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Imagery and Food Cravings: Imagining Eating Enhances the Experience of Eating

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Imagery and Food Cravings:
Imagining Eating Enhances the Experience of Eating

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A Thesis presented to the Graduate Faculty
of the College of William and Mary in Candidacy for the Degree of
Master of Arts

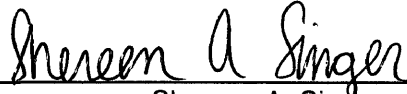
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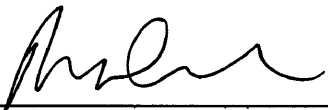


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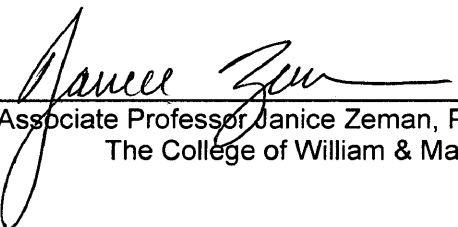
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ABSTRACT PAGE

Recent research on the role of mental imagery in cravings has shown that imagery tasks can reduce food cravings. This study examines the role of guided imagery in reducing cravings and consequently, consumption of chocolate cake. Participants (N = 144) were female undergraduate students who fell into one of two groups: restrained or non-restrained eaters. Participants were placed in one of three experimental conditions: imagining eating chocolate cake, imagining walking through the woods, or waiting. After imagining the scenario or waiting for the same period of time, participants were presented with a chocolate cake and allowed to eat as much as they wanted. Emotions about eating, guilt, attitudes toward the cake, and amount of cake eaten were compared across conditions. There were no differences in amount of cake eaten, but compared to participants in other conditions, non-restrained eaters who imagined eating the cake thought that the cake tasted better, was more satisfying, and was better for them. These participants also felt less guilty about eating the cake. These results suggest that imagining eating prior to eating may enhance the experience of eating. Implications are discussed.

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Imagery and Food Cravings: Imagining Eating Enhances the Experience of Eating

The goal of this study is to examine the effectiveness of guided imagery in reducing food cravings and consumption. The paper begins by discussing general background information on cravings. Problems associated with cravings and the effects of cravings on obesity and eating disorders are explained. Next, the Elaborated Intrusion model—a prominent cognitive model of cravings—is presented. The role of mental imagery in food cravings is described and empirical evidence from several studies is used to justify the rationale and methodology of the current study. Results for two separate samples—non-restrained and restrained eaters—are presented. The effect of imagery on emotions, attitudes, guilt, and amount of food eaten is explained. Differences between the non-restrained and restrained eaters are discussed. Finally, the implications for the use of guided imagery as a craving reduction technique—for non-restrained and restrained eaters—are examined.

Background

Most people report experiencing food cravings and are familiar with the lay definition of the term—an intense desire for a specific food (Hill & Heaton-Brown, 1994). Weingarten and Elston (1991) found that 97% of women and 68% of men experienced food cravings within the preceding year. There is, however, controversy about the scientific definition of “craving” because cravings vary widely in intensity. Estimates of craving prevalence differ based on the definition used. In one study, 58% of women reported experiencing the lay definition of the term, but only 4% reported having cravings based on the most exclusive definition, which requires that the craving affects the individuals’ behaviors and emotions. The most intense cravings are difficult to resist,

cause anxiety when the food cannot be eaten, and alter—either by increasing or decreasing—food consumption once the food is obtained (Gendall, Joyce, & Sullivan, 1997). Although craving intensity may vary between individuals, most researchers agree that food cravings are a common experience.

The basic nature of food cravings has been studied extensively over the past few decades. Although both men and women experience food cravings, women typically report more cravings than men and are more susceptible to the effects of stress, boredom, and television ads on cravings. Women also tend to crave sweets, particularly chocolate, more than men (Weingarten & Elston, 1991). With this in mind, it is not surprising that most research on food cravings tends to focus on women.

Numerous studies have shown that chocolate is one of the most commonly craved foods, especially for women (Gendall, Joyce, & Sullivan, 1997; Hill & Heaton-Brown, 1994; Rodin, Mancuso, Granger, & Nelbach, 1991; Rozin, Levine, & Stoess, 1991; Tiggemann & Kemps, 2005). Other commonly craved foods include non-chocolate sweets, starches, and snack type foods (Gendall, Joyce, & Sullivan, 1997). Evidence suggests that not all food craving episodes are equivalent; cravings differ based on the food that is desired. In an effort to better understand the experience of craving, Hill and Heaton-Brown (1994) studied a sample of 25 women, ages 20-57, over a period of five weeks. Participants completed a food craving record for every craving that they had regardless of whether or not they ate the food. Most cravings were acted upon by eating, but individuals tended to seek out chocolate more quickly than other craved foods. Results also suggest that chocolate cravings last longer than cravings for savory foods

(e.g., pizza or toast). Finally, compared to savory foods, eating chocolate when it is craved will increase pleasure but have little effect on hunger.

The role of hunger in cravings has received much attention. Indeed, cravings are related to physical needs and people who are hungrier report more intense cravings (Steel, Kemps, & Tiggemann, 2006). Cravings have been linked to several other physiological measures, including female hormonal changes, increased salivation, and neurotransmitters associated with cravings for drugs (Hill & Heaton-Brown, 1994; Pelchat, 2002; Wooley & Wooley, 1973; Wurtman & Wurtman, 1986). Some researchers propose that cravings may be an evolutionary mechanism to ensure that we get all of our required nutrients. In support of this, one study found that people who were assigned to a monotonous diet for 1.5 days showed increased amounts of cravings compared to people who were allowed to consume a normal diet (Pelchat, Johnson, Chan, Valdez, & Ragland, 2004). Finally, there is evidence that cravings can be learned when linked to hunger (Gibson & Desmond as cited in Pelchat, 2002). For example, participants who ate chocolate only when hungry reported increases in chocolate cravings compared to participants who ate chocolate only when full.

To attribute cravings to physiological needs alone would do injustice to psychological causes, which are arguably more important (Hill, Weaver, & Blundell, 1991). After all, if cravings were solely driven by hunger or the need for nutrients, there would be no reason that overweight individuals should experience cravings. Indeed, hunger is not required for a craving to occur. Psychological triggers and reactions to cravings are paramount in understanding cravings. Cravings are more often preceded by thinking about a food (60% of reported craves) than seeing or smelling a food (20% of

craves); thus, it appears that cravings are tied very closely to our cognitions (Hill & Heaton-Brown, 1994). Even when an individual is fully satiated, thinking about appealing foods will increase saliva production (Wooley & Wooley, 1973). So the overwhelming psychological nature of cravings may actually cause physical reactions such as mouth watering (Tiggemann & Kemps, 2005). Cravings may also satisfy psychological needs, as certain foods may bring about pleasure or reduce stress (Benton, Greenfield, & Morgan, 1998). To be sure, most women report better moods after satisfying a craving (Hill & Heaton-Brown, 1994).

Adverse Effects of Cravings

Food cravings are not usually pathological, but can become problematic when they are not controlled. Cravings can have adverse effects on an individual regardless of whether or not the craved food is eaten. Cravings that cannot be satiated often cause anxiety and discomfort (Gendall, Joyce, & Sullivan, 1997). In contrast, cravings that are fulfilled may result in guilt (Benton, Greenfield, & Morgan, 1998). Consequently, cravings can be particularly difficult for individuals who are overweight or who are trying to lose weight. Harvey, Kemps, and Tiggemann (2005) found that dieters reported higher levels of craving than non-dieters, and also reported significantly greater increases in craving following a food induction scenario than did non-dieters. Unfortunately, when trying to avoid eating a craved food, the craving's intensity is often increased. This increase in craving may lead to an increase in food consumption and ultimately, failure of a diet. Fedoroff, Polivy, and Herman (1997) found that compared to non-dieters, dieters were more sensitive to the exposure of food cues prior to eating. When pre-exposed to

the thought, sight, or smell of pizza before eating, dieters increased the amount of pizza that they ate whereas non-dieters did not increase consumption.

In addition to hindering weight loss goals, cravings have also been linked to impaired cognition, especially for dieters (Green, Rogers, & Elliman, 2000). After imagining eating their favorite foods, dieters and highly restrained eaters performed worse on a simple reaction time task than did non-dieters. These results show that cravings can cause significant distress and become a road block for people who are trying to lose weight.

Cravings play a large role in disordered eating behaviors. Binging, purging, and guilt have all been linked to cravings; however an analysis of women's attitudes toward chocolate revealed that guilt and cravings were not necessarily associated in all individuals (Benton, Greenfield, & Morgan, 1998). Individuals who report high guilt with eating are more likely to binge on chocolate, eat chocolate when they do not really want to eat it, and make themselves vomit after eating. Benton and colleagues suggest that high levels of guilt and craving may be a predisposition to developing an eating disorder. High levels of dietary restraint—deliberate attempts to restrict food intake—are associated with binging (Gendall, Joyce, Sullivan, & Bulik, 1998; Herman & Polivy, 1980; Ruderman & Grace, 1987). Individuals with bulimia nervosa often report that their disorders were preceded by dieting and high levels of dietary restraint (Bulik, Sullivan, Carter, & Joyce, 1997). People who crave foods and then subsequently binge on them have higher body mass indexes (BMI) than people who do not binge (Gendall, Joyce, Sullivan, & Bulik, 1998). This may lead to a vicious cycle, as body image is a major

concern for individuals who diet; high BMIs may lead to negative affect about the body and disordered eating habits (Dowson & Henderson, 2001).

Considering the adverse effects of cravings, it is easy to see how techniques that help individuals control their cravings and food consumption would be instrumental in curbing the nation's growing obesity problem and ameliorating the difficulties associated with eating disorders. Unfortunately, most methods of craving reduction have received little empirical support. The thought suppression paradigm proposes that trying to push cravings out of one's mind might decrease cravings. Research has shown that thought suppression actually increases one's motivation to obtain the craved food (Johnston, Bulik, & Anstiss, 1999). Other researchers propose that exposure to the craved food without eating it may decrease cravings. This method is similarly disappointing, as exposure to the sight or smell of food without eating it may actually increase cravings (Federoff, Polivy, & Herman, 1997).

One promising area of research in understanding the frequency, intensity, and experience of cravings is mental imagery. The role of imagery as a key component of cravings has gained consistent support, and may offer groundbreaking ways to curb cravings and food consumption (Harvey, Kemps, & Tiggemann, 2005; Kemps & Tiggemann, 2007; Kemps, Tiggemann, & Hart, 2005; McClelland, Kemps, & Tiggemann, 2005; Steel, Kemps, & Tiggemann, 2006; Tiggemann & Kemps, 2005).

Cognitive Models of Craving and the Role of Imagery

One of the major theories proposed to explain the experience, emotions, and processes involved in craving is the Elaborated Intrusion theory (EI; Kavanagh, Andrade, & May, 2005; May, Andrade, & Panabokke, 2004). According to EI, food cravings

occur when environmental and psychological triggers spontaneously reach our conscious awareness and are experienced as intrusive thoughts. These thoughts are tied to the consumption of the actual food and thus bring about feelings of reward, relief, and pleasure. When the individual feels this positive affect, they begin to further elaborate their thoughts about the food, searching their memories for other associations between the food and its rewarding effects. In this process of elaborating thoughts, the individual forms visual images of the food, which are associated with even stronger ties to positive affect, reminding the individual that they do not have this pleasure-producing food. This provides the impetus for the individual to seek out the craved food. The cycle persists as long as the craving is not satisfied, with desire leading to more imagery and further planning to satisfy the urge. The EI theory explains not only the process of cravings, but also how cravings interfere with other cognitive tasks, because the intrusive thoughts and images load the working memory and interfere with other cognitions.

Many experimental studies have illustrated the strong association between imagery and cravings, supporting the EI theory of food cravings. People report increased cravings after imagining the sight of a food (Harvey, Kemps, & Tiggemann, 2005). Further, craving intensity is related to the vividness of a food image; the stronger the vividness of the imagined food, the stronger the food craving (Harvey, Kemps, & Tiggemann, 2005; Steel, Kemps, & Tiggemann, 2006; Tiggemann & Kemps, 2005). Additionally, although craving intensity is related to current hunger levels, the relationship between the vividness of the imagined food and craving intensity persists even after controlling for hunger, supporting the psychological role of imagery in food cravings (Tiggemann & Kemps, 2005).

