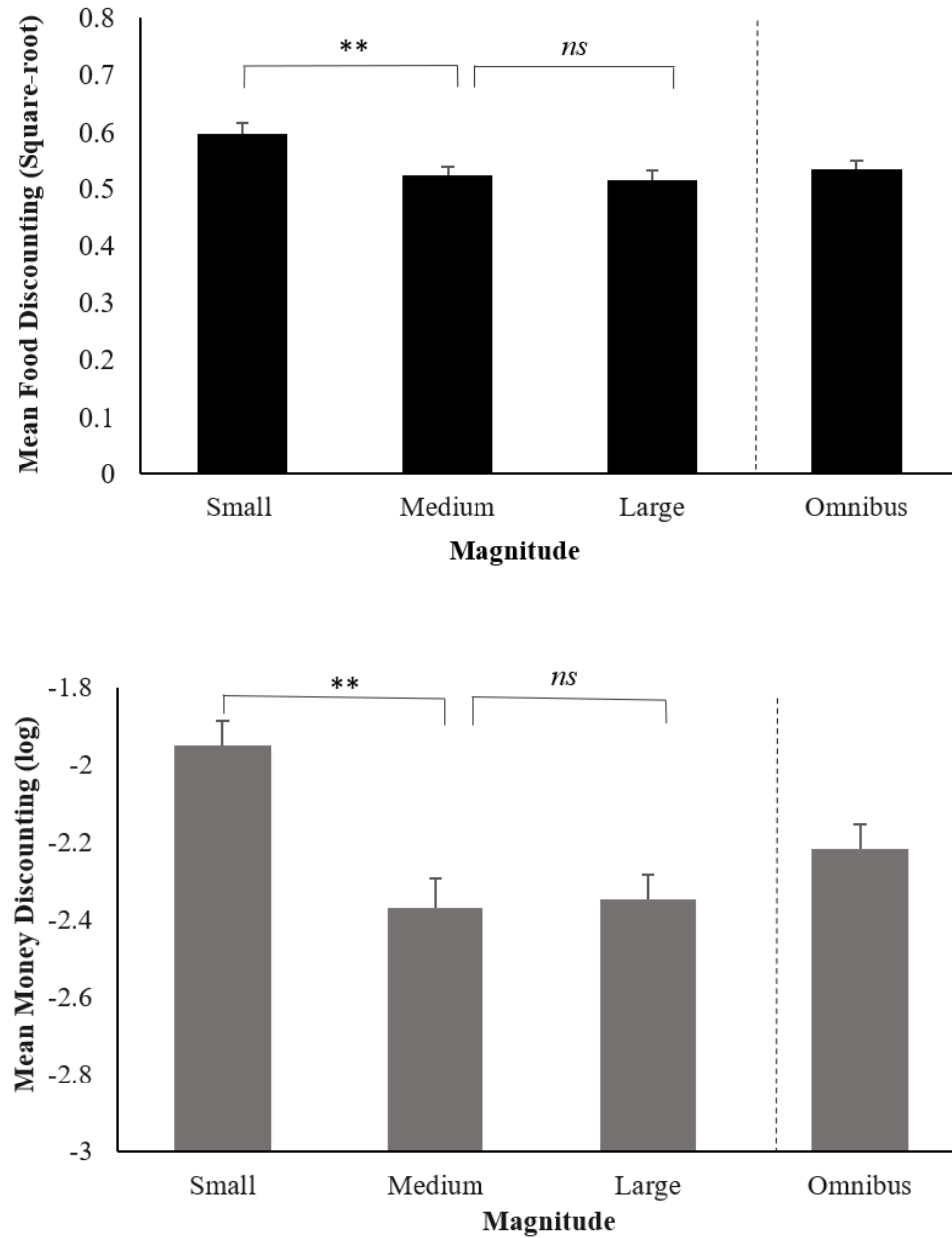
Baseline Delay Discounting

Figure 2 shows mean baseline DD values by magnitude. A repeated measures ANOVA for food DD (top) revealed a significant difference between magnitudes [$F(2,122)=11.99$ $p<.001$, $\eta_p^2=0.164$]. An LSD post-hoc test revealed that small magnitudes were discounted steeper than medium ($p<.001$) and large magnitudes ($p<.001$); no difference was found between medium and large magnitudes.

A similar effect was found for money DD (bottom) [$F(2,122)=73.76$, $p<.001$, $\eta_p^2=0.547$] such that small magnitudes were also discounted more steeply than medium ($p<.001$) and large ($p<.001$) magnitudes, with no difference between medium and large magnitudes.

Figure 2

Mean delay discounting values (transformed) as a function of magnitude for food (top) and money (bottom). Omnibus values are included as a mean of the three values but were not included in analysis.

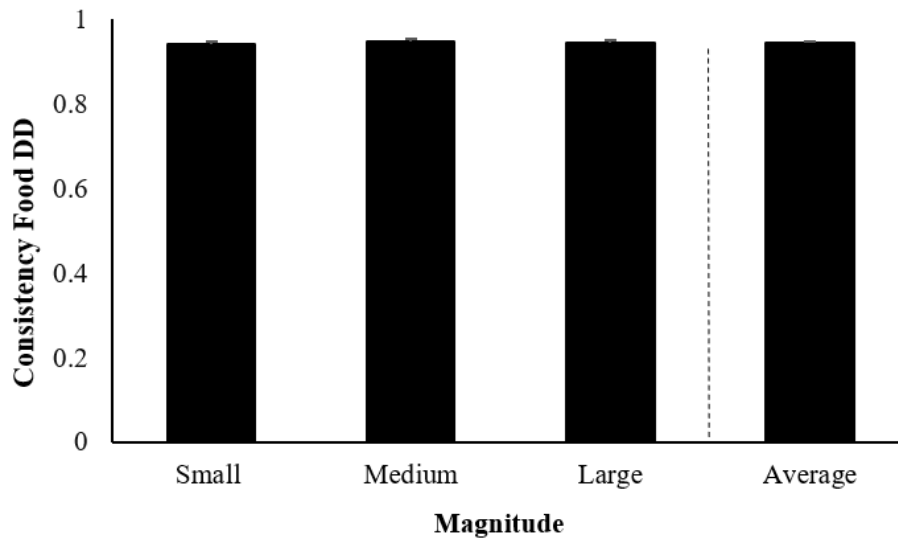


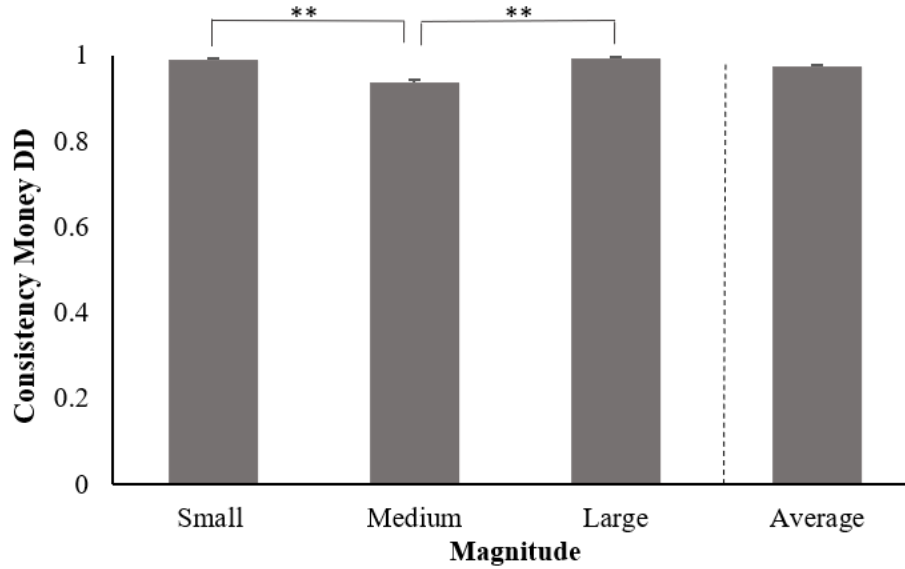
Note. ** $p \leq 0.001$, ns=not significant, Error bars = 1 SEM

Consistent responders in the baseline data were identified using criteria from Gray et al., (2016) and Hendrickson et al., (2015). Inconsistent responders remained in the dataset due to not having *a priori* exclusion criteria. Figure 2 shows a repeated measures ANOVA for baseline consistency magnitudes and average overall consistency, which were all at 0.94 or above in all conditions. No differences in magnitude were found for food DD (top) [$F(2, 122)=0.304$, $p=0.738$, $\eta_p^2=0.005$]. For money DD, mean consistency was above 0.93. However, a significant difference for magnitude was found for money discounting (bottom) [$F(2,122)=49.99$, $p<.001$, $\eta_p^2=0.450$]. An LSD post-hoc test revealed that the medium magnitude was significantly less consistent than the large ($p<.001$) and small magnitudes ($p<.001$).

Figure 3

Consistent responders in discounting as a function of magnitude.





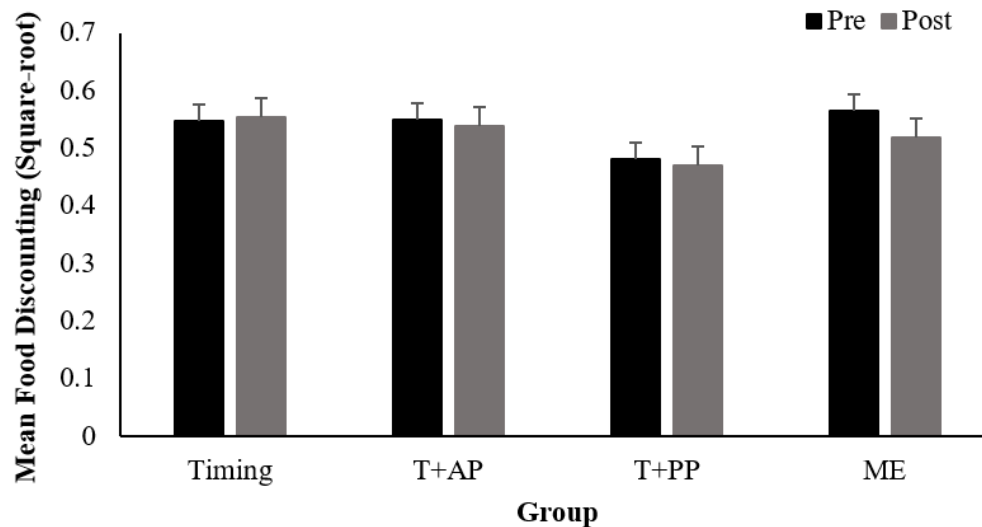
Note. ** $p \leq 0.001$, Error bars = 1 SEM

Mindful Eating and Food and ME.

Figure 4 shows mean square-root-transformed omnibus food DD values as a function of group. A repeated measures ANCOVA was run with baseline and post-session omnibus discounting as within-subjects factors and group as a between-subjects factor. Subjective hunger and income were entered as covariates. A main effect was found for session [$F(1,118)=3.95$, $p=0.049$, $\eta_p^2=0.032$], but there was no main effect was found for group ($p=0.137$) or a session X group interaction ($p=0.701$). A Bonferroni post-hoc test revealed no significant effect for session ($p=0.393$). Income was significantly related to discounting [$F(1,118)=3.99$, $p=0.049$, $\eta_p^2=0.032$], but subjective hunger was not ($p=0.289$).

Figure 4.

Omnibus food discounting as a function of group.



Error bars = 1 SEM

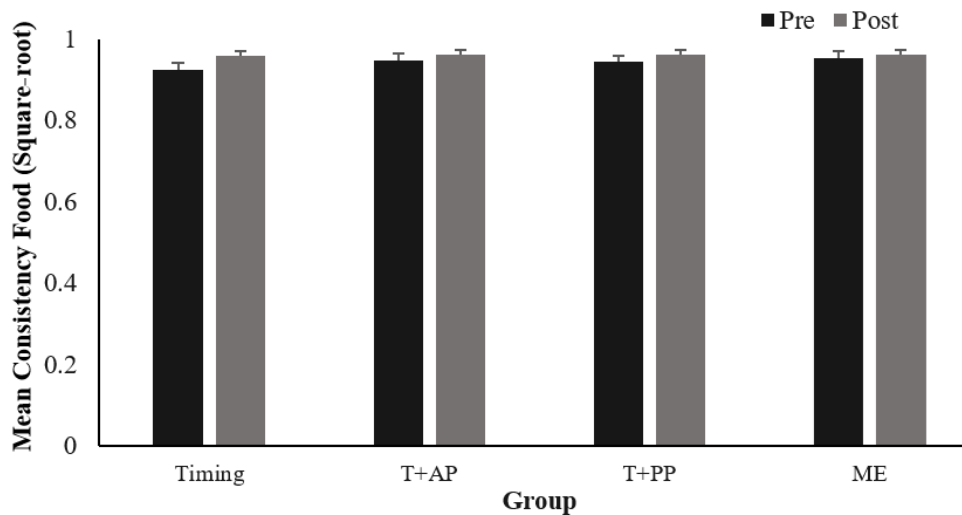
Food Discounting Magnitudes and ME. As with omnibus discounting, repeated measure ANCOVAs were run for small, medium, and large food magnitudes with subjective hunger and income as covariates. For small magnitude discounting, no main effects were found for session ($p=.274$), group ($p=0.105$), or an interaction ($p=.906$). Subjective hunger and income had no effects on discounting (p 's > 0.27). This was also the case for medium magnitude (p 's > 0.18). For large magnitude, there was a main effect for session [$F(1,118)=4.81$, $p=0.03$, $\eta_p^2=0.039$]. However, a Bonferroni post-hoc test revealed no differences pre- and post-session ($p=0.444$). No effect was found for group ($p=0.158$) and there was no interaction ($p=0.385$). A Bonferroni post-hoc comparison showed a marginal effect for mindful eating such that discounting was trending toward being lower post session ($p=0.083$). Income had a significant effect on discounting [$F(1,$

118)=4.46, $p=0.037$, $\eta_p^2=0.036$] but subjective hunger was not significant ($p=0.558$). See Appendix Q for small, medium, and large discounting figures.

Figure 5 shows a repeated-measure ANOVA for average consistency at both baseline and post-session was run. Session was run as a within-subjects factor and group was run as a between-subjects factor. There was a main effect for session, such that there was more consistent responding post intervention [$F(1,120)=10.99$, $p=0.001$, $\eta_p^2=0.084$]. This effect remained significant after a Bonferroni post-hoc correction ($p=0.001$). There was no effect for group or an interaction (p 's >0.40).