Research elaborates on the concept of imagery by asserting that the visual modality is the strongest modality involved (Tiggemann & Kemps, 2005). A sample of 130 university students who were asked to imagine eating their favorite food and to rate the extent that different sensory modalities were involved rated the visual modality as the strongest (39.7%), followed by the gustatory (30.6%), olfactory (15.8%), tactile (9.5%), and auditory (4.4%) modalities. In imagining eating their favorite foods, these participants reported seeing the food, seeing themselves eat the food, smelling the food, tasting the food, and feeling the texture of the food in their mouths.

Together, these studies show the importance of imagery, especially visual imagery, in evoking food cravings. Can techniques aimed to interfere with this imagery process—which is crucial to cravings according to the EI theory—reduce food cravings? Baddeley and Andrade (2000) showed that it was possible to reduce the strength of visual images by overloading the visuo-spatial sketchpad. Thus, tasks that load on the visuo-spatial sketchpad may reduce the vividness of food images thereby reducing cravings.

Many recent studies have found just that. Harvey, Kemps, and Tiggemann (2005) measured participants' cravings before and after they imagined one of two scenarios: either a holiday or eating their favorite food. As predicted by EI theory, cravings increased in participants who imagined eating their favorite food, but not for participants who imagined the holiday scenario. After cravings were induced, participants completed one of two non-food related imagery tasks. Participants imagined either visual images (e.g., imagine the appearance of a rainbow) or auditory sounds (e.g., imagine the sound of a telephone ringing). Both imagery tasks led to decreased cravings, but participants who

completed the visual imagery task experienced greater decreases in cravings than participants who completed the auditory task.

Concurrent visuo-spatial processing has been shown to reduce cravings in other experiments as well. Kemps, Tiggemann, and Hart (2005) found that visual imagery tasks reduced chocolate cravings. Steel, Kemps, and Tiggemann (2006) found that participants' cravings of their favorite foods were reduced by concurrent visual tasks. Participants were asked to provide a list of the three foods that they would most like to eat at that moment. They then imagined each of the foods for five seconds and were instructed to maintain the image of the food for eight more seconds while completing a concurrent task. Participants were asked to focus on a computer screen that displayed dynamic visual noise (experimental condition) or a blank screen (control condition). At the end of the retention interval, participants were asked to rate the vividness of their image and their craving intensity. Craving intensity and image vividness ratings were lower for participants in the dynamic visual noise condition than for participants in the control condition. Together, these studies provide convincing evidence that tasks that load the visuo-spatial sketchpad reduce not only the vividness of a food image, but also the associated craving for that food.

Although the visual modality is the most important modality in cravings, the gustatory, olfactory, and tactile modalities are also involved. Kemps and Tiggemann (2007) investigated the effects of non-visual imagery tasks on cravings and found that cravings could be reduced by completing olfactory imagery tasks as well as visual imagery tasks, but not by completing auditory imagery tasks.

This line of research is promising because studies show that imagery is effective in reducing cravings triggered by both hunger and psychological factors (Steel, Kemps, & Tiggemann, 2006). Further, McClelland, Kemps, and Tiggemann (2006) found that imagery techniques were effective for all individuals, regardless of imagery ability. These results warrant the further investigation of imagery as a craving reduction strategy.

Current Study

Although much evidence suggests that concurrent imagery tasks can reduce cravings, to our knowledge, no study has assessed the use of imagery to reduce food consumption. This study examines the effectiveness of two guided imagery scripts in reducing cravings and consumption of chocolate cake. In an effort to assess a sample of participants who typically crave chocolate, this study examines only women; women typically report more cravings than men, especially for chocolate.

In one imagery condition, participants imagined eating chocolate cake until they felt satisfied. This condition was designed to assess whether imagining the entire process of eating could decrease cravings and food consumption by making an individual more aware of feeling full and satiated. Although both the thought of a food and deliberate attempts at thought suppression will increase cravings, it is possible that imagining the entire process of eating—from start to finish—will reduce cravings. In another imagery condition, participants actively imagined walking through the woods—an activity not related to food. A third condition where participants waited before eating was used as a control.

It is hypothesized that both imagery tasks will reduce cravings and consumption of cake compared to the waiting period. It is also hypothesized that imagining the entire

process of eating will reduce cravings and food consumption more than the woods imagery condition. This effect is hypothesized to be weaker for individuals who have high levels of dietary restraint (i.e., strict dieters or individuals with eating disorders). The imagery scripts may not work for these individuals because they typically employ many cognitive resources to limit their food intake. They place a large emphasis on restricting their food intake; thus they may eat small amounts of food even when they have an intense craving. Individuals high on dietary restraint also tend to be high on disinhibition, restricting eating for a while but then subsequently bingeing. Consequently, the eating behaviors of these individuals may be more variable, with individuals eating either very small or very large amounts of cake, regardless of whether or not they completed an imagery task.

Method

Participants

Participants were female undergraduate students at the College of William and Mary ($N = 144$) between the ages of 18 and 26 ($M = 19.10$ years, $SD = 1.29$) who completed the experimental study in exchange for credit in their Introductory Psychology courses.

Follow-up measures were implemented in a second phase of the study and were collected from a total of 76 participants. Individuals who participated after the second phase was implemented ($n = 48$) completed both the experimental study and follow-up measures in one session and received course credit towards their Introductory Psychology courses. The 98 participants who had previously completed the experimental study were contacted and asked to participate in the follow-up study. Twenty-eight of these

participants completed the follow-up for either additional course credit in their Introductory Psychology courses ($n = 14$) or \$3 cash ($n = 14$). For these participants, the time between completion of the experimental study and questionnaire follow-up ranged between 2 months and 5 months. The breakdown of participants by study (experimental and follow-up) and condition is presented in Table 1.

Group Assignment

In the first phase of the study, we recruited individuals from the Introductory Psychology participant pool and expected to examine typical individuals, i.e., individuals without eating disorders or restrained eating habits. However, we screened individuals for eating disorders using the SCOFF questionnaire and two groups readily emerged (Morgan, Reid, & Lacey, 1999). The SCOFF questionnaire consists of five questions (see Appendix A). Answering “yes” to two or more questions indicates that an individual may have an eating disorder. Those participants ($n = 90$) with low SCOFF scores (scores less than two) were placed in the typical group.

The large proportion of our initial sample—27 out of 94—who had scored high on the SCOFF questionnaire were placed in the atypical group. Rather than throw out these participants, we decided to examine participants with high SCOFF scores as a separate group. To even out the high SCOFF score condition cells, we began to recruit participants based on their SCOFF scores in a mass testing session that occurred earlier in the semester. Overall, 46 individuals with high SCOFF scores completed the study.

Materials

Guided imagery scripts. Participants listened to one of three recorded scripts through a pair of headphones. Each script was recorded by the same woman. These

scripts are presented in Appendix B. The two imagery scripts were recorded so that questions and pauses matched in length of time. All three recordings lasted 4.5 minutes and began by telling participants that they would have the opportunity to eat chocolate cake at the end of the study.

Initial questionnaire. Participants were asked to rate how much they liked chocolate, if they were allergic to chocolate, how long it had been since they last ate, what they ate last, and to rate their current hunger level. Participants with scores of two or less on the question “how much do you like chocolate” were excluded from the analyses. See Appendix C for the full initial questionnaire.

Post-recording questionnaire. Participants were asked to rate the vividness of the imagery script (if applicable), their feelings about eating the cake (happy, troubled, anxious, excited, eager, satisfied, concerned), the cake’s taste, the cake’s nutritious value, guilt associated with eating the cake, and their current hunger. These items were used as predictors of emotions and cake ratings. See Appendix D for the full post-recording questionnaire.

Post-eating questionnaire. Participants were again asked to rate their feelings about eating the cake (happy, troubled, anxious, excited, eager, satisfied, concerned), the cake’s taste, the cake’s nutritious value, guilt associated with eating the cake, and their current hunger immediately after eating the cake. These items assessed actual emotions and cake ratings. See Appendix E for the full post-eating questionnaire.

Attitudes to Chocolate scale (ATC). The ATC is a 24-item questionnaire that assesses one’s attitudes toward chocolate (Benton, Greenfield, & Morgan, 1998). The ATC contains three subscales that measure the degree to which a participant feels guilty

about eating chocolate, habitually craves chocolate, and uses chocolate functionally (Appendix F). The guilt and craving subscales each consist of 10 questions. Participants responded to each of the items on a scale of one (never) to five (always). Total ATC craving and ATC guilt scores, ranging from 10-50, were computed for each subject, with higher scores signifying higher craving or guilt.

Vividness of Visual Imagery Questionnaire (VVIQ). The VVIQ was included to assess participants' general abilities to visualize images in order to see if individuals with better imagery abilities rate the two imagery scenarios more vividly (Marks, 1973). The VVIQ consists of eight items that assess how well an individual can imagine various objects with her eyes open and her eyes closed (see Appendix G). Each item is rated on a scale of one (no image at all) to five (perfectly clear and as vivid as normal vision), and an average of the individual's 16 responses is computed. In the published VVIQ, a score of one represents "perfectly clear and as vivid as normal vision" and a score of five represents "no image at all." To make the scale similar to other measures in our study, in the version that participants filled out, higher numbers indicated greater clarity of the image. In our analyses, however, scoring was reversed to match scores on the actual VVIQ; a lower average score indicates a greater ability to imagine visual images.

SCOFF questionnaire. The SCOFF questionnaire consists of five "yes" or "no" questions and is used to screen individuals for the presence of an eating disorder (Morgan, Reid, & Lacey, 1999). See Appendix A for a list of the questions. Answering "yes" to two or more questions is indicative of a suspected eating disorder. In a sample of 116 women (ages 18-40) with anorexia nervosa or bulimia nervosa and 96 women (ages 18-39) who did not have an eating disorder, the SCOFF questionnaire was 100% sensitive

for the presence of an eating disorder, but had a false positive rate of 12.5% (Morgan et al., 1999).

Chocolate cakes. Each participant was presented with her own Pepperidge Farm® Chocolate Fudge Three-Layer Cake. The cake was presented on a Styrofoam plate along with a fork wrapped in a napkin and a cup of water.

Follow-up measures. In a second phase of the study, participants completed the Revised Restraint Scale (RRS; Herman & Polivy, 1980), Body Shape Questionnaire (BSQ; Dowson & Henderson, 2001), Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985), and Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988). These measures were included to assess for differences between participants with low SCOFF scores and participants with high SCOFF scores.

The RRS is a commonly used measure of dietary restraint. The 10 items on the RRS ask about dieting, eating habits, weight fluctuation, and guilt after overeating (Appendix H). Total scores range from 0-35, with higher scores indicating higher dietary restraint.

The BSQ measures concern about body image (Appendix I). It consists of 14 items that assess feelings about one's appearance rated on a scale of one (never) to six (always). Total scores range from 14-84; higher scores indicate more concern about body image.

The TFEQ is another measure of dietary restraint (like the RRS), but also assesses additional factors related to eating. It consists of 51 items divided into three subscales: cognitive restraint of eating, disinhibition, and susceptibility to hunger (Appendix J). The

cognitive restraint subscale consists of 21 questions; scores on this subscale range from 0-21, with higher scores indicating more restraint. The disinhibition subscale consists of 16 questions; scores range from 0-16 with higher scores indicating greater disinhibition. The disinhibition scale has been linked to weight fluctuation because individuals high on disinhibition restrict food intake and then later binge. Finally, the hunger susceptibility subscale consists of 14 questions. Scores on this subscale range from 0-14, with higher scores indicating greater susceptibility to hunger.

The REI consists of 24 questions rated on a scale of one (not at all important) to seven (extremely important) that assess one's reasons for exercising. Scores on three subscales—fitness, appearance, and stress—were computed based on Cash, Novy, and Grant's (1994) proposed factors in the REI (Appendix K). The appearance subscale consists of eight questions and total REI appearance scores range from 8-56. The fitness subscale consists of seven questions; total REI fitness scores range from 7-49. The stress subscale consists of four questions; REI stress scores range from 4-28. Higher scores on these three subscales indicate that one is more motivated to exercise because of weight management, health management, and mood management, respectively.

In addition to these questionnaires, participants were also asked if they were currently on a diet, if they had been on a diet within the past two months, and if they have ever been diagnosed with an eating disorder (and if so, which one).

Participants were weighed and their height was measured upon the completion of the questionnaires. These measurements were used to calculate participants body mass index (BMI).

Procedure

Participants signed up online for a study entitled “Digestion.” Individual experimental sessions, between the hours of 12:00 pm and 5:00 pm were available to all female students on a first-come, first serve basis. After signing up for the study online, participants were contacted by email and asked not to eat or drink anything (except water) for 1.5 hours before the study.