Figure 5

Average consistent responding as a function of group.



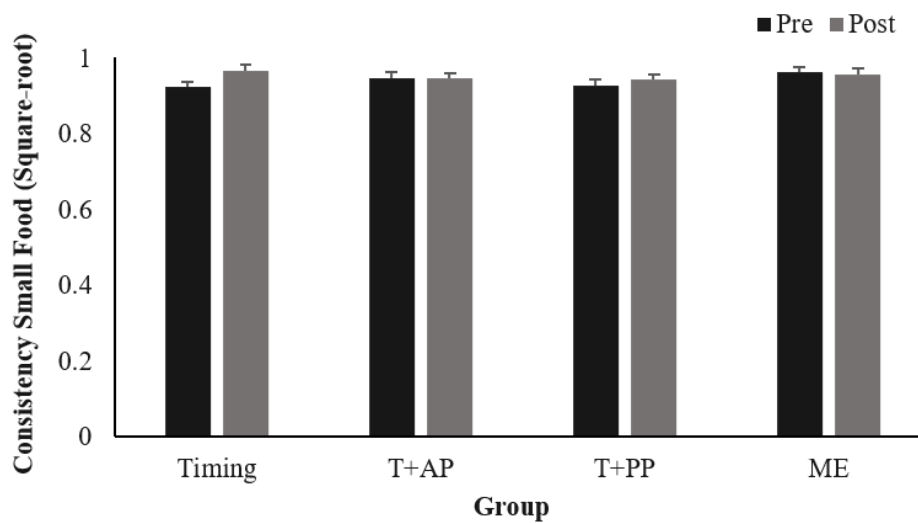
Error bars = 1 SEM

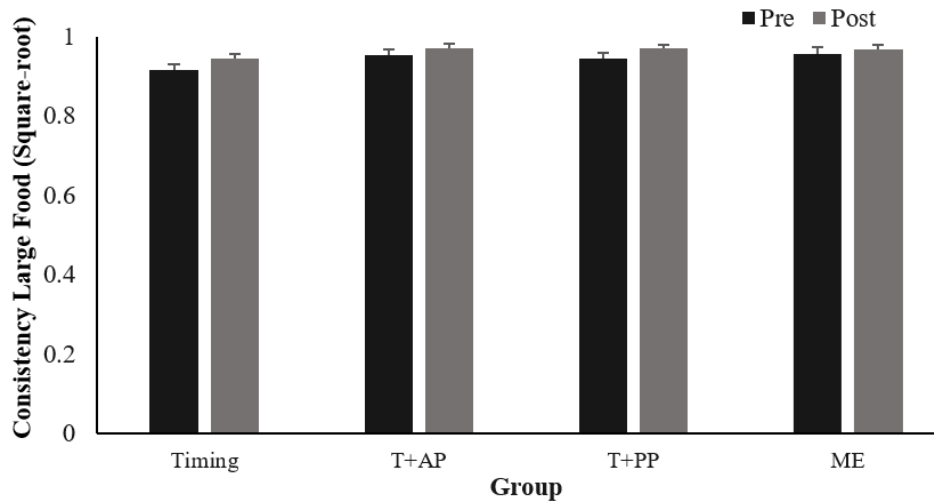
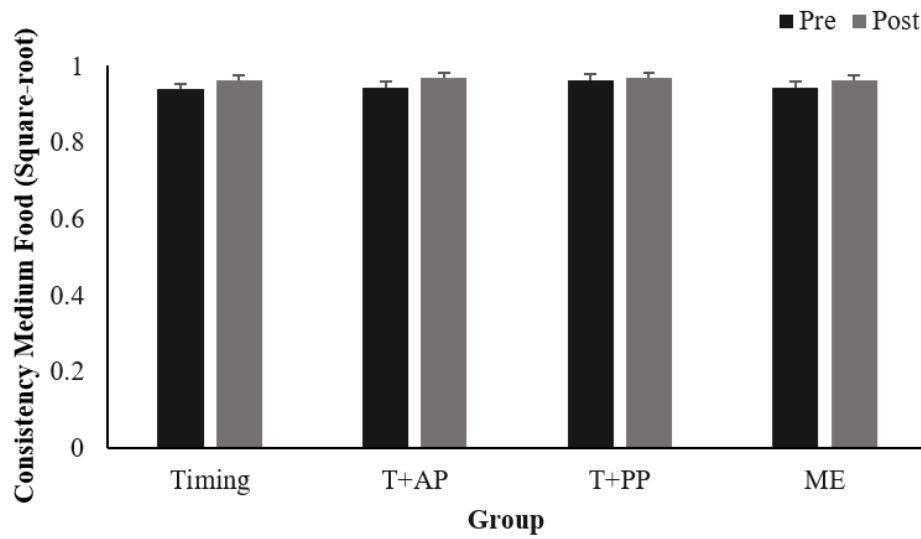
Figure 6 shows repeated-measure ANOVAs for consistent responding in small (top), medium (middle), and large (bottom) magnitudes at baseline and post-session. For small discounting, there was a marginal effect for session ($p=0.078$), with post-session values as slightly higher than pre-session, but no effect for group or an interaction (p 's >0.16). For medium

discounting, there was a significant effect for session [$F(1,120)=5.50$, $p=0.021$, $\eta_p^2=0.044$]. A Bonferroni post-hoc test showed a significant increase in consistency post session ($p=0.021$). No effect was found for group or an interaction (p 's >0.78). Similarly, for large discounting, there was a significant effect for session [$F(1,120)=7.11$, $p=0.009$, $\eta_p^2=0.056$]. This effect remained significant after a Bonferroni post-hoc test ($p=0.009$). No effect was found for group or an interaction (p 's >0.13).

Figure 6

Average consistent responding as a function of group for small (top), medium (middle) and large (bottom) magnitudes.





Error bars = 1 SEM

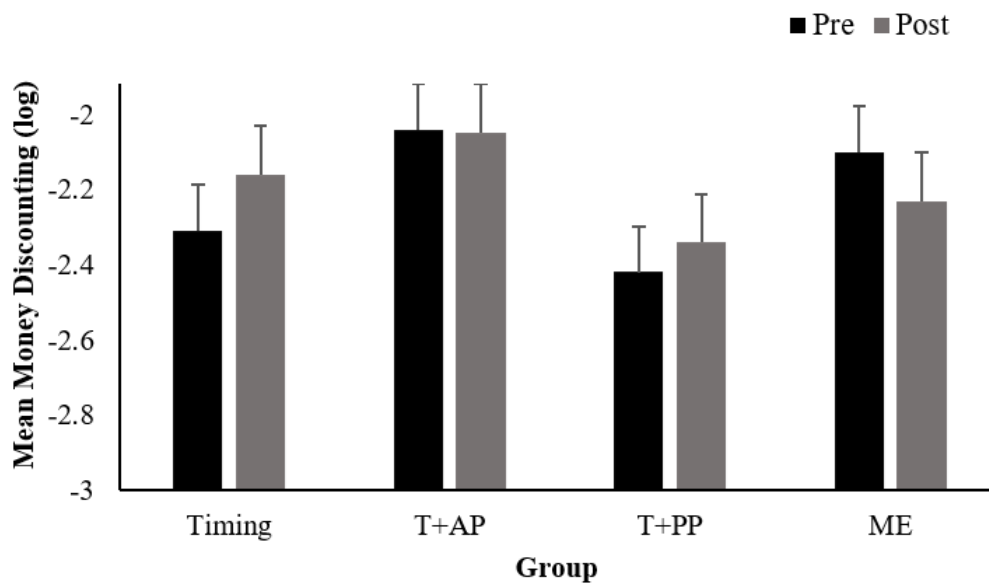
Money and ME.

Figure 7 shows mean log-transformed omnibus money DD values as a function of group. A repeated measures ANCOVA was run with baseline and post-session omnibus discounting as within-subjects factors and group as a between-subjects factor. Alcohol use and income were entered as covariates. There was no main effect for session, group, nor an interaction (p 's > 0.1).

Alcohol was significantly related to discounting [$F(1,118)=6.35$, $p=0.013$, $\eta_p^2=0.051$] and income was marginally related ($p=0.068$).

Figure 7

Omnibus money discounting as a function of group.



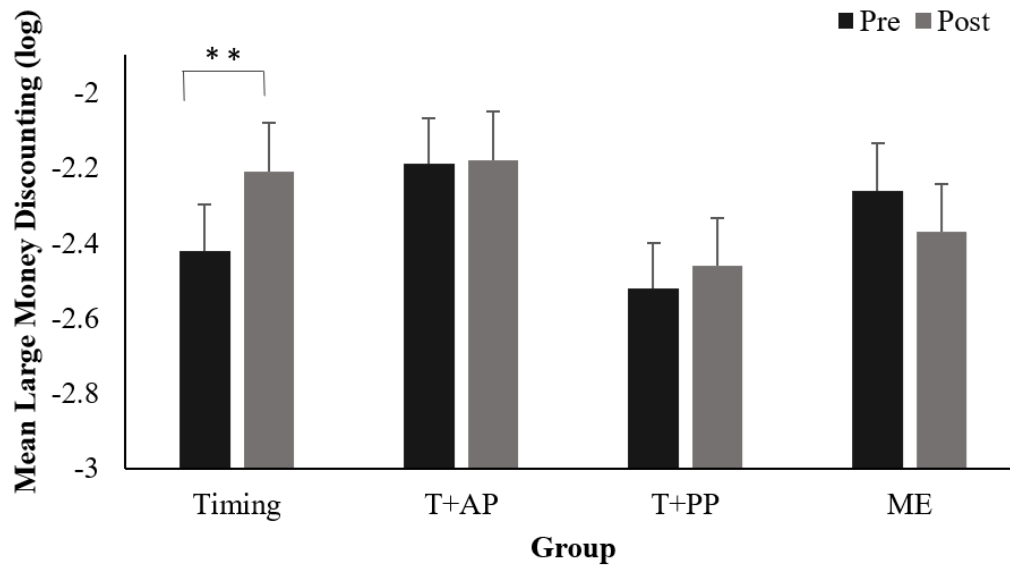
Error bars = 1 SEM

Money Discounting Magnitudes and ME. As with omnibus discounting, repeated measure ANCOVAs were run for small, medium, and large food magnitudes with subjective hunger and income as covariates. For small magnitude discounting, a marginal effect was found for session ($p=0.066$). No effect was found for group, and there was no interaction (p 's < 0.13). Alcohol use was a significant covariate [$F(1,118)=6.27$, $p=0.014$, $\eta_p^2=0.05$]. For medium discounting, no effect was found for session, group, nor an interaction (p 's < 0.21), but alcohol use remained a significant covariate [$F(1,118)=6.93$, $p=0.01$, $\eta_p^2=0.055$]. See *Appendix R* for small and medium discounting figures.

For large magnitude, there was no effect for session ($p=0.29$) or group ($p=0.38$). However, an interaction was found between session and group [$F(3,118)=2.99$, $p=0.034$, $\eta_p^2=0.071$]. A Bonferroni post-hoc test found that there was a significant increase between pre- and post-session discounting for the timing group [$F(1, 118)= 6.90$, $p=0.01$, $\eta_p^2=0.055$]. Both alcohol use [$F(1,118)=4.51$, $p=0.036$, $\eta_p^2=0.037$] and income [$F(1,118)=4.64$, $p=0.033$, $\eta_p^2=0.038$] were significant covariates.

Figure 8.

Large magnitude money discounting as a function of group.

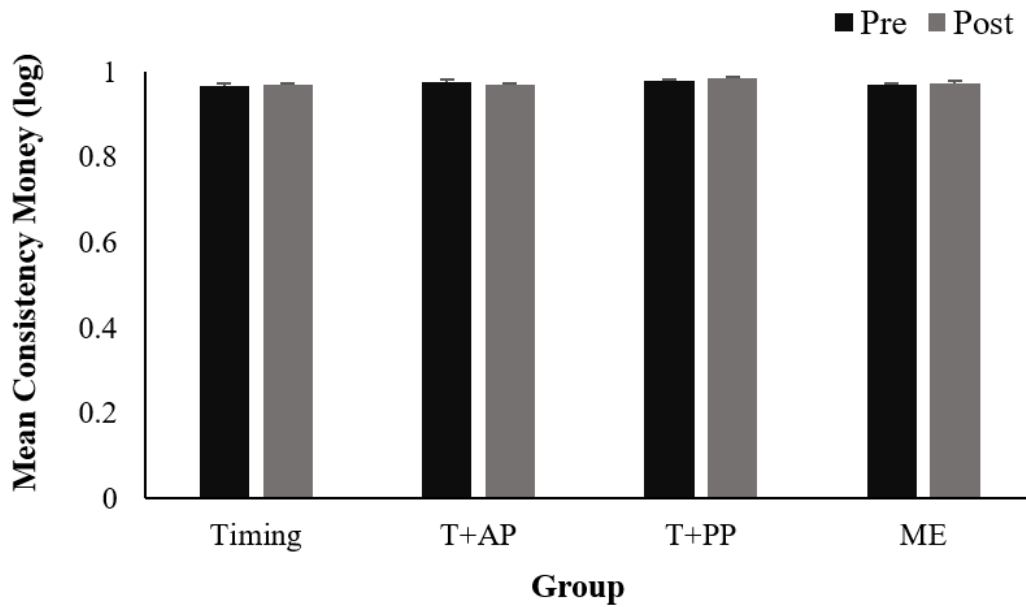


Note. * $p \leq 0.05$, ** $p \leq 0.01$, Error bars = 1 SEM

Figure 9 shows a repeated measures ANOVA for average consistent responding at both baseline and post-session as a function of group. There was no effect for session or an interaction (p 's > 0.28). A marginal effect for group was found ($p=0.093$).

Figure 9.

Average consistent responding as a function of group.

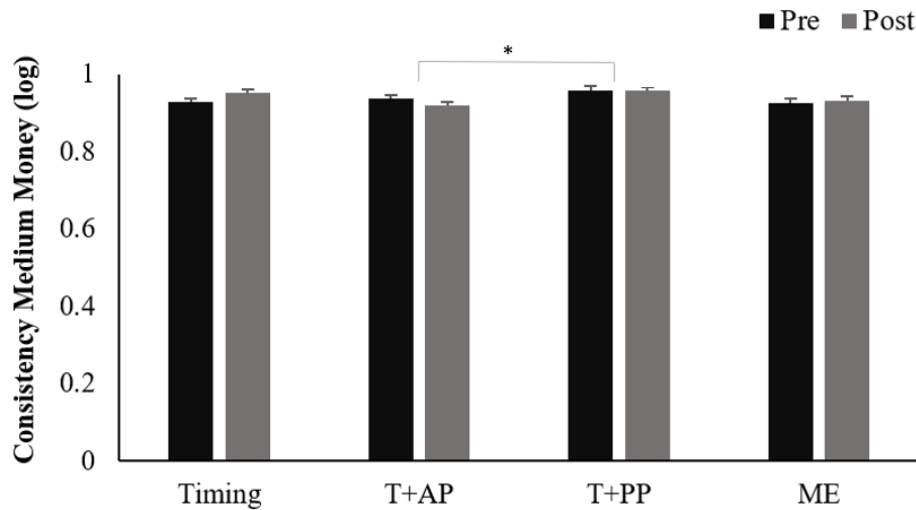


Error bars = 1 SEM

Similar effects were found for small magnitude discounting (p 's > 0.10). For medium discounting, there were no effects for session or an interaction (p 's > 0.11), but there was an effect for group [$F(3,120)=3.06$, $p=0.031$, $\eta_p^2=0.071$]. A Bonferroni post-hoc test revealed the T+PP group was significantly more consistent than the T+AP group ($p=0.049$). For large magnitude discounting, no effect was found for session group, or an interaction (p 's > 0.11). Figures for small and large magnitude discounting can be found in *Appendix S*.

Figure 10

Average consistent responding as a function of group for medium magnitude discounting.



*Note. * $p \leq 0.05$, ** $p \leq 0.01$, Error bars = 1 SEM*

Discussion

In the current study we determined the extent to which two components of ME--timing and active processing-- influence food and money delay discounting rates. The demographics of participants were college students with a mean age of 20 and mostly white and female. Regarding representativeness of sample to the greater state of Idaho, the median income of the sample was \$50,000 - \$60,000 per year ($SD=2.25$), consistent with the median income for the state of Idaho in 2019 (U.S. Census Bureau, 2020). There were no differences among demographic factors across the four group, suggesting that random assignment to groups was effective at distributing variability.

Food Delay Discounting

Contrary to the hypothesis, there was no effect for ME on food DD. This finding does not support what was reported in Hendrickson & Rasmussen (2013) or Hendrickson & Rasmussen (2017). Baseline food DD rates (transformed) from the FCQ were within the range of other studies, ranging from 0.51-0.60 at baseline (Hendrickson et al., 2015; Hendrickson & Rasmussen 2017; Rasmussen et al., 2022). Replicating previous research, a magnitude effect was found for food DD such that small magnitudes were discounted steeper than medium and large magnitudes (Hendrickson et al., 2015; Lee & Rasmussen, 2021; Rodriguez et al., 2021). Using the criteria set by Kirby (1999), baseline consistency averages ranged from 0.94 – 0.95, which is consistent with prior research (Hendrickson et al., 2015; Rodriguez et al., 2018); no differences were found between magnitudes. When examining consistency differences within and between subjects, participants were significantly more consistent post-session for medium, large, and overall magnitudes. There were no differences between groups.

Because there were magnitude effects on baseline food DD values, group effects on each magnitude were evaluated to determine if some effects of ME were stronger than others depending on magnitude. However, no effect was found for large, medium, or small magnitude discounting. There are a number of potential reasons for this. First, it is possible that participants experienced responding fatigue over the course of the study. Participants attended a single session for about two hours, completing the baseline DD procedure, intervention, and follow-up discounting questionnaires back-to-back. In the Hendrickson & Rasmussen (2013) paper, participants completed two sessions, the first of which was the baseline discounting tasks. They returned for the second session (within 21 days) to complete the ME intervention and the second discounting task immediately afterward. Similarly, Hendrickson & Rasmussen (2017) also

scheduled participants for two sessions in a similar manner, where the second session consisted of running a small group ME intervention and assessing a post-treatment discounting immediately after. It is possible that completing this study in one session over-exerted the participants. It is also possible that there were carryover effects of the first FCQ task to the second since they were completed close together in time. Indeed, the two discounting values were significantly correlated.

A second procedural difference between previous studies and this one involves counterbalancing the order of the FCQ, MCQ, and other measures. In the two previous studies, the order of the measures was counterbalanced; the present study did not counterbalance the order of questionnaires, but instead randomized the questions within each measure so participants would not detect a pattern of choices. Having the questionnaires in the same order, though, may have influenced responding. For example, participants may have experienced responding fatigue and performed less consistently on the last discounting questionnaire than the three previous ones, therefore influencing the data.

There were also no effects of timing, T+AP, and T+PP on food DD. Therefore, none of the activities of these groups by themselves affected discounting. However, some details in the procedures of the groups are important to note. For the timing group, participants waited to take bites of food every 10 minutes. While this activity slows eating timewise, future studies may consider having participants chew their food slowly in addition to waiting for bites to have two elements of slowing down the eating process, which would also be consistent with ME. For the recipe group, casual observation of the participants suggests that the rate at which participants read recipes out loud seemed to be greater than that at which the researcher read them out loud when timing the activity. Given that the recipe group took bites of food at the same time as the

other groups, this led to longer periods of silence than what was planned. Therefore, the speed at which the recipes were read may have confounded the effectiveness of that condition. Future studies should attempt to control for these aspects of the component groups.

Money Delay Discounting

No effect was found for ME on money DD. This finding replicates Hendrickson & Rasmussen (2013 & 2017) studies. Similarly, the Hendrickson & Rasmussen studies compared ME to a DVD control, much like the T+PP group with the exception that bites of food continued to be timed while watching the video. The T+PP had no effect on discounting, similar to these previous studies. Likewise, no difference was found for the timing and T+AP groups.

Baseline omnibus money DD rates (transformed) from the MCQ (-0.70 to -3.80, Mean = -2.23) were within a similar range to Hendrickson & Rasmussen (2017). Similar to food DD, a magnitude effect was found with money DD such that small magnitudes were discounted more steeply than medium and large magnitudes (Baker et al., 2003; Green et al., 1999; Hendrickson et al., 2015; Kirby, 1996; Lee & Rasmussen, 2021; Rodriguez et al., 2021).

Consistency scores for money ranged from 0.94-0.99 and were consistent with previous research (Hendrickson et al., 2015; Kirby 1996; 1999). Medium magnitude discounting was slightly, though significantly, less consistent than small and large magnitude discounting post-session. When comparing consistency within subjects, there was no significant difference post session for any group. There was, however, a significant difference between groups such that the T+PP group was significantly more consistent than both the ME and T+AP group.

Magnitude Effects for Money.

Due to magnitude effects on baseline food DD values, group effects on each magnitude were evaluated. There were no group effects with small magnitude or medium magnitude monetary DD. For the large magnitude, there was a significant effect of Timing on large magnitude DD, such that participants in the Timing group had increased discounting post-session (i.e., were more likely to choose SS rewards). This finding, though, was inconsistent with Timing on the other magnitudes of discounting. Moreover, timing is a component of the other groups, which resulted in null findings. Therefore, the effect of timing on large magnitude monetary DD is likely to be Type 1 error.

Limitations

There were limitations to this study. First, the heterogeneity of the sample was low. Participants were mainly White, female college students. While there was a relation with money discounting and ethnicity, with non-white individuals discounting more steeply, this effect was limited statistically due to the majority (85%) of participants being White. Future studies should aim to sample a more ethnically and gender-diverse population.

Second, though consistency was high (greater than 94%, despite some small though significant differences) across pre-and post-session measures of FCQ and MCQ, there may be a problem that is potentially hidden within the variable of consistent responding-- the tendency to choose all SS or all LL rewards. Individuals who show complete preference of a SS or LL outcome would be counted as consistent in responding and indeed it may be the case that these individuals exclusively prefer the SS or LL in all instances. However, it may also be the case that they are choosing one option to quickly finish the study.

The number of individuals who showed exclusive preference for the SS or LL was higher in the post-treatment condition compared to baseline. For the FCQ, 10% of sample responded with all one choice at baseline and 14% during the second FCQ. For money, 5% chose all one option during the first questionnaire and 6% did at follow-up. (For both the FCQ and MCQ, this number of participants were evenly distributed across the four groups, incidentally). It is also important to point out that there was more single-choice (i.e., all SS or all LL) responding for food than money. This may be because money choice questionnaires were presented before food discounting questionnaires both at baseline and follow up.

When participants choose all SS or LL rewards, responding is considered consistent, however it may not reflect true discounting values. It is possible that this issue inflated the percent of consistency in discounting and also may have affected discounting by creating extreme values, which could have resulted in a lack of a ME effect. Future studies should counterbalance questionnaires so that the order in which they are completed is randomized. In addition, it would make sense to also randomize the order in which the LL and SS options appear (left vs right). Finally, an attention check question should be utilized where the delays to both the SS and LL questions are both 0 (in other words, the LL should be chosen). *A priori* criteria should be set so that participants failing these attention checks can be excluded (Craft et al., 2022; Redner & Hirst, 2021; Rung & Madden, 2019).

Third, it may be possible that outside factors may have affected discounting rates. Data collection for this study was conducted one year into the COVID-19 pandemic, specifically during the Delta and Omicron variants. It is possible that the stress of the pandemic or psychological factors related to a year of online learning factored into decision-making for food and money. For example, one study found that those who reported increased stress from the

pandemic tended to discount money more steeply and were also likely to purchase excess food and household supplies (DeAngelis et al., 2021). However, this variation would likely be assigned to all four groups, so this factor may not have contributed to the lack of group differences.

In summary, ME had no effects on food DD, as was shown in the Hendrickson & Rasmussen studies. Instead, DD was similar after a ME intervention. Components of ME that were suspected of contributing to reductions in food DD-- timing and active processing-- also did not reduce discounting for food in a consistent manner. Although this study had null findings, these results emphasize the importance of replication in research. In current psychological research, replications are rarely carried out, which may create problems for psychological research (Earp & Trafimow, 2015; Open Science Collaboration, 2015; Schmidt, 2009). For example, one study from the Open Science Collaboration (2015) attempted to replicate 100 published studies and only found significant results in about one-third (36%) of the replications; most of which showed half of the original effect size. According to the replication study, psychology has been said to have experienced a “replication crisis” out of a preference for novelty in research, as replication tends to be viewed as reporting on what is already known. Replication, however, allows researchers to examine the extent to which findings generalize to other situations, such as with this study and its methodical differences from previous ME research.

A Component Analysis of Mindful Eating Effects on Delay Discounting for Food

Obesity rates have been steadily increasing in the last 30 years in the United States. Most recently, the Centers for Disease Control and Prevention (CDC) (2018) reported that of adults (age 20 and older), 39.8% are obese. When those with overweight status (BMI 25 - 29.9) are included, 71.6% are considered to have body mass sizes that increase health risk (CDC, 2018). It is well established that obesity status is related to negative health outcomes including, but not limited to high blood pressure, high cholesterol, type 2 diabetes, coronary heart disease, stroke, various cancers, low quality of life, and increased risk of premature death (see, e.g., CDC, 2020; Kissebah, 1989; Prospective Studies Collaboration, 2009). In addition to physical health consequences, obesity is associated with poor mental health outcomes, such as depression, eating disorders, and poor quality of life (Chu et al., 2019). Despite these negative consequences, the number of overweight and obese individuals in the United States has doubled since 1980 (Chooi et al., 2019).

The rise in obesity may be attributed to various environmental factors surrounding food accessibility and consumption. For example, proximity to fast-food restaurants in which highly palatable (high fat and sugar content) foods are served with little to no delay is associated with obesity. This is the case even after controlling for age, ethnicity, and physical activity (Currie, 2010; Jeffery, 2006; Maddock, 2004; Rosenheck, 2008). In addition, portion sizes used by the United States Department of Agriculture (USDA) have increased since the 1970s, surpassing portion sizes recommended by the Food and Drug Administration (FDA) by up to 700%, leading to higher energy intake and therefore heightened obesity prevalence (Young & Nestle, 2002).

Further, in 2014 the Food and Drug Administration increased serving sizes to match the portions of food people tend to eat, instead of the amount suggested for people to eat (FDA, 2014). As a result, individuals tend to struggle with interpretation of food labels and increase their consumption of highly palatable foods (Dallas, et al., 2015).

Individual difference variables that play on differential sensitivities to these environmental changes may exacerbate the probability of obesity for an individual. One such variable is delay discounting (DD), which refers to heightened sensitivity to delayed rewards. Those that prefer smaller, more immediate rewards over larger, delayed rewards especially with food, may be more susceptible to obesity (Epstein et al., 2010). This phenomenon is described in the next section.

Delay Discounting

The preference for immediate, smaller rewards, such as highly palatable foods over the benefits of larger, delayed rewards, such as good health, is implicated in a facet of impulsivity that is called delay discounting (Bickel, et. al, 1999; Renda et al., 2018). Delay discounting (DD) procedures are arranged such that humans or non-human animals make a series of choices between smaller-sooner (SS) vs. larger-later (LL) rewards. For example, a human participant may be asked if they would prefer \$10 now or \$15 in one day. Typically, the LL outcome (\$15 in one day) would be chosen in this context. The value of the LL reward is systematically decreased (or the value of the SS is increased) in subsequent choices until the participant shows a preference reversal, in which indifference (50% preference) for the SS and LL outcomes is determined. Indifference points are determined for at least four additional delays (e.g. 30 days, 60 days, 180 days, and 365 days) and plotted against those delays. The relation between these indifference points and delay to the LL is described by the hyperbolic discounting equation:

$$\text{Value} = A / (1 + kD) \quad (1)$$

where A is equal to the amount of the delayed reward and D is the length of the delay. The free parameter k is an individual difference variable that refers to the degree of discounting. In most cases, as the delay increases, indifference points decrease in a hyperbolic manner. The steepness of the hyperbola is described by k and refers to sensitivity to delay. Higher k values are described as more impulsive; lower values are more self-controlled (Voon et al., 2010). K values are relatively stable across time (Kirby, 2009; Odum, 2011a).