Upon entering the laboratory, participants walked by a chocolate cake that was displayed in glass cake stand. A plastic cup of water and a fork wrapped in a napkin were next to the cake stand. Participants were seated at a different table, facing away from the cake. See Figure 1 for a layout of the laboratory. Participants were told that we were examining the effects of imagery on craving and that they would be asked to engage in an imagery task or wait a short period and then eat some chocolate cake. After informed consent was obtained, participants completed the initial questionnaire. Participants who were allergic to chocolate were excused from the study at this point.

Participants were then instructed to put on a pair of headphones and were told that they would be hearing a recording that would last about five minutes. They were instructed to think silently about the answers to any questions that would be asked in the recording. One of three recordings, corresponding to each of the three experimental conditions—imagining eating cake, imagining walking through the woods, or waiting in silence—was played through the headphones. Participants in the two imagery conditions listened to a recording that guided them through a scenario where they actively imagined eating a piece of cake or walking through the woods. Participants in the waiting condition listened to a silent recording for the same amount of time.

Aside from those participants with high SCOFF scores who were actively recruited and assigned to a condition to even out the sample size, all other participants were randomly assigned to a condition. See Table 1 for the distribution of participants in each condition. After the recording, participants filled out the post-recording questionnaire.

Participants then replaced the headphones and listened to a recording that gave them instructions for eating the cake (see Appendix B). After the recording, the individual removed the headphones and the experimenter presented her with the chocolate cake, fork, napkin, and cup of water. When participants finished eating, the cake was removed. They then completed the post-eating questionnaire, the ATC scale, the VVIQ, and the SCOFF questionnaire.

Upon completion of these questionnaires, the participants were debriefed and dismissed. The cake was weighed in private and subtracted from the cake's original weight to determine the amount of cake eaten during the experimental session. The entire experimental session lasted about 30 minutes.

In an effort to better understand the large number of atypical eaters, we decided to add another phase to the study to collect additional information from participants. Participants were invited back into the laboratory to complete these follow-up questionnaires: RRS, BSQ, TFEQ, REI, dieting questions, eating disorder questions, height, and weight. Any newly recruited participants completed these measures immediately after the experimental session. For all participants who completed the additional measures, questionnaires were administered first, and the participant was

weighed and measured for height at the end. Follow-up questionnaires took about 30 minutes to complete.

Results

Data Analysis Overview

First, the entire sample was considered. Emotion ratings were examined and subscales were created for positive and negative emotions. Correlations between measures of hunger, hours fasting, attitudes about the cake, and cake eaten were calculated to determine the overall relationship of these measures.

Next, only participants with low SCOFF scores were analyzed. Initial differences between participants were assessed. Vividness ratings of the imagery scenarios were compared across participants who imagined eating the cake and participants who imagined walking in the woods. Correlations were run to determine if individuals' imagery abilities were related to ratings of scenario vividness. Changes in positive emotions, anxiety, and guilt over time were assessed. Changes in ratings of cake taste, cake nutritious value, and hunger over time were also examined. Finally, the effect of imagery on amount of cake eaten was examined. These same analyses were also run on individuals with high SCOFF scores.

Next, differences between participants with high and low SCOFF scores were examined. Independent samples t-tests looked for differences between the groups in cravings, positive emotions, anxiety, guilt, ratings of cake taste, ratings of cake nutritious value, and cake eaten. To further examine differences between participants with high and low SCOFF scores, independent samples t-tests were run on follow-up measures of weight, height, BMI, RRS, BSQ, TFEQ, and REI scores.

Finally, correlations between amount of cake eaten and follow-up measures of weight, height, BMI, RRS, BSQ, TFEQ, and REI scores were calculated to determine what other variables may account for differences in the amount of cake that participants ate.

Analyses of Entire Sample (n = 144)

Six participants were excluded from analyses because they indicated on the initial questionnaire that they did not like chocolate. One participant's information was excluded due to missing data. One participant was excused from the study because she was allergic to dairy products. Our final analyses are based on 136 participants.

Emotions about eating the cake. To determine changes in emotion over time, we collapsed participants' ratings of feeling happy, excited, eager, satisfied, troubled, and anxious about eating the cake into two subscales measuring positive emotions and negative emotions about the cake. In examining positive emotions (happy, excited, eager, and satisfied) and anxiety (troubled, anxious, and concerned) about eating the cake, any missing emotion ratings were replaced with that individual's average across the remaining positive or negative emotions. Internal consistency was examined for four different scales: predictions of the four positive emotions, actual ratings of four positive emotions experienced after eating, predictions of three anxiety emotions, and actual ratings of three anxiety emotions experienced after eating. All four scales were found to be internally consistent, $\alpha = .87$, $\alpha = .83$, $\alpha = .80$ and $\alpha = .84$, respectively. Thus, total predicted positive emotions and total actual positive emotion scores, ranging from 4 to 20, were calculated for each participant. Similarly total predicted anxiety and total actual

anxiety scores were computed, ranging from 3 to 15 for each participant. These total scores were used to assess changes in affect over time.

Correlations between initial measures, Attitudes to Chocolate, and cake eaten.

We examined the relationship between objective measures (i.e., amount of cake eaten, hours fasting) and subjective psychological measures such as hunger, craving, guilt, and palatability of the cake. Correlations between initial hunger, how much participants like chocolate, hours fasting, ATC guilt, ATC craving, how good participants thought the cake actually tasted, and the amount of cake eaten are shown in Table 2.

Participants with Low SCOFF Scores

Initial differences. Analyses were run on initial measures to ensure that there were no pre-existing differences between participants across conditions. Univariate ANOVAs on how much participants reported liking chocolate, hours fasting, and ATC craving scores revealed no effect of condition. Participants in all conditions reported liking chocolate ($M = 4.34$, $SD = 0.72$), similar amounts of time fasting ($M = 4.32$ hours, $SD = 4.85$), and similar ATC craving scores ($M = 22.72$, $SD = 5.63$). An ANOVA on VVIQ scores revealed no significant main effect of condition, so imagery abilities did not differ between the three conditions.

Vividness of scenarios. Imagery abilities and ratings of scenario vividness were examined for the sub-sample of participants with low SCOFF scores. Surprisingly, VVIQ scores were not correlated with ratings of scenario vividness. An independent samples t-test on participants' ratings of the vividness of the cake and woods scripts indicated differences in vividness between the two scripts, correcting for unequal variances between the two groups, $t(51.35) = 3.36$, $p < .001$. Participants were able to

imagine eating the cake ($M = 4.11, SD = 0.63$) more vividly than they were able to imagine walking in the woods ($M = 3.46, SD = 0.79$).

Positive emotions about eating the cake. Changes in positive emotion after listening to the recording and after eating the cake were assessed with a 3 (condition) \times 2 (time: initial, post-recording) mixed-factorial ANOVA. A significant effect of time, ($F(1, 87) = 6.76, p = .011$) showed that participants predicted more positive emotions about eating the cake ($M = 12.78, SD = 3.50$) than they actually felt after eating the cake ($M = 11.99, SD = 3.53$). There was no main effect of condition.

When considering the four emotions included in the total positive emotion score, it was decided that anticipatory emotions such as eagerness and excitement might change differentially over time compared to feelings of happiness and satisfaction. Therefore, a 3 (condition) \times 2 (time: initial, post-recording) mixed-factorial ANOVA was run on each individual emotion. Figure 2 shows the average rating across time for the four emotions. There were no effects of time or condition on participants' ratings of happiness. No effects of condition, but main effects of time were found for feeling eager and excited. Participants were more eager before eating than they were after eating, $F(1, 86) = 51.87, p < .001$. Participants were also more excited before eating than they were after eating, $F(1, 84) = 16.57, p < .001$. The ANOVA on satisfaction revealed a main effect of time, $F(1, 85) = 19.78, p < .001$. Participants were more satisfied after eating the cake than they were before eating the cake. There was also a main effect of condition, $F(2, 85) = 4.44, p = .015$. Tukey's post hoc test revealed that participants who imagined eating the cake were more satisfied than participants who waited, $p = .012$, and that participants who

imagined walking in the woods did not differ significantly in satisfaction from the other two groups. Figure 3 shows satisfaction plotted based on time and condition.

Anxiety about eating the cake. A 3 (condition) \times 2 (time) mixed-factorial ANOVA on the composite score of anxiety about the cake revealed no significant effect of time and no effect of condition. Participants accurately predicted the amount of anxiety ($M = 4.14$, $SD = 1.80$) that they actually felt after eating the cake ($M = 4.18$, $SD = 1.78$).

Guilt. Guilt was assessed in three different ways: post-recording guilt rating, post-eating guilt rating, and total ATC guilt score. A 3 (condition) \times 2 (time) mixed factorial ANOVA was run on participants' ratings of guilt ($M = 2.46$, $SE = .12$) associated with eating the chocolate cake. No significant main effects of time, condition, or interaction effects were found.

An ANOVA on participants' total ATC Guilt score revealed a significant main effect of condition, $F(2, 87) = 3.52$, $p = .034$. Post hoc analyses using Tukey's HSD revealed that participants who imagined eating the cake had significantly lower ATC guilt scores ($M = 19.90$, $SD = 4.93$) than participants who waited ($M = 24.28$, $SD = 7.85$), $p = .035$. Participants who imagined walking in the woods did not report different ATC guilt scores ($M = 20.96$, $SD = 7.19$) than either of the two groups.

How good is the cake? A 3 (condition) \times 2 (time) mixed-factorial ANOVA on participants' ratings of the predicted and actual taste of the cake revealed a significant effect of condition, $F(2, 87) = 3.35$, $p = .040$. Post hoc comparisons of the group means using Tukey's HSD showed that participants who imagined eating the cake ($M = 4.35$, $SE = .14$) thought the cake was significantly better than participants who waited ($M = 3.83$,

$SE = .14$), $p = .030$. Participants who imagined walking in the woods did not rate the cake taste differently than participants in the other two conditions ($M = 4.05$, $SE = .15$).

How good for you is the cake? A 3 (condition) \times 2 (time) mixed-factorial ANOVA was run on participants' predicted and actual ratings of the cake's nutritious value. A significant effect of condition was found, $F(2, 87) = 4.22$, $p = .018$. Tukey's post hoc test showed that participants who imagined eating the cake ($M = 2.12$, $SE = .16$) thought the cake was better than participants who waited ($M = 1.56$, $SE = .15$), $p = .02$. Participants who imagined walking in the woods did not rate the cake's nutritious value differently from participants in the other two conditions ($M = 2.02$, $SE = .16$).

Hunger. A 3 (condition: cake, woods, waiting) \times 3 (time: initial, post-recording, post-eating) mixed-factorial ANOVA on participants' ratings of hunger revealed no main effect of condition. There was a main effect of time, $F(2, 171) = 97.14$, $p < .001$. Planned contrasts show that participants' hunger increased between the initial rating and the rating after the recording ($F(1, 87) = 13.07$, $p = .001$), suggesting that participants in all three conditions reported increases in hunger after listening to the imagery or waiting recording. Hunger ratings decreased between initial and final ratings ($F(1, 87) = 91.21$, $p < .001$). These effects are qualified by a significant time \times condition interaction, $F(4, 174) = 4.15$, $p = .003$. Tests of simple effects show that this interaction is the result of differences between initial and final ratings of hunger across conditions, $F(2, 87) = 4.40$, $p = .015$. Tukey's post hoc tests on the difference scores between initial and final ratings show that the cake condition differs significantly from the waiting condition, $p = .041$, and the woods condition differs from the waiting condition, $p = .029$. As shown in

Figure 4, participants in the cake and woods conditions reported a greater decrease between initial and final hunger than did participants in the waiting condition.

Cake consumption. The ANOVA on amount of cake eaten did not reveal any significant main effects of condition. Participants in all conditions ate similar amounts of cake ($M = 77.6$ g, $SD = 44.5$ g).

Participants with High SCOFF Scores

Initial differences. Univariate ANOVAs revealed no initial differences between participants in each of the conditions on liking chocolate ($M = 4.55$, $SD = 0.69$), hours fasting ($M = 3.28$ hours, $SD = 2.77$), or ATC craving ($M = 27.77$, $SD = 6.45$).

Vividness of scenarios. Unlike participants with low SCOFF scores, there was a significant correlation between VVIQ scores and ratings of scenario vividness, $r(29) = -.45$, $p = .015$. An ANOVA on VVIQ scores revealed no significant main effect of condition, so imagery abilities did not differ between the three groups. An independent samples t-test on participants' ratings of the vividness of the cake and woods scripts showed that participants rated the cake ($M = 4.11$, $SD = 0.63$) and woods ($M = 4.11$, $SD = 0.63$) imagery scripts as equally vivid.

Positive emotions about eating the cake. A 3 (condition) \times 2 (time) mixed-factorial ANOVA on the composite score of positive emotions about the cake revealed a significant effect of time, $F(1, 43) = 7.34$, $p = .010$. Participants predicted more positive emotions about eating the cake ($M = 11.70$, $SD = 3.81$) than they actually felt after eating the cake ($M = 10.57$, $SD = 3.63$). There was no main effect of condition.

Each emotion was examined to determine if they changed differentially over time. Analyses revealed no effects of time or condition on ratings of feeling happy. There were

an effect of time on feeling eager, with participants feeling more eager before eating than after eating, $F(1, 43) = 25.60, p < .001$. Similarly, there was an effect of time on ratings of feeling excited, with participants feeling more excited before eating than after eating, $F(1, 43) = 21.26, p < .001$. Finally, there was no effect of condition, but an effect of time on satisfaction ratings, $F(1, 43) = 5.03, p < .030$. Participants reported feeling more satisfied after eating the cake than before eating the cake. Figure 5 illustrates the changes in these emotion ratings across time.

Anxiety about eating the cake. A 3 (condition) \times 2 (time) mixed factorial ANOVA on the composite score of anxiety about the cake revealed no significant effect of time and no effect of condition. Participants accurately predicted the amount of anxiety ($M = 5.89, SD = 3.29$) that they actually felt after eating the cake ($M = 6.26, SD = 3.44$). There was a trending interaction between time and condition, $F(2, 43) = 2.64, p = .083$, which is shown in Figure 6.

Guilt. A 3 (condition) \times 2 (time) mixed-factorial ANOVA was run on participants' ratings of "do you associate any guilt with the experience of eating chocolate cake?" No significant main effects of time, condition, or interactions were found on guilt ratings ($M = 3.37, SD = 0.16$).

An ANOVA on participants' total ATC Guilt scores revealed no main effect of condition for participants with high SCOFF scores ($M = 29.77, SD = 8.15$).

How good is the cake? A 3 (condition) \times 2 (time) mixed-factorial ANOVA on participants' ratings of cake taste revealed no significant effects of condition or time. Participants all rated the cake as good ($M = 4.05, SE = 0.12$).

How good for you is the cake. A 3 (condition) \times 2 (time) mixed-factorial ANOVA was run on participants' ratings of "do you think the chocolate cake is good for you". No significant effects of condition or time were found ($M = 1.41$, $SE = 0.08$).

Hunger. A 3 (condition) \times 3 (time) ANOVA on participants' ratings of hunger revealed a main effect of time, $F(2, 86) = 43.98$, $p < .001$, as shown in Figure 7. Planned contrasts show that participants' hunger increased between the initial rating and the rating after the recording ($F(1, 43) = 6.08$, $p = .02$). Ratings also decreased between initial hunger and after eating the cake ($F(1, 43) = 40.71$, $p < .001$). Unlike participants with low SCOFF scores, participants with high SCOFF scores did not display a significant time \times condition interaction. There was, however, a trending effect of condition, $F(2, 43) = 2.72$, $p = .077$. The mean hunger for the participants in the cake condition ($M = 3.02$, $SE = .20$) is greater than the mean hunger for participants in the woods condition ($M = 2.36$, $SE = .21$) and waiting condition ($M = 2.63$, $SE = .19$).

Cake consumption. The ANOVA on amount of cake eaten did not reveal any significant main effects of condition. Participants with high SCOFF scores ate similar amounts of cake across all conditions ($M = 67.4$ g, $SD = 42.9$ g).

Differences between Participants with Low and High SCOFF Scores

Independent samples t-tests were run to examine differences between participants with low SCOFF scores and high SCOFF scores on "how much do you like chocolate," hours fasting, initial hunger, predicted positive emotions about eating the cake, actual positive emotions about eating the cake, predicted anxiety about eating the cake, actual anxiety about eating the cake, guilt ratings before eating the cake, guilt ratings after eating the cake, ATC craving, ATC guilt, and amount of cake eaten. There were no

differences between the low SCOFF group and high SCOFF group in how much they liked chocolate, hours fasting, initial hunger, predicted positive emotions, or amount of cake eaten. As shown in Table 3, participants with low SCOFF scores had lower ATC craving scores, reported greater positive emotions after actually eating the cake, predicted less anxiety about eating the cake, reported less anxiety after actually eating the cake, predicted less guilt associated with eating the cake before actually eating, associated less guilt with eating the cake after eating it, and had lower ATC guilt scores than participants with high SCOFF scores.

To examine the differences in imagery between the two groups, a 2 (condition: cake, woods) \times 2 (group: low SCOFF, high SCOFF) ANOVA was run on participants' ratings of vividness of the two imagery conditions. There was a significant interaction between condition and SCOFF group was found, $F(1, 81) = 10.40, p = .002$. This interaction is displayed in Figure 8. Follow-up t-tests show that the cake imagery script was rated as more vivid by participants with low SCOFF scores ($M = 4.11, SD = 0.63$) than by participants with high SCOFF scores ($M = 3.60, SD = 0.83$), $t(41) = 2.25, p = .030$. In contrast, the woods imagery script was rated as more vivid by participants with high SCOFF scores ($M = 4.07, SD = 0.83$) than by participants with low SCOFF scores ($M = 3.46, SD = 0.79$), $t(40) = -2.31, p = .026$.

In an effort to better understand the large percentage of participants scoring high on the SCOFF questionnaire, we analyzed the available data on follow-up measures. Of participants with low SCOFF scores ($n = 45$) seven indicated that they were currently on a diet, 15 indicated that they had been on a diet within the past two months, one participant reported being diagnosed with anorexia and bulimia, and one participant

reported being diagnosed with anorexia. Amongst participants with high SCOFF scores ($n = 31$), 10 indicated that they were currently on a diet, 13 said that they had been on a diet within the past two months, and two indicated that they had been diagnosed with an eating disorder. Two participants reported they had been diagnosed with anorexia, one reported a history of bulimia, and one reported a history both disorders.

Independent samples t-tests between the low SCOFF and high SCOFF groups were run on weight, height, BMI, REI fitness scores, REI appearance scores, REI stress scores, TFEQ cognitive restraint scores, TFEQ disinhibition scores, TFEQ hunger susceptibility scores, total BSQ scores, and total RRS scores. The groups did not differ in weight, height, BMI, REI fitness scores, and REI stress scores. Compared to participants with low SCOFF scores, participants with high SCOFF scores had higher REI appearance scores, higher TFEQ cognitive restraint scores, higher TFEQ disinhibition scores, higher BSQ scores, and higher RRS scores. There was also a trend for participants with high SCOFF scores to have higher TFEQ hunger susceptibility scores than participants with low SCOFF scores. Group means and statistical results are shown in Table 4.

To examine the effect of other variables on the amount of cake eaten, correlations were calculated between amount of cake eaten, total SCOFF score, BMI, REI fitness scores, REI appearance scores, REI stress scores, TFEQ cognitive restraint scores, TFEQ disinhibition scores, TFEQ hunger susceptibility scores, total BSQ scores, and total RRS scores were computed. The only variable that correlated significantly with amount of cake eaten was TFEQ cognitive restraint, $t(70) = -.31, p = .009$.

Discussion

Correlations between measures of hunger and craving using data from all participants were as expected based on previous research. Hunger increases over time, and participants who had fasted longer reported more initial hunger. Participants who were hungrier also ate more cake. We tend to crave foods we like; participants reported more chocolate cravings the more that they liked chocolate. We also tend to eat foods that we like, and participants who liked chocolate and thought the cake tasted better ate more cake. In contrast, participants who typically feel more guilt associated with eating chocolate tended to eat less cake.

Participants with Low SCOFF Scores

Analyses showed no pre-existing differences between conditions in liking chocolate, initial hunger, hours fasting, habitual chocolate cravings, and imagery abilities, allowing us to examine the effects of imagery on cravings and food consumption.

Vividness of imagery. For participants with low SCOFF scores, one's general abilities to imagine an image were not related to how vividly they imagined eating the cake or walking in the woods. Participants with low SCOFF scores reported that the cake imagery condition was more vivid than the woods imagery condition. Together, these results suggest that this difference is due to some actual difference between the vividness of the scenarios, as there were no differences between conditions on imagery abilities. This difference in vividness may be due to the fact that all participants saw the cake before imagining it, whereas there was no visual image of the woods prior to imagining that scenario.

Emotions about eating. Unexpectedly, participants had higher total positive emotion scores before eating the cake than after eating the cake. This finding is contrary to other research, which shows that people report increased positive emotions after fulfilling a craving. Although the four items have good internal consistency, feelings of anticipation (excited, eager), happiness, and satisfaction changed differently over time. When each emotion was examined individually, we found that participants were more excited and eager prior to eating the cake than post-eating. Participants' levels of happiness remained constant across time. Finally, satisfaction increased after eating the cake. Thus, the experience of eating had a calming effect—reducing eagerness and excitement—while also satisfying the participants' cravings. These results clarify the changes in positive emotion across time and are more in line with previous research on craving.

Feelings of anxiety and guilt associated with eating the cake remained stable across time for participants with low SCOFF scores. Participants with low SCOFF scores were screened for possible eating disorders, and so we would expect that these participants do not typically associate guilt and anxiety with eating. Thus, there would be no reason for experiencing more or less guilt after eating the cake.

These results suggest that cravings for chocolate are associated with excitation and eagerness to eat chocolate for unrestrained eaters. After satisfying the craving, excitation and eagerness drop, but feelings of both happiness and anxiety toward eating remain constant.

Effects of imagery on craving and eating behaviors for participants with low SCOFF scores. Participants who imagined eating the cake were the most satisfied and

participants who waited were the least satisfied. Similarly, participants who imagined eating the cake rated the cake significantly better in taste and better in nutritious value than participants who waited. Although not significantly different, ratings of satisfaction, cake taste, and cake nutritious value for participants who imagined walking in the woods fell in between those of participants who imagined eating the cake and participants who waited. Together, these results suggest that imagining eating the cake led to a better experience of eating—more satisfaction, better taste, and better thinking about the cake—than waiting. The woods imagery scenario led to similar increases in quality of eating experience as the cake scenario, but not significantly. This may be due to the fact that the woods scenario was not as vivid as the cake scenario.

The effects of imagery on guilt are less clear. There was no effect of condition on the question “do you associate any guilt with the experience of eating chocolate cake.” This result would imply that the imagery scripts did not affect guilt. This finding contradicts the main effect of condition found on ATC guilt scores, in which participants who imagined eating the cake reported significantly less guilt than participants who waited. To examine this contradiction, we must consider differences between the ATC guilt subscale and the single guilt question.

The ATC assesses one’s typical feelings of guilt after eating chocolate, so it is possible that the effect of condition on ATC guilt score is due to differences in guilt generally associated with eating chocolate. Although this cannot be ruled out, we believe that the differences between conditions are due to the effects of the experimental condition. First, participants with low SCOFF scores were randomly assigned to a condition. Second, there were no other pre-existing differences between condition on

attitudes toward chocolate, including how much participants liked chocolate and habitual chocolate cravings as rated by the ATC craving scale. It seems unlikely that participants would differ solely on guilt toward chocolate and not other attitudes toward chocolate. Additionally, if participants did initially differ on habitual guilt cravings, we would expect to see group differences in the single guilt rating both before and after eating.

The alternative explanation is that participants' responses on the ATC guilt subscale were affected by the experience of eating chocolate cake that occurred immediately prior to filling out the scale. It is likely that responses were associated with guilt that one experienced immediately after eating the chocolate cake. For example, in responding to the items "I often feel sick after eating chocolate," "After eating chocolate I often wish I hadn't," and "I feel unattractive after I have eaten chocolate," participants could have drawn on their most recent memory of eating chocolate. Lastly, the ATC guilt scale elaborates on guilt in 10 separate questions that assess one's negative feelings with eating chocolate and the effects of eating chocolate on one's body image and weight. Compared to the general question "do you associate any guilt with the experience of eating chocolate cake," the ATC guilt subscale may be a better measure of guilt than simply asking participants if they feel guilty.