A second way of measuring delay discounting is area under the curve (AUC) (Myerson et al., 2001). While k values are often skewed and require log transformation or non-parametric analysis, AUC values are more normally distributed, which allows more traditional statistical analyses. To calculate AUC, the area under the discounting curve is segmented by creating trapezoids. The area of each trapezoid is summed and calculated by using Equation 2. The data are normalized by setting the length of delay as the X coordinate and then dividing the amount of the SS reward at the indifference point by the actual value, creating a Y coordinate. These coordinated are plotted and a vertical line is drawn from each point to the X axis. Each trapezoid is represented by the formula:

$$(X_2 - X_1) [(Y_1 + Y_2)/2] \quad (2)$$

where X_2 and X_1 are successive delays and Y_1 and Y_2 are subjective values associated with delays. AUC varies between 0 and 1, where 0 is the steepest possible discounting (low space under the curve as it approximates the axes) and 1 is no discounting. Though AUC values are normally distributed, they do not characterize the shape of the discounting curve. Therefore, both k values and AUC values are important in characterizing discounting.

Discounting: State or Trait? Discounting is regarded as both a trait and a state variable. The evidence for discounting as a trait comes from test-retest reliability studies which show individuals discount money similarly to baseline at follow-ups between one week and one year (Beck & Triplet, 2009; Kirby, 2009; Odum, 2011b; Ohmura et al., 2006; Simpson et al., 2000; Takahashi et al., 2007). In addition to test-retest reliability, discounting research shows inter-commodity consistency, such that individuals who discount steeply for one commodity will discount steeply for another commodity (Odum et al., 2020, Odum, 2011b). For example, a systematic review by Odum et al. (2020) found that individuals who discount monetary rewards more steeply discount tend to discount non-monetary rewards (e.g., alcohol, drugs, food, health) steeply as well. Individuals have also been shown to discount steeply across contexts. Based on data from Dixon et al. (2006), for example, Odum et al. (2020) found that individuals who discounted steeply in one environment were likely to discount steeply in other environments, further supporting discounting as a trait variable.

Discounting is also sensitive to state-based conditions. That is, discounting can be altered by variables such as type of outcome, magnitude of reward, and the context in which the choice is being made (Odum, 2011b, Odum & Baumann, 2010). For example, when using monetary rewards, discounting rates becomes less steep as the reward magnitude increases in size (Green et al., 1997; Johnson & Bickel, 2002; Kirby, 1997, Rung & Madden, 2018). This is also the case for food, in terms of magnitude of bites (Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017). In addition, monetary rewards have been repeatedly found to be discounted less steeply than nonmonetary outcomes (e.g., food, drugs, CDs, books, DVDs) (Charlton & Fantino, 2008; Hendrickson & Rasmussen, 2013; Odum et. al, 2020), suggesting that discounting is dependent on the type of outcome being presented (called the *domain effect*). Regarding

context of choice, Dixon et al. (2006) found that pathological gamblers discount money more steeply in a gambling context containing bars and televisions broadcasting horse-racing events than in nongambling contexts such as coffee shops, restaurants, and other public locations, suggesting that discounting may vary based on the context of the environment.

Berry et al. (2014) further explored the effects of environment on discounting by showing participants different scenes (i.e., nature, buildings, geometric designs) before a discounting task. Participants who were shown nature scenes (e.g., forest) discounted less steeply than those in the building or geometric groups. Additionally, Morrison et al. (2019) explored the relationship between acceptance and commitment therapy (ACT) and delay discounting, where participants were asked to attend 50-minute therapy sessions where they examined their values and learned to control urges for immediate rewards once a week for eight weeks. Morrison found that when compared to a control group that did not receive an intervention, those in the ACT group discounted significantly less steeply.

A growing literature also examines the effect of episodic future thinking (EFT) on discounting, where participants are asked to imagine future events which correspond to different delay time points (e.g., something that will happen 1 week from now) and these events (*cues*) are shown to the participant while making decisions during the discounting task. When compared to controls, EFT interventions have been shown to reduce monetary discounting in obese populations (Daniel et al., 2013a; Daniel et al., 2014b; Daniel et al., 2015), cigarette smokers (Stein et al., 2016; Stein et al., 2018), and those who use alcohol (Snider et al., 2016). Taken together, there are a multitude of factors that can influence state-based discounting.

Examining discounting as both a state and trait variable can provide context in situations where an individual may discount steeply, such as conditions that make one more likely to drink

alcohol or gamble. Examining environment influences as well as discounting patterns within an individual may provide a more complete characterization of behavior (Dixon et al., 2006; Odum, 2020). For example, research suggests that alcohol is consistently discounted steeper than money, even by non-problematic alcohol users (Odum et al., 2020; Odum & Rainaud, 2003; Petry, 2001), and those with problem drinking patterns are especially likely to discount alcohol. Similar findings have been found in cigarette use, where tobacco users discount cigarettes more steeply than money (Bickel et al., 1999, Odum 2011b, Odum et al., 2020) and with those with opioid-use disorders discounting heroin more steeply than money (Madden et al., 1997).

These state and trait patterns in discounting that are applied to putatively addictive behaviors, such as gambling and substance abuse may also be applied to the problem of obesity, in which food functions highly and consistently as a strong reinforcer at the expense of long-term health. First, food is often more steeply discounted than money and represents another inter-commodity difference that is state based (Charlton & Fantino, 2008; Estle et. al., 2007; Holt et al., 2013; Holt et al., 2016; Odum et al. 2020; Odum, 2011b; Tsukayama & Duckworth, 2010).

Second, previous research also has shown that obesity is related to steep discounting for money and food (Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017; Rasmussen et al., 2010; Weller et al., 2008). For example, one study, by Weller et al. (2008) examined delay discounting (DD) differences between obese ($BMI > 30.0 \text{ kg/m}^2$) and non-obese ($BMI = 18.5 - 24.9 \text{ kg/m}^2$) participants. Using a computerized task, participants were given two different DD tasks: one where the delayed amount was \$50,000 and one where the delayed amount was \$1,000. Results found that obese women made more impulsive decisions than non-obese women, though no difference was found in men. For example, when looking at delay discounting in school-age children, obese children discount food at a steeper rate than non-obese

children (Bonato, et al. 1983; Johnson et al. 1978; Temple et al., 2008). A similar effect is found when examining women, such that obese women tend to have steeper discounting rates than non-obese women, even after controlling for intelligence and socioeconomic status (SES) (Saelens et al., 1996; Weller, et al., 2008). These findings suggest that the relative reinforcing value of food is higher for obese individuals than non-obese individuals, particularly in women (Epstein et al., 2010; Saelens, et al., 1996; Temple et al., 2008).

Further, Jarmolowics, et al. (2014) examined the relationship between discounting with monetary rewards and BMI in a community-dwelling sample in Kansas and Missouri. Using the monetary choice questionnaire (MCQ; Kirby & Maraković, 1999)- a 27 item delay discounting task, participants were asked to make hypothetical choices between a SS amount of money (e.g., \$15 now) vs. a LL amount of money (e.g. \$35 in 7 days) across 23 time points (7 -186 days). Results showed that participants with a greater BMI had steeper monetary discounting rates than healthy and underweight participants, even after controlling for age, education, and socioeconomic status (SES).

Fields et al. (2011) also investigated the relationship between BMI and delay discounting, though in obese and nonobese adolescent smokers. Participants were asked to make choices between hypothetical monetary rewards with LL rewards presented before SS rewards (e.g., Would you like \$10 in 2 days or \$2 now?) over 5 different delays (1, 2, 30, 80, and 365 days). Results showed that obese smokers discounted money more steeply than nonobese smokers, suggesting that being both obese and a smoker contributes to steeper discounting than being a smoker alone.

When examining delay discounting with food-related outcomes and obesity, results are similar in that obese individuals discount more steeply than non-obese individuals for food.

Rasmussen et al. (2010) examined the relationship of discounting food-related outcomes with percent body fat (PBF). Participants were asked to make hypothetical choices between larger amounts of money (e.g., \$10 now) vs. smaller, more immediate amounts of money (e.g., \$1 now) across five different delay points (1, 2, 30, 180, & 365 days). Similarly, participants made hypothetical choices between SS vs. LL amounts of food (e.g., 4 bites now, or 8 bites in 5 hours) across 1, 2, 5, 10, and 20 hours. Results showed that individuals with a greater PFB had steeper DD rates for food. Significant results were not found for monetary discounting. These results were replicated by Hendrickson & Rasmussen (2013) and Hendrickson & Rasmussen (2017) using a different measure of discounting—the Food Choice Questionnaire, which is a 27-item delay discounting choice questionnaire (Hendrickson & Rasmussen, 2017).

Overall, research seems to suggest that obese individuals discount more steeply than nonobese individuals in a variety of contexts with both food and money commodities (Amlung et al., 2016; Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017; Rasmussen et al., 2010; Weller et al., 2008; Jarmolowicz et al., 2014; Fields et al., 2017). Given that the value of delayed commodities plunges more strongly with obese individuals, further research is needed to explore ways of reducing steep discounting.

Mindfulness and Discounting

Mindfulness interventions have become increasingly prevalent in recent years for treatment of a variety of physical and psychological disorders including depression, anxiety, chronic pain, and substance use disorders (Hofmann et al., 2010; Kabat-Zinn, et al., 1985; Witkiewitz et al., 2010). Originally a core aspect of Buddhist meditation (Kabat-Zinn, 2003; Shapiro et al, 2006), mindfulness is often described as a practice of attention and present-centered awareness. Focusing an individual's attention to basic processes like breathing,

individuals are encouraged to verbally acknowledge any stimuli such as emotions, senses, or other phenomenon that arise, but to not assess them as good or bad and instead return attention to the breathing and physical location (i.e., body part) in which the sensation is taking place (Marlatt & Kristeller, 1999), which therefore aids in sustaining attention (Bishop et al., 2006; Shapiro et al., 2006).

While the mechanisms of how mindfulness works are often debated by researchers, attention and acceptance tend to be reoccurring themes. For example, Bishop et al. (2006) suggests that mindfulness should be operationalized by two components: (1) self-regulation of attention and (2) adoption of acceptance and openness to thoughts. In other words, individuals must direct their attention to what is going on in the moment (e.g., breathing, sitting in a chair, etc.) and use non-judgmental language with labeling thoughts. For example, when an individual has a thought, the person will not say that the thought is good or bad. Instead, they simply acknowledge by stating publicly or privately that they had a thought. Similarly, Shapiro et al. (2006) defined mindfulness as attention to the present moment while keeping a non-judgmental attitude (i.e., using language that does not define thoughts as good or bad). However, Shapiro added the axiom of intention, where those who engage in mindfulness must identify their goals or values for taking part in this practice (e.g., to manage anxiety). Moreover, Brown & Ryan (2004) also suggest that mindfulness consists of attention to the present moment and acknowledgment of thoughts, but argue that these behaviors are interconnected, such that when an individual is placing judgment on thoughts, they are no longer paying attention to the given moment (e.g., stop focusing on breathing). Taken together, mindfulness seems to be broadly defined by attending to the present moment and labeling thoughts and private observations without using judgmental language.

While the components of mindfulness remain nuanced, in recent years mindfulness strategies have been applied to eating behaviors. For example, Alberts, et al. (2010) examined the relation between mindfulness as a strategy for coping with food cravings. In this study, overweight and obese participants took part in a 10-week health program where they visited with a dietician to learn about healthy food choices and engaged in one hour of physical activity per week. While all participants received this health training, half of the participants in this program were also randomly assigned to a 7-week mindfulness program. The mindfulness group received manual-based training focused on regulating cravings through increased attention to bodily sensations (e.g., hunger) and actively observing thought processes to notice food-related thinking. For example, if an individual were “craving” food, they would be taught to name it as such, in a nonjudgmental manner; doing this allows the thought to eventually fade. Findings showed that while both groups had significant weight loss, the experimental groups had significantly fewer food cravings.

An application of mindfulness applied to the behavior of eating is called mindful eating (ME). ME is generally characterized by making food choices through “active” decision-making as opposed to snacking without awareness. ME is also attending to and recognizing (i.e., labeling) satiety cues and being aware of present-moment experiences while eating (Dalen et al., 2010; Kristeller et al., 2014). One study by Kristeller et al. (2014) found that when using Mindfulness-Based Eating Awareness Training (MB-EAT), where individuals are asked to focus on the taste of food and satiation cues, that binge eating participants binged less often and had reduced levels of depression compared to a wait-listed control group.

Additionally, Dalen et al. (2010) examined the effects of a ME program on weight loss, eating behavior, and psychological outcomes (i.e., depression and anxiety) in obese individuals.

Using the Mindful Eating and Living (MEAL) program, individuals participated in a 6-week program consisting of group and individual mindfulness trainings where participants were taught to focus on hunger and satiation cues, types of food cravings (palatable vs nonpalatable), and emotional phenomena related to food for two hours each week, while taking part in light physical activity (i.e., yoga). Findings revealed significant weight loss, a decrease in hunger and binge eating, as well as reduced psychological distress when comparing pre and post-test results.

Mindful eating has also been shown to reduce delay discounting (Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017). In these studies, participants were systematically presented with small bites of food and are asked to verbally describe their experiences using their senses, i.e., observing, touching, smelling, and tasting and to also use proprioceptive cues in their descriptions, e.g., salivation flow, the feel of the food moving down their esophagus, feeling fuller, etc. Participants were asked to focus on the present moment and describe their experiences objectively, using non-judgmental language. Hendrickson & Rasmussen (2013) randomly assigned participants into two groups, where one group received a ME intervention, and the other group received a DVD control where participants watched a video on nutrition. Both before and after the interventions, participants were asked to complete a discounting task with both monetary and food rewards. Results showed that individuals in the ME group had lower discounting with food outcomes, but not monetary outcomes, whereas the control group had similar discounting rates compared to baseline.

This finding was replicated by Hendrickson & Rasmussen (2017) with both adolescents and adults, where participants were once again randomly assigned to either a ME intervention, a DVD control group, or a second control group that did nothing. Completing a DD task with both food and monetary outcomes before and after the intervention, researchers found that those in the

ME condition discounted food, but not money, less steeply compared to baseline. In the control groups, there was no differences in discounting in the pre- vs. post-tests. With monetary rewards, there were no pre-posttest differences, replicating the domain effect from the Hendrickson & Rasmussen (2013) findings.