As expected, hunger decreased across all three conditions after eating the cake. No overall effect of condition was found, indicating that neither of the imagery conditions reduced hunger. In fact, hunger ratings increased in all three conditions after listening to the recordings. This may be attributed to the fact that participants in all three conditions saw the cake and were told that they would have the opportunity to eat it. As previous studies have found, the sight of food or thought of food will induce a craving, so

the increase in hunger ratings suggests that chocolate cravings were induced across all three conditions. Interestingly, participants who completed the two imagery conditions exhibited a greater decrease between initial hunger and hunger after eating the cake than participants who waited. Thus, imagining eating the cake prior to eating reduces hunger more than waiting. Imagery could be effective by making one feel more satisfied and full after eating.

These results are promising for the use of imagery to reduce food cravings, albeit that our experimental manipulation had no effect on the amount of cake eaten. Perhaps food consumption is not a good indicator of craving, as the variance in the amount of cake eaten was very large. Indeed, Pelchat (2002) suggests that subjective measures are better indicators of craving than objective measures such as amount of food consumed. Although imagery had no effect on the amount of food eaten, imagining eating the cake resulted in a better experience of eating than merely waiting. Individuals who imagined eating prior to actually eating thought the craved food tasted better, was less bad for them, felt less guilty about eating, and were more satisfied than those who waited. The woods condition exhibited similar trends in the experience of eating, though not significantly so; this may be attributed to the woods condition being less vivid than the cake condition. Finally, hunger after eating decreased more in both imagery conditions than it did in the waiting condition. Thus, imagery may stave off future cravings by lowering perceived hunger after a craving is satisfied. Together, these results suggest that imagery, and in particular imagining eating a craved food, may make the experience of eating more positive, satisfying, rewarding, and may also decrease cravings in the future by decreasing perceived hunger levels.

Participants with High SCOFF Scores

Like participants with low SCOFF scores, participants with high SCOFF scores did not initially differ in how much they liked chocolate, initial hunger, how long they had fasted before the study, habitual chocolate cravings, or imagery abilities. Even though these participants were not randomly assigned to condition, they did not differ on these important characteristics.

Vividness of imagery. Ratings of vividness for the scripts were related to imagery ability for participants with high SCOFF scores. Additionally, participants with high SCOFF scores rated the cake and woods scripts as equally vivid. Perhaps the scripts were equally vivid because these participants typically refrain from eating sweets, so the cake scenario might not have been more familiar than the woods scenario. For participants with low SCOFF scores, the cake script may have been more familiar and more easily imaginable, thereby explaining the difference in vividness ratings.

Emotions about eating. Similar to participants with low SCOFF scores, participants with high SCOFF scores showed a decrease in overall positive emotions after eating the cake. This was driven by a decrease in feelings of eagerness and excitement. Ratings of happiness remained stable across time, and ratings of satisfaction increased after eating the cake. Thus, participants with high SCOFF scores exhibited the same trend in positive emotions across time as did participants with low SCOFF scores. Even though these participants have tendencies toward eating disordered behaviors, they were still felt more satisfied after eating the cake than before eating it. Thus, people with high SCOFF scores are still able to get satisfaction from eating.

There were no differences in guilt or anxiety across condition or time for participants with high SCOFF scores, but a non-significant trend suggests that anxiety increased in the cake and woods condition, but decreased in the waiting condition. If this effect were significant, it would seem as if the participants with high SCOFF scores may have been reassuring themselves that it was okay to eat the cake while they sat and waited, whereas the thoughts of participants in the imagery conditions were guided by the scripts and not free to focus on reassurance of eating.

Effects of imagery on craving and eating behaviors in participants with high SCOFF scores. There was no effect of condition on ratings of cake taste, cake nutrition value, or satisfaction for participants with high SCOFF scores. Results suggest that hunger was induced by all three imagery scripts, and then decreased by eating the cake. Participants in the cake condition tended to report greater mean hunger levels than participants in the other two conditions, so perhaps the cake imagery script may work to increase cravings in this highly restrained group.

Imagery did not affect food consumption for participants with high SCOFF scores, and the two trending effects may even suggest that imagining eating may actually increase cravings (based on the larger mean hunger level for participants in the cake condition) and anxiety after eating (based on the trending condition \times time interaction) for these participants. These results need to be clarified in future studies, however, because these effects were only trending and there are several limitations that apply to this group of participants.

Limitations of Group Assignment

The study involving high SCOFF participants has several limitations. The results for participants with high SCOFF scores are based on a small sample size, in which participants were not randomly assigned to condition. Additionally, the SCOFF questionnaire is based on five yes-or-no questions and is designed to screen individuals for anorexia and bulimia. Participants with high SCOFF scores may not be qualitatively different from participants with low SCOFF scores in this way. First, in the initial stage of data collection, a large percentage of participants scored past the cut-off for a suspected eating disorder. Second, interpretations of some of the questions are very subjective, (i.e., Do you make yourself *sick* because you feel uncomfortably full? Would you say that food *dominates* your life?) While collecting data, some participants even asked for clarification about the SCOFF questions. Thus, it seems unlikely that the SCOFF was accurately distinguishing participants with eating disorders from participants without eating disorders.

Results from our follow-up measures support this critique. It seems unlikely that nearly 29% (27 people out of 94) of our initial random sample that scored highly on the SCOFF questionnaire actually have eating disorders. This rate is far above the prevalence rates of eating disorders (Brandsma, 2007). We believe that the SCOFF questionnaire produced a very large number of false positives in our sample. Follow-up data supports this, as only four of the 31 participants with high SCOFF scores reported having an eating disorder. Additionally, two of the 45 participants with low SCOFF scores reported having an eating disorder. Thus, the SCOFF was not 100% sensitive to eating disorders, as has been reported in previous studies (Morgan, Reid, & Lacey, 1999).

Therefore, these findings for participants with high SCOFF scores should not be generalized and certainly need to be examined more closely in future studies.

There were, however, quantitative differences between participants with low SCOFF scores and participants with high SCOFF scores. Participants who scored high on the SCOFF questions are more concerned with their body image, citing appearance as a more important reason to exercise and indicating greater concern with their body shape. Participants with high SCOFF scores also score higher on two measures of dietary restraint, the TFEQ cognitive restraint subscale and the RRS. Finally, these participants also score higher on measures of TFEQ disinhibition, which has been linked to weight fluctuation. These characteristics are often cited as risk factors for eating disorders, but are not indicative of eating disorders. Thus, instead of the non-eating disordered and suspected eating disordered labels, as the SCOFF would imply, we propose that low SCOFF and high SCOFF groups be considered as an indicator of dietary restraint and disordered eating tendencies. The notion of dietary restraint in relation to cravings and food consumption warrants more attention in future studies, especially since the TFEQ cognitive restraint subscale was strongly correlated with the amount of cake eaten.

One interesting difference between the SCOFF groups was that participants with high SCOFF scores imagined the woods script more vividly and the cake script less vividly than participants with low SCOFF scores. This may be due to the high SCOFF groups' normal tendencies toward dietary restraint as well as their use of exercise to modify appearance. It is possible that participants with high SCOFF scores rated the woods script more vividly than participants with low SCOFF scores because participants with high SCOFF scores thought of the woods script as an opportunity to exercise.

Additionally, they may have had a harder time imagining eating because they typically put much more cognitive effort into restraining eating. Future studies should address these differences in vividness by examining scripts related to eating, exercising, and non-exercising/non-food related scripts.

General Conclusions

Overall, these results show promise for the effects of guided imagery in reducing unwanted cravings, particularly for individuals with lower dietary restraint (those who are not dieting and those who do not have an eating disorder). Imagining the entire process of eating enhances the quality of the eating experience for non-restrained eaters, resulting in better taste, more satisfaction, and less guilt. By enhancing eating experiences, we may be better able to satisfy our cravings and less likely to crave the same food again in a short period of time. Additionally, imagining eating before eating may lead us to feel less hungry after eating, which may reduce food consumption over time.

A follow-up study examining the effects of seeing the cake and knowing that one will be able to eat the cake is currently underway. This follow-up study will attempt to conceal the dependent variable amount of cake eaten, as the unnatural laboratory setting is one of the limitations of the current study. Future research should examine the effects that dietary restraint and disordered eating tendencies have on the efficacy of imagery to reduce cravings. Finally, research should elaborate on ways to apply imagery techniques to clinical and non-clinical populations.

Table 1

Distribution of Participants

Condition	Low SCOFF <i>n</i>	High SCOFF <i>n</i>
Experimental study (<i>n</i> = 136)		
Cake	29	15
Woods	28	14
Waiting	33	17
Follow-up questionnaires (<i>n</i> = 76)		
Cake	14	9
Woods	13	7
Waiting	18	15

Note. Overall, 144 participants completed the study. Eight participants were excluded from the analyses: six participants were excluded because they did not like chocolate, one participant was excluded due to missing data, and one participant was excused from the study due to dairy allergies.

Table 2

Correlations between Initial Measures, ATC, and Amount of Cake Eaten

Measure	1	2	3	4	5	6
1. Weight eaten						
2. Like chocolate	.21*					
3. Hours fasting	.05	-.05				
4. Initial hunger	.24**	.01	.39***			
5. Cake taste	.25**	.39***	-.01	.02		
6. ATC guilt	-.21*	.10	-.11	-.10	.04	
7. ATC craving	.10	.48***	-.11	-.04	.21*	.36***

Note. $n = 136$.

* $p < .05$. ** $p < .01$. *** $p < .001$

Table 3

Group means for low and high SCOFF scores

Variable	Mean		Standard deviation	
	Low ^a	High ^b	Low	High
Like chocolate	4.34	4.54	0.72	0.69
Hours fasting	4.39	3.27	4.85	2.77
Initial hunger	2.91	2.91	1.05	0.96
Hunger after recording	3.11	3.15	1.05	1.05
Hunger after eating	1.98	1.96	0.99	0.89
Vividness of imagery script	3.79	3.83	0.78	0.85
Predicted positive emotions	12.78	11.70	3.50	3.81
Actual positive emotions	11.99*	10.57*	3.53	3.63
Predicted anxiety	4.14***	5.89***	1.80	3.29
Actual anxiety	4.18***	6.26***	1.78	3.44
Predicted guilt	2.46***	3.39***	1.09	1.22
Actual guilt	2.47***	3.35***	1.26	1.23
ATC Craving	22.70***	27.67***	5.63	6.45
ATC Guilt	21.84***	29.82***	7.01	8.15
Amount of Cake Eaten (g)	77.6	67.4	44.5	42.9

Note. Independent samples t-tests were run to assess group differences.

^a*n* = 90. ^b*n* = 46

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

Table 4

Examining differences between Low and High SCOFF scores

Variable	<i>t</i>	<i>df</i>	<i>p</i>	Mean		SD	
				Low	High	Low	High
Weight (lbs.)	-1.63	74	.107	133.50	142.26	22.41	23.22
Height(in.)	-1.41	74	.164	64.94	65.84	2.63	2.89
BMI	-1.04	74	.304	24.21	25.06	2.58	3.37
REI fitness	0.34	72	.736	41.02	40.40	8.09	10.27
REI stress	0.87	73	.386	16.66	15.61	5.37	4.72
REI appearance	-3.72	72	<.001	35.61	44.94	11.64	9.10
TFEQ cog. restraint	-3.04	68	.003	25.46	31.34	7.43	8.70
TFEQ disinhibition	-6.44	69	<.001	11.28	16.86	3.29	3.96
TFEQ hunger	-1.80	73	.076	11.75	13.06	2.96	3.33
BSQ total	-6.20	46 ^a	<.001	34.38	57.40	11.90	17.88
RRS total	-5.30	71	<.001	12.25	18.24	4.54	5.00

Note. ^aAssumption of equal variances violated, *df* based on equal variances not assumed.

Figure Captions

Figure 1. Schematic of the laboratory area in which the study took place.

Figure 2. Mean positive emotion ratings for participants with low SCOFF scores as a function of time and emotion.

Figure 3. Mean satisfaction ratings for participants with low SCOFF scores as a function of time and condition.

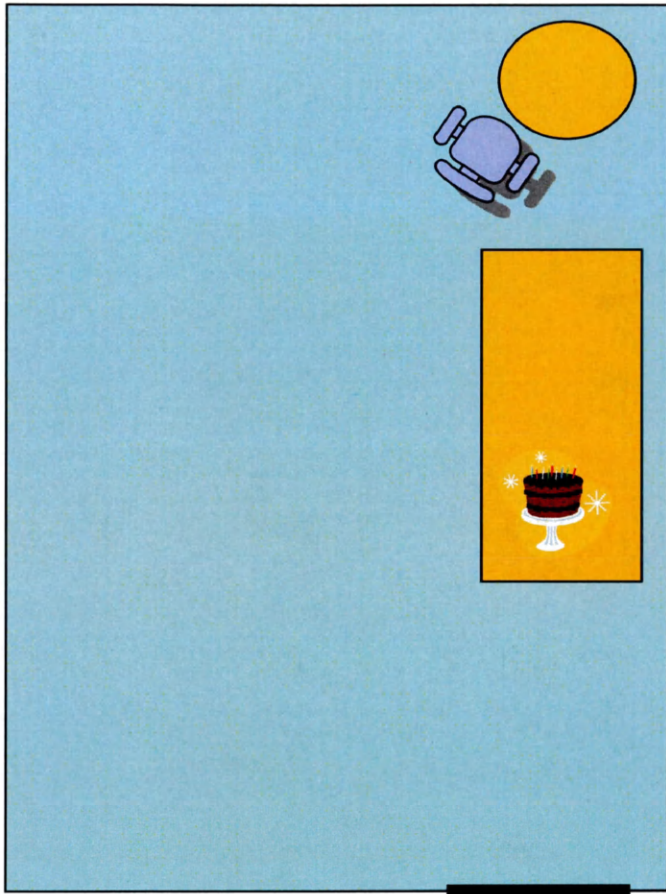
Figure 4. Mean hunger ratings for participants with low SCOFF scores as a function of time and condition.

Figure 5. Mean positive emotion ratings for participants with high SCOFF scores as a function of time and emotion.

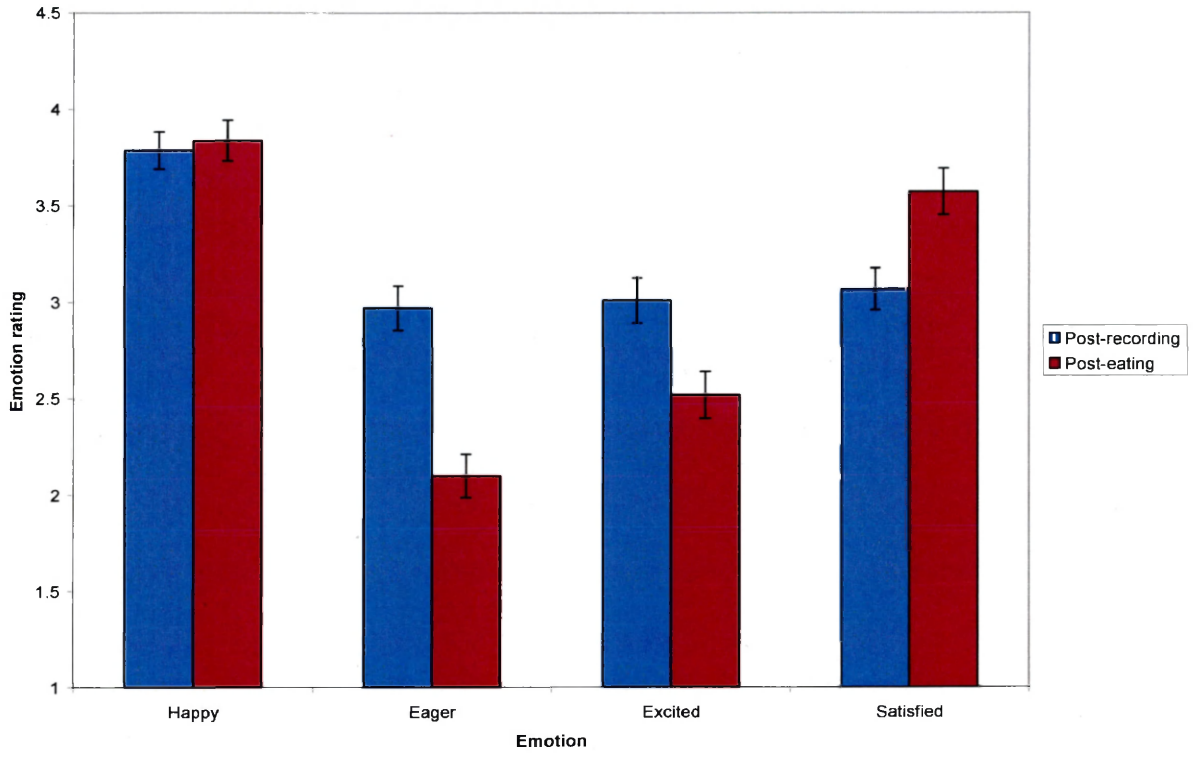
Figure 6. Mean anxiety ratings for participants with high SCOFF scores as a function of time and condition.

Figure 7. Mean hunger ratings for participants with high SCOFF scores as a function of time and condition.

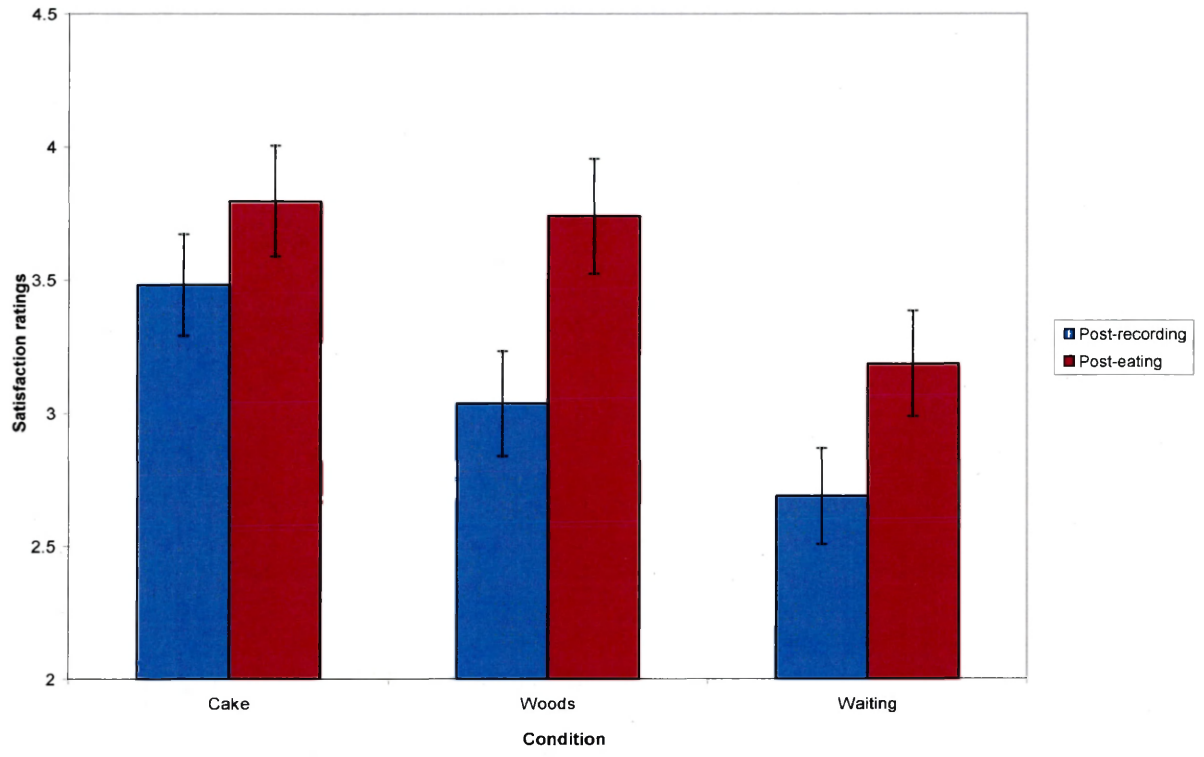
Figure 8. Mean vividness ratings for the two imagery conditions plotted by SCOFF group.