While there is evidence that ME reduces impulsive eating (Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017), the mechanisms for how ME works is uncertain. One speculation is that ME allows the individual to slow the pace of eating. Some evidence shows that when individuals slow their pace of eating in a sitting, they are more likely to eat less (Andrade et al., 2008; Zhu & Hollis, 2013), which may allow for better self-regulation as delay training, in which pausing before a reward is delivered is required to get access to the reward, reduces delay discounting (Marshall et. al., 2014; Panfil et al., 2020; Smith et al., 2015). For example, one study by Andrade et al. (2008) assigned female participants to either a slow or fast-eating condition. In the slow condition, participants were asked to take small bites, put down their silverware between bites, and chew their food 20 to 30 times per bite. The fast-eating group was asked to take larger bites and eat as fast as possible without pausing. Results found that while the slow-eating group took longer to complete the task, participants in this condition consumed less food than the fast-eating group, even after controlling for subjective hunger, thirst, desire to eat, and menstrual cycle. Results also showed that while the fast-eating group consumed more calories, participants in this condition reported lower satiety ratings than the slow-eating group. Another study by Zhu & Hollis (2013) reported similar findings.

ME may also reduce discounting because *any active behavioral process* (overt or covert) may reduce discounting. Describing the experience of eating is an active process, as opposed to passively eating. In the Hendrickson and Rasmussen studies, individuals who passively watched

a DVD about nutrition and ate food did not show a reduction in food impulsivity, so it seems that watching a video about food, a fairly passive process, does not affect food impulsivity.

Conversely, a number of other studies show that active processes, such as working memory training, Acceptance and Commitment Therapy (ACT), and episodic future thinking can also suppress discounting (Bickel et al., 2010; Hue et al., 2017; Morrison et al., 2014). It should be noted, however, that none of these studies have been conducted with food. Bickel et. al (2010), for example, examined working memory training on delay discounting. Here, participants being treated for stimulant substance abuse were placed in either a working memory training group focused on recalling sequential digits, words, and verbal memory, or a control group which did not receive working memory training. Both groups received identical treatment at a substance abuse treatment facility. Results showed that individuals in the working memory group discounted less steeply than the control group.

Further, Morrison et al. (2014) investigated the relationship between ACT and delay discounting. Here, participants were placed either in an ACT group where they received a one-time intervention focused on acceptance-based strategies and examination of values or were placed in a waitlist control. Both groups received a discounting task consisting of seven time points (1 week - 25 years) and monetary rewards between \$1 - \$100. Results showed that the ACT group discounted less steeply at post-treatment than the control group.

Moreover, Hu et al. (2017) examined the relationship between DD and episodic future imagination using Functional Magnetic Resonance Imaging (fMRI). Here, participants were randomly assigned to either an episodic future imagination group where they were asked to imagine future events at six different time points (1 week - 1 year) and to generate a verbal cue for each event, or to a control group which only received the DD task. All participants completed

a DD task while in an fMRI machine at baseline and follow-up. Those in the episodic future imagination group had their cue words show up on the screen between the two options and were asked to elaborate on them before making discounting choices. Results showed that those in the episodic future imagination group discounted less steeply than those in the control group. Other studies on this topic show similar results (Daniel et al., 2013a; Daniel et al., 2014b; Daniel et al., 2015; Stein et al., 2016; Stein et al., 2018; Snider et al., 2016). Taken together, there seems to be evidence that different active processes can reduce DD.

Another possible factor that may matter in terms of ME's effectiveness, is the verbal nature of ME. It may be the case that *what* one states while they are eating matters. As previously stated, a non-judgmental description, as seen by absence of emotion (i.e., neutrality), is often viewed as a key component of mindfulness (Bishop et. al, 2006; Brown & Ryan, 2004; Shapiro et al., 2006) and a main feature when used in practice (Alberts et al. 2010; Hendrickson & Rasmussen, 2013; Hendrickson & Rasmussen, 2017; Kristeller et al., 2014). For example, in the Hendrickson & Rasmussen studies, participants were given a pencil and paper and were asked to write down their objective thoughts and feelings while eating the bites of food. Similarly, Alberts et al. (2010) and Kristeller et al. (2014) asked participants to accept and be non-judgmental of any sensations they may be experiencing during mindfulness trainings. However, no studies have focused on specifically on the verbal behavior of ME.

This study sought to make contributions to both discounting and mindful eating research. The present study isolated aspects of ME to determine if timing and/or active processing would contribute to decreases in discounting. Knowing the mechanisms under which ME reduces discounting may allow for possible tailoring of ME interventions to aid with food impulsivity and perhaps obesity. However, this study resulted in null findings and instead emphasizes the

importance replication within psychological research. It is possible that factors such as participant fatigue and the COVID-19 pandemic factored into these results and shows that environmental factors may play into ME's effect on DD.

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Appendix A. Demographics

PLEASE CIRCLE RESPONSE OR FILL IN THE BLANK. Remember, your answers are confidential.

1. What is your gender?

- a. Male
- b. Female
- c. Other _____

2. What is your age? _____

3. What is your ethnicity?

- a. White/ Caucasian
- b. Black/ African American
- c. Hispanic/ Latino
- d. Asian
- e. Native-American
- f. Other

4. What is your religious affiliation? _____

5. Approximately what is your annual family income?

- a. Less than 10,000
- b. 10,000-20,000
- c. 20,000-30,000
- d. 30,000-40,000
- e. 40,000-50,000
- f. 50,000-60,000

g. 60,000-70,000

h. 70,000+

6. Do you smoke?

a. Yes (Continue to Question 7)

b. No (Skip to Question 13)

7. How many cigarettes do you smoke per day?

a. 10 or less

b. 11 – 20

c. 21 – 30

d. 31 or more

8. How soon after you wake up do you smoke your first cigarette?

a. 0 – 5 minutes

b. 30 minutes

c. 31 – 60 minutes

d. After 60 minutes

9. Do you find it difficult to refrain from smoking in places where smoking is not allowed (e.g., hospitals, government offices, cinemas, libraries, etc.?)

a. Yes

b. No

10. Do you smoke more during the first hours after waking than during the rest of the day?

a. Yes

b. No

11. Which cigarette would you be the most unwilling to give up?

- a. First in the morning
- b. Any of the others

12. Do you smoke even when you are very ill?

- a. Yes
- b. No

13. How would you classify your exercise routine for a typical day?

- a. None
- b. Very light
- c. Light
- d. Moderate
- e. Vigorous

14. What types of exercise do you typically engage in?

15. How long do you engage in this/these exercise/s per day (in hours)?

16. Have you been diagnosed with an eating disorder in the last two years or do you think you may have an eating disorder?

- a. Yes
- b. No

17. If you answered yes to questions 16, which eating disorder?

- ___ Anorexia Nervosa
- ___ Bulimia Nervosa
- ___ Binge Disorder

___ Other (please specify): _____

20. Have you ever been diagnosed with Attention Deficit-Hyperactivity Disorder (ADHD)?

- a. Yes
- b. No

21. How long does it normally take for you to eat a meal?

- a. 0-5 minutes
- b. 5-10 minutes
- c. 10-15 minutes
- d. 15-20 minutes
- e. 20-25 minutes
- f. 25-30 minutes
- g. 30-35 minutes
- h. Don't know

Appendix B. Subjective Hunger Questionnaire (SHQ)

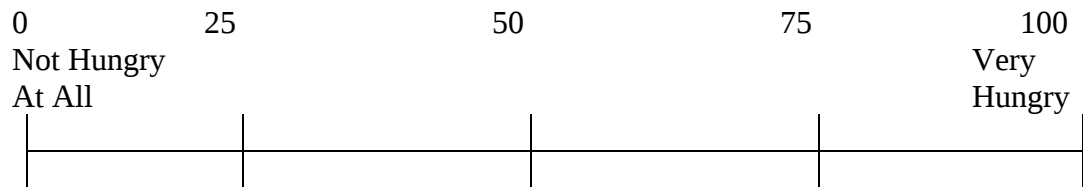
Subject Code _____

Subjective Hunger Assessment

Subjective Hunger Questionnaire

1. How long ago was your last full meal? _____
2. How long has it been since you had anything at all to eat (e.g., a snack)? _____

Using the scale below, how hungry do you feel right now?



Appendix C. Fagerstrom Test for Cigarette Dependence (FND)

Fagerstrom Test for Cigarette Dependence (FND)

Segment: --

Visit number: --

Date of Assessment: (mm/dd/yyyy) -- / -- / ----

Do you currently smoke cigarettes?

☐ No ☐ Yes

How many cigarettes do you smoke per day?

- 1: 10 or less
- 2: 11-20
- 3: 21-30
- 4: 31 or more

How soon after you wake up do you smoke your first cigarette?

- 1: 0-5 minutes
- 2: 30 minutes
- 3: 31-60 minutes
- 4: After 60 minutes

Do you find it difficult to refrain from smoking in places where smoking is not allowed (e.g. hospitals, government offices, cinemas, libraries, etc.)?

- 1: Yes
- 2: No

Do you smoke more during the first hours after waking up than during the rest of the day?

- 1: Yes

2: No

Which cigarette would you be most willing to give up?

1: First in the morning

2: Any of the others

Do you smoke even when you are very ill?

1: Yes

2: No

2: No

Appendix D. Dowd Vaping Questionnaire

Please answer the following questions:

	1 (Strongly Disagree)	2	3	4	5	6	7 (Strongly Agree)
I have a strong desire for an e-cigarette right now.	☐	☐	☐	☐	☐	☐	☐
I have an urge for an e-cigarette.	☐	☐	☐	☐	☐	☐	☐
All I want right now is an e-cigarette.	☐	☐	☐	☐	☐	☐	☐
I am missing vaping right now.	☐	☐	☐	☐	☐	☐	☐
I am craving an e-cigarette right now.	☐	☐	☐	☐	☐	☐	☐
I need to vape now.	☐	☐	☐	☐	☐	☐	☐
I need to vape as soon as possible,	☐	☐	☐	☐	☐	☐	☐
I will vape as soon as I get the chance.	☐	☐	☐	☐	☐	☐	☐
Nothing would be better than vaping right now.	☐	☐	☐	☐	☐	☐	☐
Vaping would make me happier now.	☐	☐	☐	☐	☐	☐	☐

Appendix E. Drug Abuse Screening Test (DAST-10)

DAST-10 Questionnaire

I'm going to read you a list of questions concerning information about your potential involvement with drugs, excluding alcohol and tobacco, during the past 12 months.

When the words "drug abuse" are used, they mean the use of prescribed or over-the-counter medications/drugs in excess of the directions and any non-medical use of drugs. The various classes of drugs may include: cannabis (e.g., marijuana, hash), solvents, tranquilizers (e.g., Valium), barbiturates, cocaine, stimulants (e.g., speed), hallucinogens (e.g., LSD) or narcotics (e.g., heroin). Remember that the questions do not include alcohol or tobacco.

If you have difficulty with a statement, then choose the response that is mostly right.
You may choose to answer or not answer any of the questions in this section.

These questions refer to the past 12 months.	No	Yes
1. Have you used drugs other than those required for medical reasons?	0	1
2. Do you abuse more than one drug at a time?	0	1
3. Are you always able to stop using drugs when you want to? (If never use drugs, answer "Yes.")	1	0
4. Have you had "blackouts" or "flashbacks" as a result of drug use?	0	1
5. Do you ever feel bad or guilty about your drug use? If never use drugs, choose "No."	0	1
6. Does your spouse (or parents) ever complain about your involvement with drugs?	0	1
7. Have you neglected your family because of your use of drugs?	0	1
8. Have you engaged in illegal activities in order to obtain drugs?	0	1
9. Have you ever experienced withdrawal symptoms (felt sick) when you stopped taking drugs?	0	1
10. Have you had medical problems as a result of your drug use (e.g., memory loss, hepatitis, convulsions, bleeding, etc.)?	0	1

Interpreting the DAST 10

In these statements, the term "drug abuse" refers to the use of medications at a level that exceeds the instructions, and/or any non-medical use of drugs. Patients receive 1 point for every "yes" answer with the exception of question #3, for which a "no" answer receives 1 point. DAST-10 Score Degree of Problems Related to Drug Abuse Suggested Action.

DAST-10 Score	Degree of Problems Related to Drug Abuse	Suggested Action
0	No problems reported	None at this time
1–2	Low level	Monitor, re-assess at a later date
3–5	Moderate level	Further investigation
6–8	Substantial level	Intensive assessment
9–10	Severe level	Intensive assessment

Skinner, H. A. (1982). The Drug Abuse Screening Test. *Addictive Behavior*, 7(4),363–371.

Appendix F. Alcohol Use Disorders Identification Test-C (AUDIT-C)

AUDIT-C Questionnaire

Patient Name _____ Date of Visit _____

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

- ☐ a. Never
- ☐ b. Monthly or less
- ☐ c. 2-4 times a month
- ☐ d. 2-3 times a week
- ☐ e. 4 or more times a week

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

- ☐ a. 1 or 2
- ☐ b. 3 or 4
- ☐ c. 5 or 6
- ☐ d. 7 to 9
- ☐ e. 10 or more

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

- ☐ a. Never
- ☐ b. Less than monthly
- ☐ c. Monthly
- ☐ d. Weekly
- ☐ e. Daily or almost daily

Appendix G. Philadelphia Mindfulness Scale

We are interested in your day-to-day experiences. Below is a list of things that people sometimes experience.

Please read each statement. Please indicate how often you experienced each of the described items over the past week.

There are no “right” or “wrong” answers, so please answer in a way that reflects your own experiences.

	Never	Rarely	Sometimes	Often	Very often
1. I am aware of what thoughts are passing through my mind.	☐	☐	☐	☐	☐
2. I try to distract myself when I feel unpleasant emotions.	☐	☐	☐	☐	☐
3. When talking with other people, I am aware of their facial and body expressions.	☐	☐	☐	☐	☐
4. There are aspects of myself I don't want to think about.	☐	☐	☐	☐	☐
5. When I shower, I am aware of how the water is running over my body.	☐	☐	☐	☐	☐
6. I try to stay busy to keep thoughts or feelings from coming to mind.	☐	☐	☐	☐	☐
7. When I am startled, I notice what is going on inside my body.	☐	☐	☐	☐	☐
8. I wish I could control my emotions more easily.	☐	☐	☐	☐	☐
9. When I walk outside, I am aware of smells or how the air feels against my face.	☐	☐	☐	☐	☐
10. I tell myself that I shouldn't have certain thoughts.	☐	☐	☐	☐	☐
11. When someone asks how I am feeling, I can identify my emotions easily.	☐	☐	☐	☐	☐
12. There are things I try not to think about.	☐	☐	☐	☐	☐
13. I am aware of thoughts I'm having when my mood changes.	☐	☐	☐	☐	☐

14. I tell myself that I shouldn't feel sad.	☐	☐	☐	☐	☐
15. I notice changes inside my body, like my heart beating faster or my muscles getting tense.	☐	☐	☐	☐	☐
16. If there is something I don't want to think about, I'll try many things to get it out of my mind.	☐	☐	☐	☐	☐
17. Whenever my emotions change, I am conscious of them immediately.	☐	☐	☐	☐	☐
18. I try to put my problems out of mind.	☐	☐	☐	☐	☐
19. When talking with other people, I am aware of the emotions I am experiencing.	☐	☐	☐	☐	☐
20. When I have a bad memory, I try to distract myself to make it go away.	☐	☐	☐	☐	☐

Scoring:

All items of the awareness subscale are written in a positively keyed direction, so no reverse scoring is required.