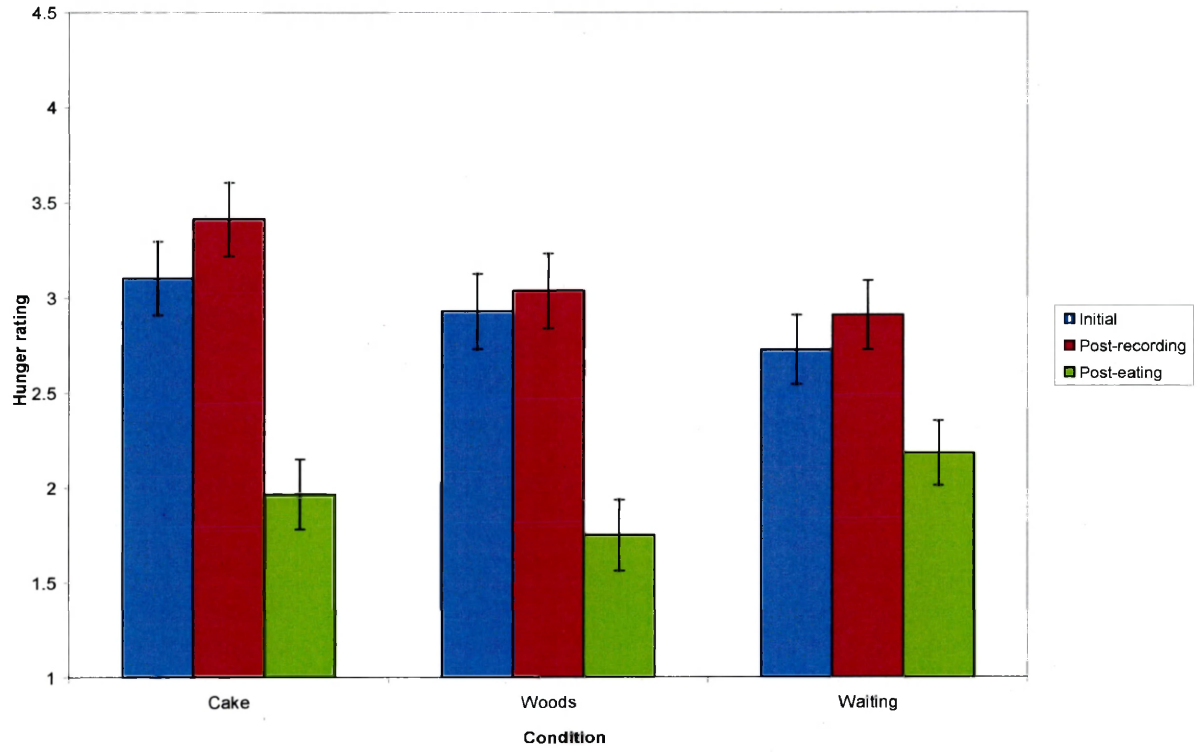
Entrance



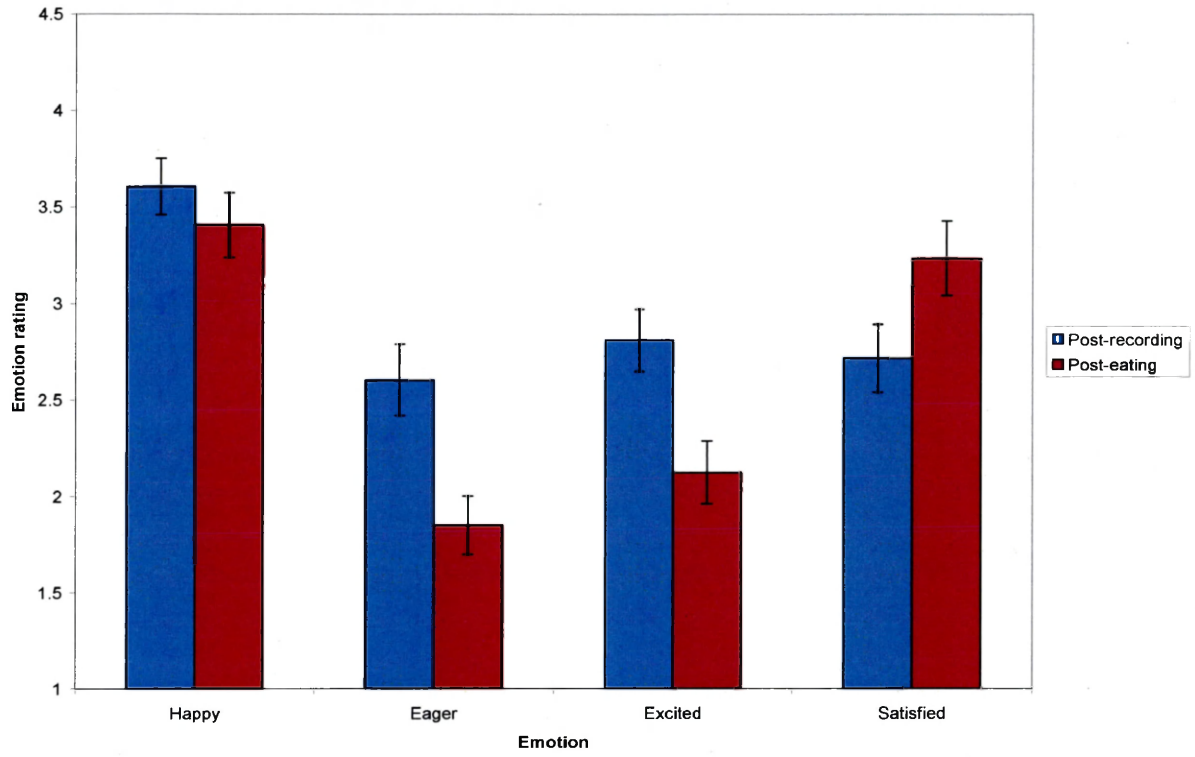
Low SCOFF



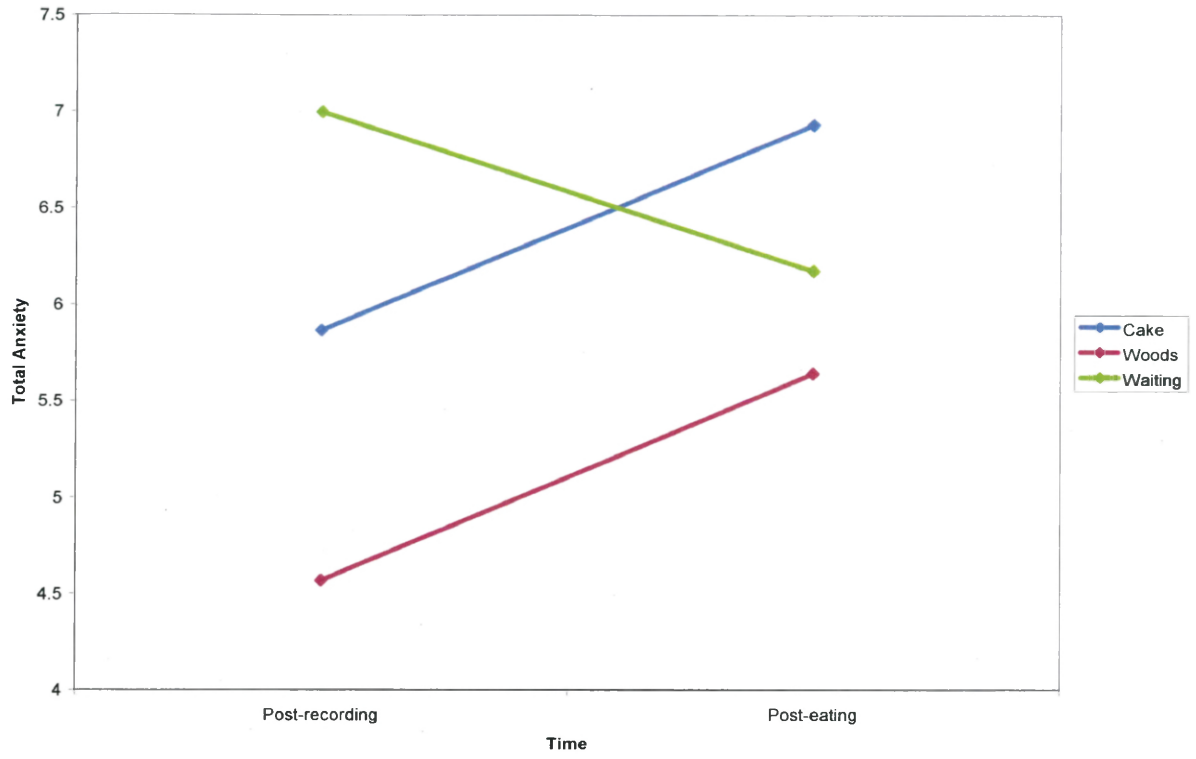
Low SCOFF



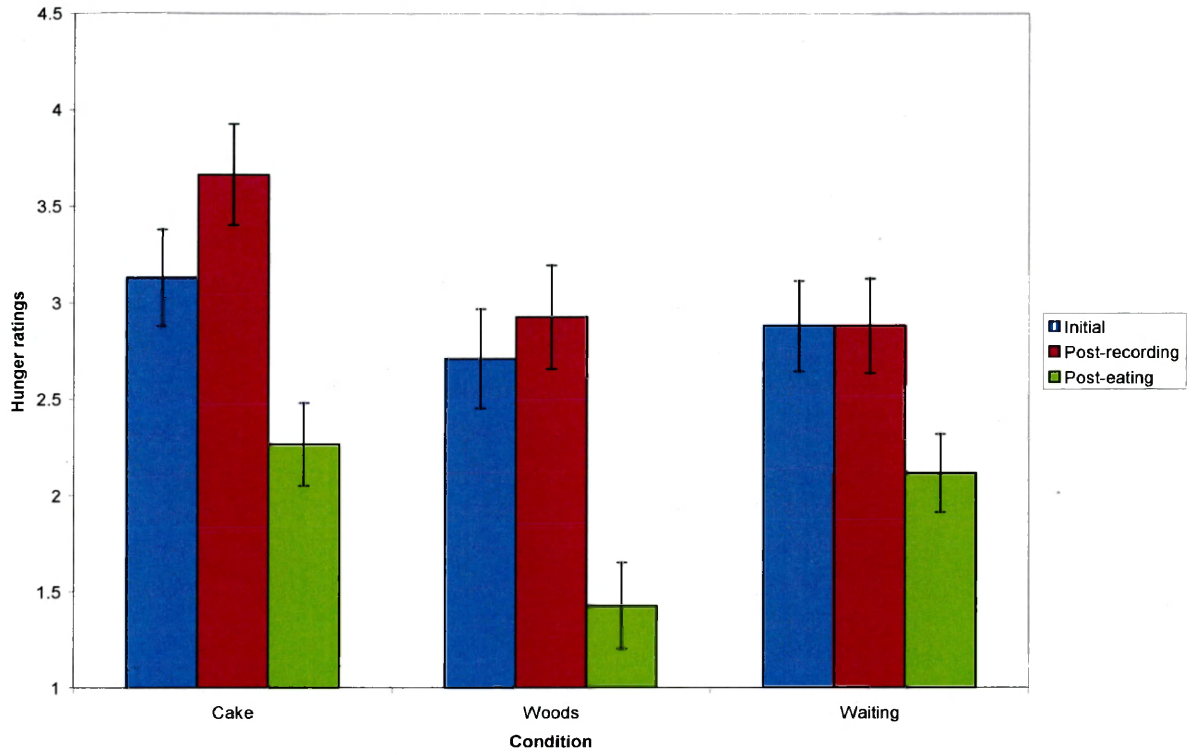
Low SCOFF



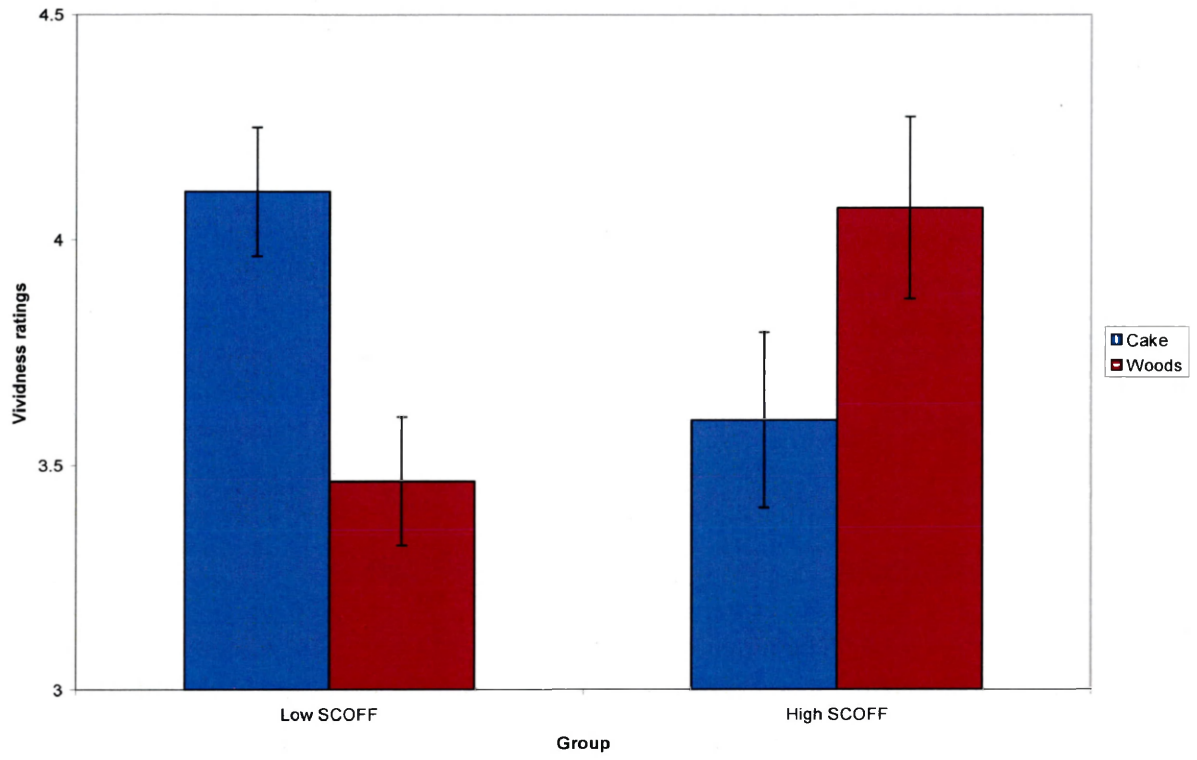
High SCOFF



High SCOFF



High SCOFF



Appendix A

SCOFF Questions

1. Do you make yourself sick because you feel uncomfortably full?

Yes

No

2. Do you worry that you have lost control over how much you eat?

Yes

No

3. Have you recently lost more than 14 lbs in a 3-month period?

Yes

No

4. Do you believe yourself to be fat when others say you are too thin?

Yes

No

5. Would you say that food dominates your life?

Yes

No

Appendix B

Imagery Scripts

Cake Imagery Script (Length of pause is in parentheses.)

At the end of this study, you will have the opportunity to eat chocolate cake. But first, let's imagine the experience of eating the chocolate cake.

Imagine your hand picking up the fork and preparing for the first bite. Initially, let's imagine taking a small bite, one that is carved from the top half of the chocolate cake. The bite includes the frosting on the top and on the side.

Now imagine the first taste of the dessert. The frosting is fluffy and the cake is moist and flavorful. How much do you enjoy the cake? (10 seconds) What do you like about it? (10 seconds) Is there anything you do not like about it? (10 seconds)

Let's take a bigger bite now, one that is carved from the entire height of the dessert. Imagine delving your fork into the chocolate cake and scooping the entire bite into your mouth. It takes longer to chew the bigger bite. (15 seconds)

Now imagine taking another bite, this time, from the middle of the cake. Notice how rich the cake is as you bring the fork to your mouth. How long does it take to chew this bite? (10 seconds)

Let's take a few more bites. You are free to imagine any bite size you like, but you should imagine eating enough bites to feel just about full. (1 minute)

Now that you've finished eating all that you want of the chocolate cake, how do you feel? (5 seconds) Are you satisfied? (5 seconds) Do you want more? (5 seconds)

Let's end our imagined eating by taking one more small bite. But this time, carve a bite out of the part of the cake that you like best--the top, bottom, entire height--anything you like, just be sure it's a bite that involves your favorite part of the cake. Take some time now to savor the experience of this last bite. (20 seconds)

You are now finished with imagining eating the chocolate cake.

Woods Imagery Script (Length of pause is in parentheses.)

At the end of this study, you will have the opportunity to eat chocolate cake. But first, let's imagine the experience of walking along a wooded path on a crisp sunny afternoon.

Imagine the feeling of the cool, fresh air as you enter the wooded path. Initially, let's imagine you are walking slowly along the path, listening to the rustle of leaves and the sound of birds singing. The squirrels are scampering through the leaves.