All items of the acceptance subscale are written in a negatively keyed direction, thus reverse scoring is required.

The items belong to two subscales:

Awareness: All odd items are totalled: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Acceptance: All even items are reversed and then totalled: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Appendix H. Blood Glucose Standard Operating Procedure

Materials Needed:

- Disposable latex-free exam gloves
- Accu-Check® glucometer
- Accu-Check® test strips (disposable)
- One Touch Ultra disposable lancet or Unistik 3Comfort single-use lancets
- Alcohol Swab
- Band-aids
- Sharps Container
- Biohazard Container

Procedure:

1. Put on disposable gloves
2. Check number of remaining test strips in glucometer – replace with new drum if number reads zero or a dot appears in the window
3. Remove lancet cap
4. Turn on glucometer and wait until it displays it is ready to receive sample
5. Wipe participant's finger with an alcohol swab near the lateral portion of the nail
6. Apply the head of the lancet to the sterile environment
7. Depressing the button on top of lancet to obtain blood sample
 - a. If no blood is drawn after first prick, repeat step 6 and 7
8. Apply the test strip from glucometer to the blood sample until meter has completely absorbed the drop of blood and given a blood glucose reading
9. Offer cotton swab and Band-Aid to participant
10. Dispose of used lancet in sharps container
11. Remove and dispose of gloves, alcohol wipes, test strips, etc. in red biohazard bag.
12. Clean glucometer according to manufacturer's instructions:

Wipe the display and outside of meter with a soft cloth slightly dampened (wring out any excess liquid) with one of these cleaning solutions: water, 10% bleach solution, 70% alcohol (ethyl alcohol), or 70% rubbing alcohol (isopropyl alcohol).

NOTE: Only open the drum door when the meter is turned off. Opening the drum door when the meter is turned on may damage the meter.

To wipe the test strip opening (or if your meter displays the "E-5" message), follow these steps to clean it:

1. With the meter off, open the drum door by lifting up the drum door tab located to the right of the test strip slot.
2. Gently wipe the small measurement window. You may use water, 10% bleach, 70% alcohol (ethyl alcohol), or 70% rubbing alcohol (isopropyl alcohol). Wipe these fluids off immediately after application.
3. Close the drum door until it snaps. The meter turns of and rotates test drum to the next available test strip
4. The meter turns off.

NOTE: Some cleaning methods can damage your meter. To protect it, DO NOT:

- use vinegar or scouring agents to clean the meter because they can harm the display and measurement window.
- Spray any cleaning solution directly on the meter
- Put the meter under water (or any liquid)
- Pour liquid into the meter

All investigators must be trained on this protocol and sign the Glucose Training log (in Regulatory/Essential Documents binder when training is complete.

When new supplies are purchased, document them in the Supply Inventory. When supplies expire, document their removal.

Appendix I. Money Choice Questionnaire

PARTICIPANT CODE _____

Now we are going to ask you to make some decisions about which of two rewards you would prefer. You will not receive the rewards that you choose, but we want you to make your decisions as though you were really going to get them. **Please take the choices seriously.** The reward choices are written on this form. Circle your reward choice for each question and answer every question as though you will actually receive that choice. The choices you make are up to you.

- | | | | | |
|-----|------------------|----------|----|-------------------|
| 1. | Would you prefer | \$54 now | or | \$55 in 117 days? |
| 2. | Would you prefer | \$55 now | or | \$75 in 61 days? |
| 3. | Would you prefer | \$19 now | or | \$25 in 53 days? |
| 4. | Would you prefer | \$31 now | or | \$85 in 7 days? |
| 5. | Would you prefer | \$14 now | or | \$25 in 19 days? |
| 6. | Would you prefer | \$47 now | or | \$50 in 160 days? |
| 7. | Would you prefer | \$15 now | or | \$35 in 13 days? |
| 8. | Would you prefer | \$25 now | or | \$60 in 14 days? |
| 9. | Would you prefer | \$78 now | or | \$80 in 162 days? |
| 10. | Would you prefer | \$40 now | or | \$55 in 62 days? |
| 11. | Would you prefer | \$11 now | or | \$30 in 7 days? |
| 12. | Would you prefer | \$67 now | or | \$75 in 119 days? |
| 13. | Would you prefer | \$34 now | or | \$35 in 186 days? |
| 14. | Would you prefer | \$27 now | or | \$50 in 21 days? |
| 15. | Would you prefer | \$69 now | or | \$85 in 91 days? |
| 16. | Would you prefer | \$49 now | or | \$60 in 89 days? |

17.	Would you prefer	\$80 now	or	\$85 in 157 days?
18.	Would you prefer	\$24 now	or	\$35 in 29 days?
19.	Would you prefer	\$33 now	or	\$80 in 14 days?
20.	Would you prefer	\$28 now	or	\$30 in 179 days?
21.	Would you prefer	\$34 now	or	\$50 in 30 days?
22.	Would you prefer	\$25 now	or	\$30 in 80 days?
23.	Would you prefer	\$41 now	or	\$75 in 20 days?
24.	Would you prefer	\$54 now	or	\$60 in 111 days?
25.	Would you prefer	\$54 now	or	\$80 in 30 days?
26.	Would you prefer	\$22 now	or	\$25 in 136 days?
27.	Would you prefer	\$20 now	or	\$55 in 7 days?

Appendix J.

MCQ Item Values and Associated Discounting Rates at Indifference Point (K)

Order	Reward Values			Indifference k
	$SS(\$)$	$LL(\$)$	Delay (days)	
Small Delayed Rewards (\$25-\$35)				
13	34	35	186	0.00016
20	28	30	179	0.00040
26	22	25	136	0.0010
22	25	30	80	0.0025
3	19	25	53	0.0060
18	24	35	29	0.016
5	14	25	19	0.041
7	15	35	13	0.10
11	11	30	7	0.25
Medium Delayed Rewards (\$50-\$60)				
1	54	55	117	0.00016
6	47	50	160	0.00040
24	54	60	111	0.0010
16	49	60	89	0.0025
10	40	55	62	0.0060
21	34	50	30	0.016
14	27	50	21	0.041
8	25	60	14	0.10
27	20	55	7	0.25
Large Delayed Rewards (\$75-\$85)				
9	78	80	162	0.00016
17	80	85	157	0.00040
12	67	75	119	0.0010
15	69	85	91	0.0025
2	55	75	61	0.0060
25	54	80	30	0.016
23	41	75	20	0.041
19	33	80	14	0.10
4	31	85	7	0.25

Appendix K. Food Choice Questionnaire

Kirby for Food

In the task that follows, you will have the opportunity to choose between food amounts after different delays. For this task, imagine the block in front of you as 1 standardized bite of your favorite food. Answer the questions as if what you would eat would be your favorite kind of food and as if the only options you would have to choose from would be those in the question. Please take the choices seriously. The reward choices are written on this form. Circle your reward choice for each question and answer every question as though you will actually receive that choice. The choices you make are up to you.

- | | | | | |
|-----|------------------|---------------------|----|--------------------------------|
| 1. | Would you prefer | 19 bites now | or | 30 bites in 23 hours? |
| 2. | Would you prefer | 20 bites now | or | 40 bites in 5 hours? |
| 3. | Would you prefer | 4 bites now | or | 8 bites in 5 hours? |
| 4. | Would you prefer | 35 bites now | or | 50 bites in 30 minutes |
| 5. | Would you prefer | 5 bites now | or | 8 bites in 1.5 hours? |
| 6. | Would you prefer | 11 bites now | or | 25 bites in 15 hours? |
| 7. | Would you prefer | 9 bites now | or | 13 bites in 1 hour? |
| 8. | Would you prefer | 24 bites now | or | 35 bites in 1 hour? |
| 9. | Would you prefer | 28 bites now | or | 45 bites in 24 hours? |
| 10. | Would you prefer | 15 bites now | or | 30 bites in 5 hours? |
| 11. | Would you prefer | 7 bites now | or | 10 bites in 30 minutes? |
| 12. | Would you prefer | 17 bites now | or | 40 bites in 10 hours? |
| 13. | Would you prefer | 5 bites now | or | 8 bites in 24 hours? |
| 14. | Would you prefer | 16 bites now | or | 25 bites in 1.5 hours |
| 15. | Would you prefer | 23 bites now | or | 50 bites in 7 hours? |
| 16. | Would you prefer | 15 bites now | or | 35 bites in 8 hours? |

- | | | | | |
|-----|------------------|-----------------------|----|-------------------------------|
| 17. | Would you prefer | 22 bites now | or | 50 bites in 15 hours? |
| 18. | Would you prefer | 8 bites now | or | 13 bites in 2 hours? |
| 19. | Would you prefer | 31 bites now | or | 45 bites in 1 hour? |
| 20. | Would you prefer | 4 bites now | or | 10 bites in 17 hours? |
| 21. | Would you prefer | 14 bites now | or | 25 bites in 2.5 hours? |
| 22. | Would you prefer | 5 bites now | or | 10 bites in 6 hours? |
| 23. | Would you prefer | 25.5 bites now | or | 40 bites in 1.5 hours? |
| 24. | Would you prefer | 15 bites now | or | 35 bites in 10 hours? |
| 25. | Would you prefer | 25 bites now | or | 45 bites in 2.5 hours? |
| 26. | Would you prefer | 5 bites now | or | 13 bites in 12 hours? |
| 27. | Would you prefer | 21 bites now | or | 30 bites in 0.5 hours? |

Appendix L.

FCQ Item Values and Associated Discounting Rates at Indifference Point (k):

Order	Reward Values			Indifference k
	$SS(\text{bites})$	$LL(\text{bites})$	Delay (hours)	
Small Delayed Rewards (8 – 13 bites)				
13	5	8	24	0.0252
20	4	10	17	0.0855
26	5	13	12	0.134
22	5	10	6	0.167
3	4	8	5	0.201
18	8	13	2	0.319
5	5	8	1.5	0.381
7	9	13	1	0.454
11	7	10	0.5	0.854
Medium Delayed Rewards (25 – 35 bites)				
1	19	30	23	0.0252
6	11	25	15	0.0855
24	14	35	10	0.134
16	15	35	8	0.167
10	15	30	5	0.201
21	14	25	2.5	0.319
14	16	25	1.5	0.381
8	24	35	1	0.454
27	21	30	0.5	0.854
Large Delayed Rewards (40 – 50 bites)				
9	28	45	24	0.0252
17	22	50	15	0.0855
12	17	40	10	0.134
15	23	50	7	0.167
2	20	40	5	0.201
25	25	45	2.5	0.319
23	25.5	40	1.5	0.381
19	31	45	1	0.454
4	35	50	0.5	0.854

Appendix M. Consent Form

Idaho State University Human Subjects Committee Informed Consent Form for Non-Medical Research

Present Moment Awareness Training

CONSENT TO PARTICIPATE IN RESEARCH

You are asked to participate in a research study conducted by Sierra Baca-Zeff and Erin B. Rasmussen, PhD. (208-282-5651), from the Department of Psychology at Idaho State University. You have been asked to participate in this research because you are at least 18 years of age, a student at Idaho State University, and fluent in English. To participate you must not be pregnant or have been diagnosed with an eating disorder. Your participation in this research is voluntary. Please read the information below and ask questions about anything you do not understand before deciding whether or not to participate.

1. PURPOSE OF THE STUDY

The purpose of this study is to examine strategies that affect money-related and food-related decisions.

2. PROCEDURES

You will be asked to sign this consent form and complete several brief questionnaires. You will be asked questions pertaining to your lifestyle, such as drinking habits and nicotine use. We will measure your height, weight, body fat percentage, and waist circumference. You will **not** need to remove clothing for any part of this study, except for shoes and socks while being weighed. We will also collect a blood glucose sample, which requires a minor skin prick. Lastly, you will participate in an activity lasting 50 minutes, where you may be asked to do a variety of different activities, such as read aloud or take bites of food. All components of this study will be completed in Garrison Hall room 504.

We ask that you do not eat or drink any liquid for 2 hours prior to participating in the study. If you do eat or drink water within 2 hours, we ask that you report it to us. Participation in this study will take approximately 1.5 to 2 hours of your time.

3. POTENTIAL RISKS AND DISCOMFORTS

Providing a blood glucose sample using a finger prick may cause slight momentary discomfort. You may also feel mild discomfort when answering questions about your lifestyle or in association with physical health measurements, such as being weighed.

4. ANTICIPATED BENEFITS TO SUBJECTS

Participants will receive research credit upon completion of their participation in the study.

5. ANTICIPATED BENEFITS TO SOCIETY

There are no benefits others than aiding our understanding of food and money-related decision making.

6. ALTERNATIVES TO PARTICIPATION

Individuals are not obligated to participate in this research study.

7. PAYMENT FOR PARTICIPATION

You will receive one (1) credit for every 30-minutes of participation in this study. We expect most participants to earn 3-4 credits.

FINANCIAL OBLIGATIONS

There are no financial obligations for participants.

EMERGENCY CARE AND COMPENSATION FOR INJURY

Idaho State University does not provide any other form of compensation for injury. If someone is injured during participation, standard emergency care (e.g., an ambulance) will be solicited. The subject will be solely responsible for costs of any medical care.

PRIVACY AND CONFIDENTIALITY

To protect your privacy, the questionnaires you complete will contain a subject code and not your name. Your name and subject code will be located on a master list available only to the researcher. Your contact information and this consent form will be stored separately from the other information you provide us. No information about you, or provided by you during the research, will be disclosed to others without your written permission, except (a) if necessary to protect your rights or welfare (for example, if you are injured), or (b) if required by law. Your identity cannot be associated with your responses. This research will not disclose any of the information you provide with others without your written consent, unless required by law.

When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity. Any paper containing your name will be stored in a

locked cabinet in the Principle Investigator's laboratory separate from data collected during the study

PARTICIPATION AND WITHDRAWAL

Your participation in this research is voluntary. If you decide not to participate, it will not affect your relationship with Idaho State University, or your right to receive services at Idaho State University to which you are otherwise entitled. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without prejudice to your future at Idaho State University.

WITHDRAWAL OF PARTICIPATION BY THE INVESTIGATOR

The investigators may stop your participation in this study at any time if circumstances arise which warrant doing so. The investigators will make the decision and let you know if it is not possible for you to continue. The decision may be made either to protect your health and welfare, or because it is part of the research plan. You may also be forced to withdraw if you do not follow the investigator's instructions.

IDENTIFICATION OF INVESTIGATORS

In the event of a research related injury or if you experience an adverse reaction, please immediately contact one of the investigators listed below. If you have any questions about the research, please feel free to contact Sierra Baca-Zeff or Erin B. Rasmussen, Ph.D., Garrison Hall, Campus Box 8112, Idaho State University, Pocatello, ID 83201-8112; (208) 282-5651.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. If you have any questions regarding your rights as a research subject, you may contact the Human Subjects Committee office at 282-2179 or by writing to the Human Subjects Committee at Idaho State University, Mail Stop 8130, Pocatello, ID 83209.

SIGNATURE OF RESEARCH SUBJECTS OR LEGAL REPRESENTATIVE

I have read (or someone has read to me) the information provided above. I have been given an opportunity to ask questions, and all of my questions have been answered to my satisfaction. I have been given a copy of the informed consent form.

BY SIGNING THIS FORM, I WILLINGLY AGREE TO PARTICIPATE IN THE RESEARCH IT DESCRIBES

Participant's Signature: _____ **Date:** _____

Appendix N. Blood Glucose Script

Now we are going to measure your blood glucose level. The purpose of this measurement is to ensure participants have not consumed food or beverages for at least 2 hours. I am going to rub your finger with rubbing alcohol and will give a small prick with this apparatus. I will then guide your finger onto this test strip to obtain a reading. This procedure is quick and should result in minimal discomfort.

Appendix O. Mindful Eating Script

Before we begin, please feel free to wash your hands. You will be handling and eating food during this workshop.

Now, the researcher will go around the room and give you four different food samples, paper, and a pencil. Do not eat the food samples yet. As we go through the exercise, we will instruct you on how to experience the food. We would like you to write down your feelings and thoughts on the piece of paper as we go through this exercise. The researcher will be collecting them at the end of the session but will not share this information with anyone outside our study. Please do not share your food with any other participants. Are there any questions?

0:00 Let's begin the exercise. First, I would like you to focus on one of the food samples and imagine that you have never seen anything like it before. Take the food and hold it in the palm of your hand or between your finger and thumb. **(1:00; Pause)**. Look at it carefully, as if you had never seen such a thing before. **(1:30; Pause)**. Turn it over between your fingers. **(2:00; Pause)**. Explore the food's texture between your fingers **(3:00; Pause)**. Examine the highlights where the light shines on the food, letting your eyes explore every part of it **(3:30; Pause)**. If thoughts come to your mind like "what an odd thing we are doing" or "what is the point of this", that is all right that is what minds do. Note them as thoughts and gently and compassionately, guide your focus back to the food. **(4:00; Pause)**. And now, smell the food. Take it and hold it beneath your nose. With each inhale, notice the smell of it. **(5:00; Pause)**. Take another careful look at the food **(6:00; Pause)**. Slowly, move the food close to your mouth. Notice how your hand and arm know where to go in order to place it near your mouth. Perhaps you notice your mouth watering as your hand moves. **(7:00; Pause)**. Now, without biting it, gently place the food in your mouth, noticing how it feels. Explore the sensations of having it in your mouth. **(7:30; Pause)**. When you are ready, very consciously, take a bite into the food and notice the tastes that it releases. **(8:00; Pause)**. Slowly chewing it, notice the saliva in your mouth, the change in consistency of the food. **(9:00; Pause)**. When you feel ready to swallow, see if you can first detect the intention to swallow. **(9:30; Pause)**. Finally, see if you can follow the sensations of swallowing it, sensing it moving down to your stomach. Realize how your body is now slightly heavier from the food. You may have the desire to eat more of the food, or perhaps you notice hunger sensations. However, you might observe that you are content with the amount of food that you just

consumed. Please take a few moments to write down your thoughts. (*Pause*). We will now transition to the next food sample.

** should be around 10 minutes by the time you finish.

Questions to ask after fourth (and final) food sample (let the participants lead most of the discussion if possible). Should be about 10 minutes.

- What are your thoughts about this exercise?
 - Like it? Don't like it?
- How do we normally eat?
- What might be the benefits eating like this?
 - slower eating
 - being aware of intake
 - taking a break from fast pace of life

Appendix P. Recipes

Baked Salmon

Ingredients:

- Four 6-ounce salmon fillets (1-inch thick)
- 2 teaspoons olive oil
- ½ Teaspoon sea salt
- ½ Teaspoon pepper

Instructions:

1. Preheat your oven to 400 degrees Fahrenheit (204 degrees Celsius)
2. Place the salmon on a baking sheet skin down, leaving a little room between each piece.
3. Pat the salmon dry with a paper towel. Drizzle each salmon fillet with ½ teaspoon of olive oil and sprinkle with the salt and pepper
4. Put the salmon in the oven and set a timer for 8 minutes. When the timer goes off, take the salmon out of the oven and let it rest for a few minutes. It will be tender, the flesh will have turned opaque, and there will only be a few tiny spots of white showing.
5. Plate salmon and serve

15-Minute Spaghetti

Ingredients:

- One 12-ounce box of half-cut spaghetti
- Pinch of salt, optional to taste
- Pinch of pepper, optional to taste
- 1 pound ground beef (90% lean is recommended)
- One 24-ounce jar of pasta sauce
- 3 cups cold water

Instructions:

1. In a large pot, add the pasta, cover with 3 cups cold water, optional salt to taste, and boil over high heat until water has absorbed, about 10 minutes, but watch your pasta and cook until al dente
2. While the pasta cooks, start the meat. In a large skillet, add the ground beef and cook over medium-high heat, breaking up the meat with a spatula as it cooks to ensure even cooking
3. After beef has cooked through, add the pasta sauce, stir to combine, and cook for 1 to 2 minutes, or until heated through
4. After pasta has cooked for about 10 minutes, or until all the water has been absorbed, add the sauce over the pasta and toss to combine in the skillet or alternatively plate the pasta and add sauce to each individual plate as desired

Basic Vanilla Cake

Ingredients:

- 2 sticks unsalted butter, at room temperate, plus more for the pans
- 3 cups all-purpose flour, plus more for the pans
- 1 Tablespoon baking powder
- ½ teaspoon salt
- 1 ¼ cups sugar
- 4 eggs at room temperature
- 1 tablespoon vanilla extract
- 1 ¼ cups whole milk

Directions

1. Preheat the oven to 350°F. Butter two 9-inch round cake pans and line the bottoms with parchment paper; butter the parchment and dust the pans with flour tapping out the excess
2. Whisk 3 cups flour, the baking powder and salt in a bowl until combined. Beat 2 sticks butter and the sugar in a large bowl with a mixer on medium-high speed until light and fluffy, about 3 minutes. Reduce the mixer speed to medium; beat in the eggs, one at a time, scraping down the bowl as needed. Beat in the vanilla (the texture may look separated at this point). Beat the flour mixture in 3 batches, alternating with the milk, beginning and ending with flour, until smooth
3. Divide the batter between the prepared pans. Bake until the cakes are lightly golden on top, and a toothpick inserted into the middle comes out clean, about 30 to 35 minutes. Transfer to racks and let cool 10 minutes, then run a knife around the edge of the pans and turn the cakes out onto the racks to cool completely. Remove the parchment. Trim the tops of the cakes with a long, serrated knife to make them level, if desired.

Easy Homemade Bread

Ingredients

- 2 cups warm water (110°F)
- ½ cup white sugar
- 1 ½ tablespoons active dry yeast
- 1 ½ teaspoons salt
- ¼ cup vegetable oil
- 5-6 cups flour

Instructions

1. In a large bowl, dissolve the sugar in warm water and then stir in yeast. Allow to proof until yeast resembles a creamy foam, about 5 minutes
2. Mix remaining sugar, salt, and vegetable oil into the yeast. Mix in flour one cup at a time. Dough should be tacky and cling to the sides of the bowl. Too much flour added in yields a dry loaf of bread, so if you're worried you added too much, add a bit more water, until you get the correct consistency.
3. Knead dough for 7 minutes. Place in a well-oiled bowl and turn dough to coat. Cover with a damp cloth. Allow to rise until doubled in bulk, about 1 hour.
4. Punch dough down. Knead for 1 minute and divide in half. Shape into loaves and place into two greased 9x5 inch loaf pans. Allow to rise for 30 minutes, or until dough has risen 1 inch above pans.
5. Bake at 350°F for 30-40 minutes. Allow the bread to cool and brush with butter.

Baked Chicken

Ingredients

- 4 skinless, boneless chicken breast halves
- 2 tablespoons olive oil
- 1 tablespoon coarse sea salt
- 1 tablespoon pepper

Instructions

1. Preheat oven to 400 degrees Fahrenheit (200 degrees Celsius)
2. Using a meat mallet or rolling pin, pound each chicken breast to 0.8-inch at the thickest part. Make sure your fillets are all the same thickness to ensure even cooking.
3. Line a baking pan with aluminum foil. Transfer the chicken to the pan and rub the chicken breasts with olive oil and sprinkle both sides with salt and pepper. Make sure the chicken is evenly coated.
4. Bake for 10 minutes. Flip chicken and cook until no longer pink in the center and the juices run clear, about 15 minutes more. A thermometer inserted into the center should read at least 165 degrees Fahrenheit (74 degrees Celsius)
5. Remove chicken from oven, transfer chicken to serving plates and let rest 5 minutes before serving.

Scrambled Egg

Ingredients

- 4 large eggs
- ¼ cup half-and-half
- ¼ teaspoon kosher salt
- ¼ teaspoon black pepper
- 1 tablespoon unsalted butter

Instructions

1. In a medium mixing bowl, aggressively whisk together the eggs, half-and-half, and salt until the mixture is uniform in color and texture. The consistency should be light and foamy, without any separate streaks of yolk or whites
2. Melt the butter in a small nonstick pan over medium heat, until the butter coats the whole pan and just starts to foam
3. Add the eggs to the center of the pan and immediately reduce the heat to medium-low
4. Wait for the edges to just barely start to set, then using a rubber spatula, gently push the eggs from one end of the pan to the other. Continue this process, pausing in-between swipes to allow the uncooked egg to settle on the warm pan and cook, gently pushing the liquid to form the curds
5. When the eggs are mostly cooked, but still look pretty wet, slowly fold the eggs into itself a couple times, bringing them together
6. Remove from the heat when the eggs still shimmer with some moisture
7. Transfer to serving plates. Finish with pepper.

Mashed Potatoes

Ingredients

- 3 pounds mixed potatoes, such as Russets and Yukon Golds
- Kosher salt
- Freshly ground black pepper
- 1 stick butter
- ½ cup milk

Instructions

1. In a large pot, cover potatoes with water and add a generous pinch of salt. Bring to a boil and cook until totally soft, about 16-18 minutes. Drain using a colander and return potatoes to pot
2. Use a potato masher to mash potatoes until smooth
3. Meanwhile, in a saucepan, melt butter and milk until warm
4. Pour the potatoes over the mixture and stir until completely combined and creamy
5. Season mashed potatoes generously with salt and pepper
6. Transfer potatoes to a serving bowl and top with remaining two tablespoons butter. Season with more pepper before serving.

Scones

Ingredients

- 2 cups all-purpose flour, plus more for work surface
- ½ cup granulated sugar
- ½ teaspoon salt
- 2 ½ teaspoons baking powder
- ½ cup unsalted butter, frozen
- ½ cup heavy cream
- 1 large egg
- 1 ½ teaspoons vanilla extract

Instructions

1. Whisk flour, sugar, salt, and baking powder together in a large bowl. Grate the frozen butter using a box grater. Add it to the flour mixture and combine with a pastry cutter, two forks, or your fingers until the mixture comes together in pea-sized crumbs. Place in refrigerator or freezer as you mix the wet ingredients together.
2. Whisk ½ cup heavy cream, the egg, and vanilla extract together in a small bowl. Drizzle over the flour mixture then mix together until everything appears moistened.
3. **To make triangle scones:** Pour onto the counter and, with floured hands, work dough into a ball as best you can. Dough will be sticky. If it's too sticky, add a little more flour. If it seems too dry, add 1-2 more tablespoons heavy cream. Press into an 8-inch disc and with a sharp knife, cut into 8 wedges. For smaller scones, press dough into two 5-inch discs and cut each into 8 wedges.
4. Place scones on a plate or lined baking sheet and refrigerate for at least 15 minutes.
5. Bake for 18-26 minutes or until golden brown around the edges and lightly browned on top. Larger scones take closer to 25 minutes. Remove from the oven and cool for a few minutes before eating.

Cornbread

Ingredients

- 1 cup all-purpose flour
- 1 cup yellow cornmeal
- 2/3 cup granulated sugar
- 1 teaspoon salt
- 3 ½ teaspoons baking powder
- 1/3 cup butter, melted
- 1 large egg
- 1 cup milk

Instructions

1. Grease a 9-inch round pan or cast-iron skillet and set aside. Preheat oven to 400 degrees Fahrenheit (200 degrees Celsius).
2. In a medium mixing bowl, add the flour, cornmeal, sugar, salt, and baking powder. Whisk to combine.
3. In a different bowl, combine the butter, milk, and eggs. Whisk to combine.
4. Combine the wet and dry ingredients by making a well in the center of your dry mixture and adding the liquid mixture slowly. Stir just until the mixture comes together and there are only a few lumps remaining.
5. Pour the batter into the prepared pan and bake for 20-25 minutes until the top is brown and a toothpick inserted into the center comes out clean.

Muffins

Ingredients:

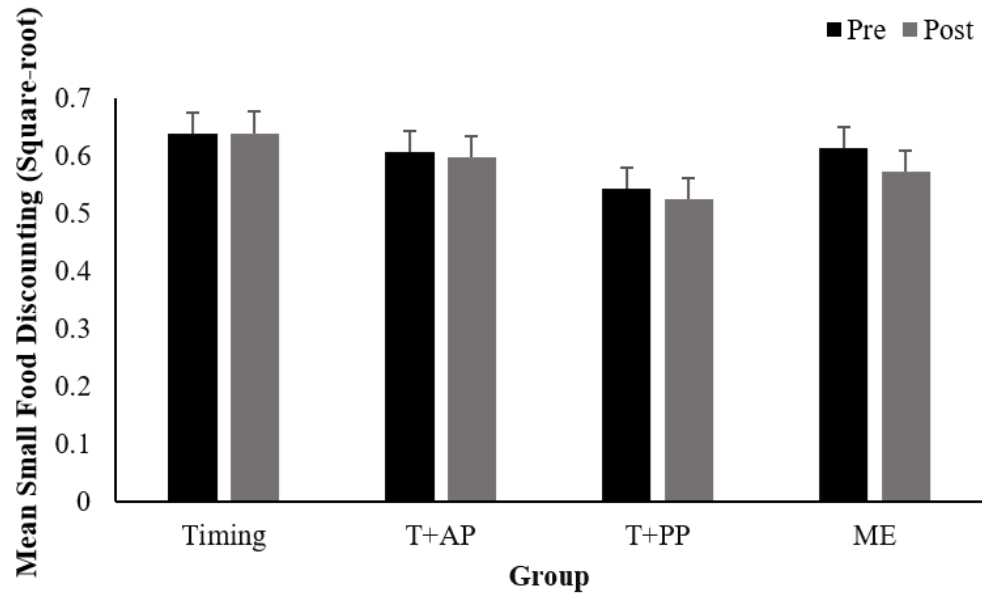
- 2 cups self-rising flour
- 1 cup sugar
- $\frac{1}{2}$ teaspoon salt
- 1 egg
- $\frac{3}{4}$ cup milk
- $\frac{1}{3}$ cup oil

Instructions:

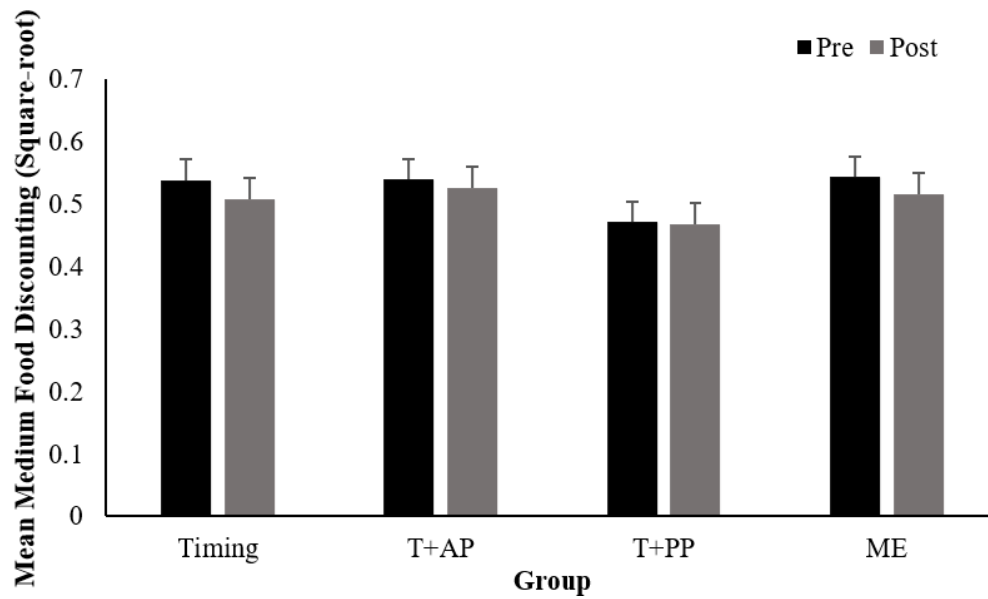
1. In a bowl, combine the dry ingredients (flour, sugar, and salt). Mix together gently.
2. In a separate bowl, combine the wet ingredients (egg, milk, and oil). Mix together until combined.
3. Pour the wet mixture into the dry ingredients slowly. Gently fold the mixture into itself.
4. Stir until combined. The mixture may be slightly watery.
5. Using a $\frac{1}{3}$ cup measure, fill each muffin cup and smooth the top.
6. Bake for 22 – 25 minutes, or until golden brown and a toothpick comes out dry.
7. Wait 10 minutes to cool before eating.

Appendix Q: Repeated measure ANCOVAs for small, medium, and large food
discounting magnitudes

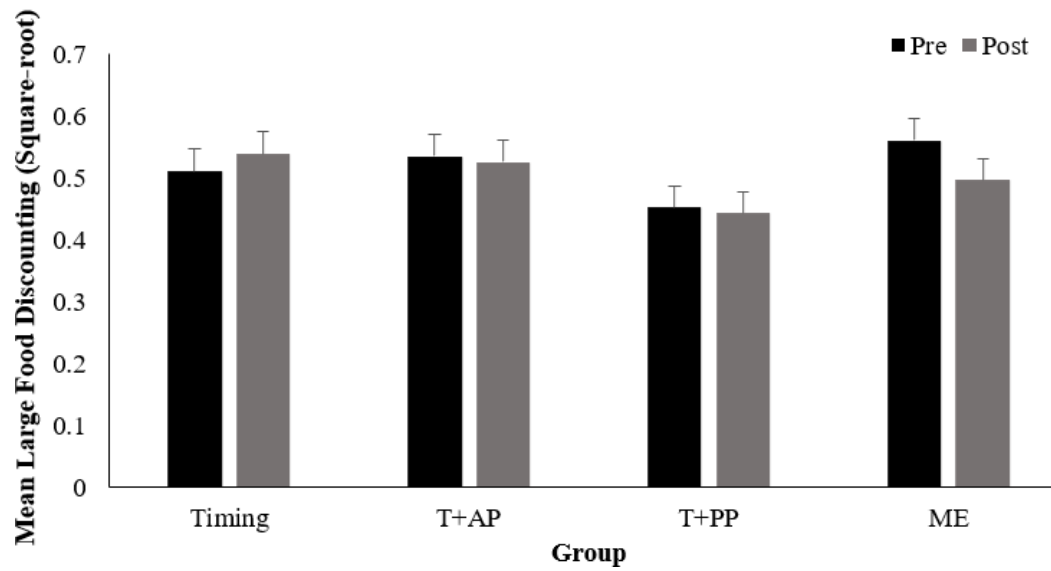
Small Food DD



Medium Food DD



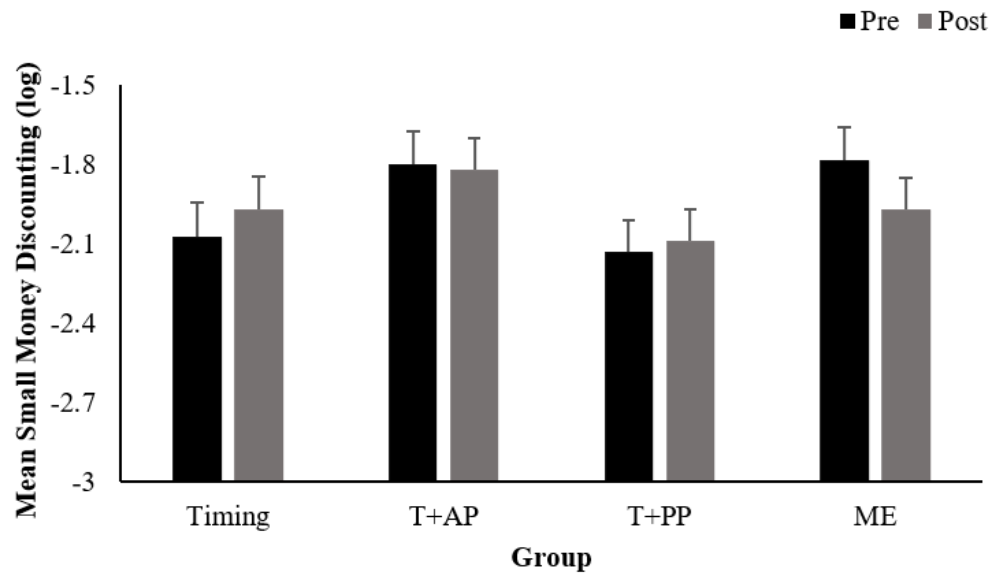
Large Food DD



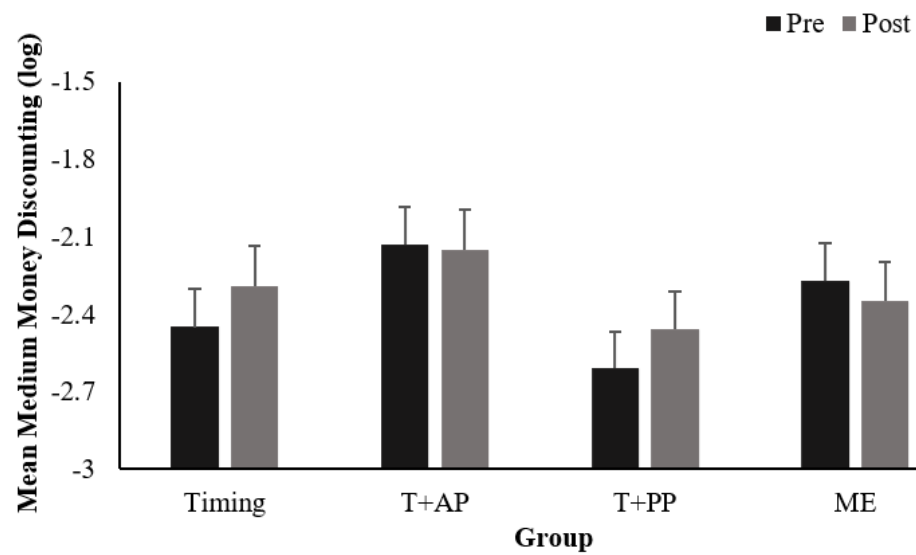
Error bars = 1 SEM

Appendix R: Repeated measure ANCOVAs for small and medium money discounting magnitudes

Small Money DD



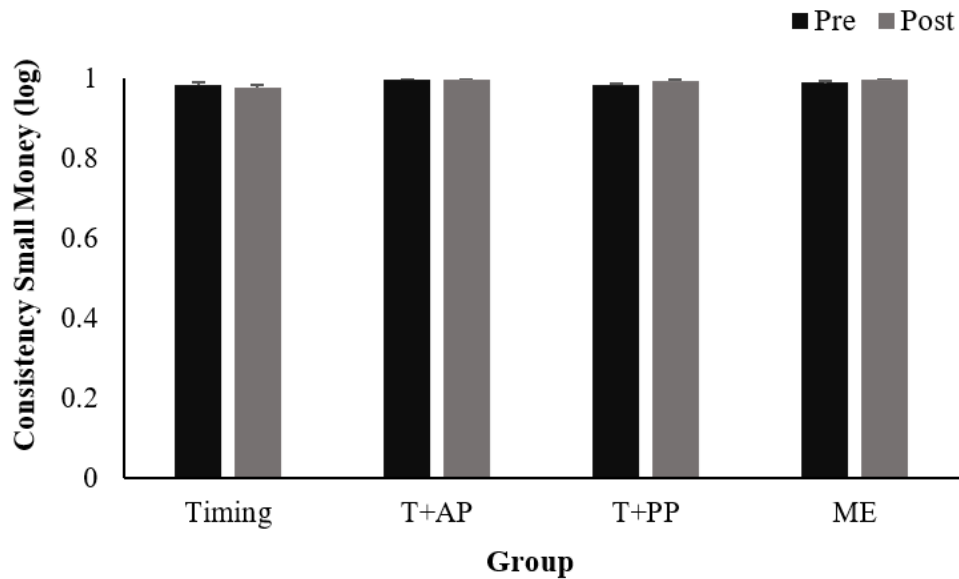
Medium Money DD



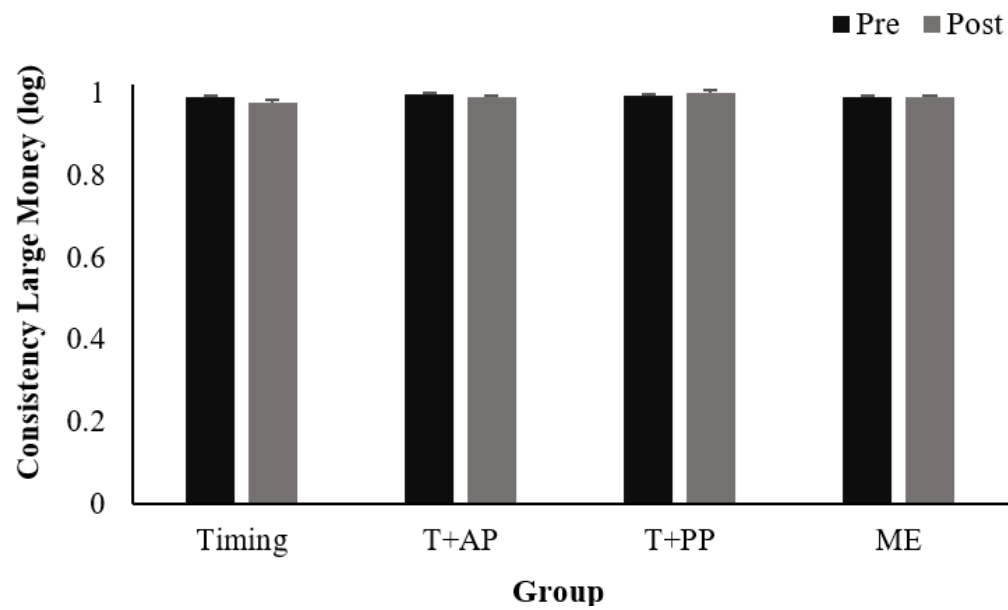
Error bars = 1 SEM

Appendix S: Repeated measure ANOVA for small and large magnitude money consistency.

Small Consistency Money



Medium Consistency Money



Error bars = 1 SEM