Now imagine a breeze blowing on your body. It is calm and refreshing, and it cools your skin. How much do you enjoy the woods? (10 seconds) What do you like about them? (10 seconds) Is there anything you do not like about them? (10 seconds)

Let's continue walking. You speed up and travel further into the woods. Imagine that there are branches scattered about the path. You step over them as you walk. It takes longer to walk down this section of the path. (15 seconds)

Now imagine the sound of the leaves crunching beneath your feet as you walk down the path. Notice how dry the leaves are. How loud is the crunching of the leaves? (10 seconds)

Let's take a few more steps into the woods. You are free to explore for as long as you like. When you are ready, turn around to exit the woods. (1 minute)

Now that you are approaching a clearing in the woods, how do you feel? (5 seconds) Are you satisfied? (5 seconds) Do you want to continue your walk? (5 seconds)

Let's end our imagined trip by stopping to observe one final aspect of the woods. It can be anything—the sound of the birds singing, the color of the leaves, the cool breeze on your skin—just be sure that it involves your favorite part of the woods. Take some time now to appreciate this final experience. (20 seconds)

You are now finished with imagining your walk in the woods.

Waiting Imagery Script (Length of pause is in parentheses.)

At the end of this study, you will have the opportunity to eat chocolate cake. But first, please wait with your headphones on. We will tell you when to remove them. (4 minutes)

You are now finished waiting.

Eating Instructions Script

At this point we'd like you to go ahead and actually eat the chocolate cake. Just eat as much as you like. We will not ask you any questions while you are eating, nor must you eat a certain way. When you are finished eating as much as you like of the chocolate cake, place the fork down next to the plate to indicate that you are finished eating.

Appendix D

Post-Recording Questionnaire

Rate each of the items below using the following scale of 1 to 5. Circle your answer for each item.

1	2	3	4	5
Not at all				Very Much

1. How vividly were you able to imagine eating the cake/walking in the woods?

1 2 3 4 5

2. How much do you feel each of the following about eating the chocolate cake?

Happy 1 2 3 4 5

Troubled 1 2 3 4 5

Anxious 1 2 3 4 5

Excited 1 2 3 4 5

Eager 1 2 3 4 5

Satisfied 1 2 3 4 5

Concerned 1 2 3 4 5

3. Do you think the chocolate cake is good?

1 2 3 4 5

4. Do you think the chocolate cake is good for you?

1 2 3 4 5

5. Do you associate any guilt with the experience of eating chocolate cake?

1 2 3 4 5

6. How hungry are you right now?

1 2 3 4 5

Appendix E

Post-Eating Questionnaire

Rate each of the items below using the following scale of 1 to 5. Circle your answer for each item.

1	2	3	4	5
Not at all				Very Much

1. How do you feel about eating the chocolate cake?

Happy	1	2	3	4	5
Troubled	1	2	3	4	5
Anxious	1	2	3	4	5
Excited	1	2	3	4	5
Eager	1	2	3	4	5
Satisfied	1	2	3	4	5
Concerned	1	2	3	4	5

2. Do you think the chocolate cake is good?

1	2	3	4	5
---	---	---	---	---

3. Do you think the chocolate cake is good for you?

1	2	3	4	5
---	---	---	---	---

4. Do you associate any guilt with the experience of eating chocolate cake?

1	2	3	4	5
---	---	---	---	---

5. How hungry are you right now?

1	2	3	4	5
---	---	---	---	---

Appendix F

Attitudes to Chocolate (ATC) Scale

Each item was rated on a scale of 1 (never) to 5 (always).

1. I eat chocolate to cheer me up when I am down.¹
2. My desire for chocolate often seems overpowering.¹
3. I feel unattractive after I have eaten chocolate.²
4. I often feel sick after eating chocolate.²
5. I eat chocolate as a reward when everything is going really well for me.
6. I am often on one kind of diet or another.²
7. The thought of chocolate often distracts me from what I am doing (e.g. watching TV).¹
8. I usually find myself wanting chocolate during the afternoon.¹
9. I consider chocolate to be high in fat and to be of poor nutritional value.²
10. After eating chocolate I often wish I hadn't.²
11. I feel guilty after eating chocolate.²
12. I eat chocolate only when I am hungry.
13. Chocolate often preys on my mind.¹
14. I feel unhealthy after I have eaten chocolate.²
15. I always look at the caloric value of a chocolate snack before I eat it.²
16. If I resist the temptation to eat chocolate I feel more in control of my life.
17. Nothing else but chocolate will satisfy my chocolate cravings.¹
18. Even when I do not really want any more chocolate I will often carry on eating it.¹
19. I eat chocolate to keep my energy levels up when I am doing physical exercise.
20. I eat more chocolate in the winter when it is colder.
21. I often go into a shop for something else and end up buying chocolate.¹
22. I feel depressed and dissatisfied with life after eating chocolate.²
23. I often eat chocolate when I am bored.¹
24. I like to indulge in chocolate.¹

¹Craving (total scores ranged from 5-50)

²Guilt (total scores ranged from 5-50)

Appendix G

Vividness of Visual Imagery Questionnaire (VVIQ)

All items are rated once for eyes open, once for eyes closed, using the rating scale below. Responses were later recoded so that lower scores indicate higher imagery abilities.

- 1 = No image at all, you only “know” that you are thinking of the object
 2 = Vague and dim
 3 = Moderately clear and vivid
 4 = Clear and reasonably vivid
 5 = Perfectly clear and as vivid as normal vision

For items 1 to 4, think of some relative or friend whom you frequently see (but who is not with you at present) and consider carefully the picture that comes before your mind’s eye.

- 1 The exact contour of face, head, shoulders and body
- 2 Characteristic poses of head, attitudes of body, etc.
- 3 The precise carriage, length of step, etc. in walking
- 4 The different colors worn in some familiar clothes

(Items 5 – 8) Visualize the rising sun. Consider carefully the picture that comes before your mind’s eye.

- 5 The sun is rising above the horizon into a hazy sky
- 6 The sky clears and surrounds the sun with blueness
- 7 Clouds. A storm blows up, with flashes of lightening
- 8 A rainbow appears

(Items 9 – 12) Think of the front of a shop which you often go to. Consider the picture that comes before your mind’s eye.

- 9 The overall appearance of the shop from the opposite side of the road
- 10 A window display including colors, shape, and details of individual items for sale
- 11 You are near the entrance. The color, shape, and details of the door
- 12 You enter the shop and go to the counter. The counter assistant serves you.
Money changes hands.

(Items 13 – 16) Finally, think of a country scene which involves trees, mountains and a lake. Consider the picture that comes before your mind’s eye.

- 13 The contours of the landscape
- 14 The color and shape of the trees
- 15 The color and shape of the lake
- 16 A strong wind blows on the tree and on the lake causing waves

Appendix H

Revised Restraint Scale

1. How often are you dieting?

Never Rarely Sometimes Usually Always

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

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

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

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

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

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

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

Not at all Slightly Moderately Extremely

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

Never Rarely Often Always

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

Never Rarely Often Always

8. Do you have feelings of guilt after overeating?

Never Rarely Often Always

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

Not at all Slightly Moderately Extremely

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

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

Appendix I

Body Shape Questionnaire (BSQ)

We would like to know how you have been feeling about your appearance over the past two weeks. *Questions were rated on a scale of 1 (never) to 6 (always).*

1. Have you been so worried about your shape that you have been feeling that you ought to diet?
2. Has being with thin people made you feel self-conscious about your shape?
3. Have you ever noticed the shape of other people and felt that your own shape compared unfavorably?
4. Has being undressed, such as when taking a bath, made you feel fat?
5. Has eating sweets, cakes or other high calorie food made you feel fat?
6. Have you felt excessively large and rounded?
7. Have you felt ashamed of your body?
8. Has worry about your shape made you diet?
9. Have you thought that you are the shape you are because you lack self-control?
10. Have you worried about other people seeing rolls of fat around your waist and stomach?
11. Have you felt that it is not fair that other people are thinner than you?
12. Has seeing your reflection (e.g. in a mirror or shop window.) made you feel bad about your shape?
13. Have you been particularly self-conscious about your shape when in the company of other people?
14. Has worry about your shape made you feel you ought to exercise?

Appendix J

Three Factor Eating Questionnaire (TFEQ)

Part I.

Directions: Please answer the following questions by circling T for true, F for False.

1. When I smell a sizzling steak or see a juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal.
2. I usually eat too much at social occasions, like parties and picnics.
3. I am usually so hungry that I eat more than three times a day.
4. When I have eaten my quota of calories, I am usually good about not eating any more.
5. Dieting is so hard for me because I just get too hungry.
6. I deliberately take small helpings as a means of controlling my weight.
7. Sometimes things just taste so good that I keep on eating even when I am no longer hungry.
8. Since I am often hungry, I sometimes wish that while I am eating, an expert would tell me that I have had enough or that I can have something more to eat.
9. When I feel anxious, I find myself eating.
10. Life is too short to worry about dieting.
11. Since my weight goes up and down, I have gone on reducing diets more than once.
12. I often feel so hungry that I just have to eat something.
13. When I am with someone who is overeating, I usually overeat too.
14. I have a pretty good idea of the number of calories in common food.
15. Sometimes when I start eating, I just can't seem to stop.

16. It is not difficult for me to leave something on my plate.
17. At certain times of the day, I get hungry because I have gotten used to eating then.
18. While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it.
19. Being with someone who is eating often makes me hungry enough to eat also.
20. When I feel blue, I often overeat.
21. I enjoy eating too much to spoil it by counting calories or watching my weight.
22. When I see a real delicacy, I often get so hungry that I have to eat right away.
23. I often stop eating when I am not really full as a conscious means of limiting the amount that I eat.
24. I get so hungry that my stomach often seems like a bottomless pit.
25. My weight has hardly changed at all in the last ten years.
26. I am always hungry so it is hard for me to stop eating before I finish the food on my plate.
27. When I feel lonely, I console myself by eating.
28. I consciously hold back at meals in order not to gain weight.
29. I sometimes get very hungry late in the evening or at night.
30. I eat anything I want, any time I want.
31. Without even thinking about it, I take a long time to eat.
32. I count calories as a conscious means of controlling my weight.
33. I do not eat some foods because they make me fat.
34. I am always hungry enough to eat at any time.
35. I pay a great deal of attention to changes in my figure.

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

Part II

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

37. How often are you dieting in a conscious effort to control your weight?

1	2	3	4
rarely	sometimes	usually	always

38. Would a weight fluctuation of 5 lbs affect the way you live your life?

1	2	3	4
not at all	slightly	moderately	very much

39. How often do you feel hungry?

1	2	3	4
only at mealtimes	sometimes between meals	often between meals	almost always

40. Do your feelings of guilt about overeating help you to control your food intake?

1	2	3	4
never	rarely	often	always

41. How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours?

1	2	3	4
easy	slightly difficult	moderately difficult	very difficult

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

1	2	3	4
not at all	slightly	moderately	extremely

43. How frequently do you avoid 'stocking up' on tempting foods?

1	2	3	4
almost never	seldom	usually	almost always

44. How likely are you to shop for low calorie foods?

1	2	3	4
unlikely	slightly unlikely	moderately likely	very likely

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

1	2	3	4
never	rarely	often	always

46. How likely are you to consciously eat slowly in order to cut down on how much you eat?

1	2	3	4
unlikely	slightly unlikely	moderately likely	very likely

47. How frequently do you skip dessert because you are no longer hungry?

1	2	3	4
almost never	seldom	at least once a week	almost every day

48. How likely are you to consciously eat less than you want?

1	2	3	4
unlikely	slightly unlikely	moderately likely	very likely

49. Do you go on eating binges though you are not hungry?

1	2	3	4
never	rarely	sometimes	at least once a week

50. On a scale of 0 to 5, where 0 means no restraint in eating and 5 means total restraint, what number would you give yourself?

0	1	2	3	4	5
eat whatever you want, whenever you want it	usually eat whatever you want, whenever you want it	often eat whatever you want, whenever you want it	often limit food intake, but often 'give in'	usually limit food intake, rarely 'give in'	constantly limiting food intake, never 'giving in'

51. To what extent does this statement describe your eating behavior? 'I start dieting in the morning, but because of any number of things that happen during the day, by evening I have given up and eat what I want, promising myself to start dieting again tomorrow.'

1	2	3	4
not like me	little like me	pretty good description of me	describes me perfectly

Appendix K

Reasons for Exercise Inventory (REI)

People exercise for a variety of reasons. When people are asked why they exercise, their answers are sometimes based on the reasons they believe they *should* have for exercising. What we want to know are the reasons people *actually* have for exercising. Please respond to the items below as honestly as possible. To what extent is each of the following an important reason that you have for exercising? Use the scale below, ranging from 1 (not at all important) to 7 (extremely important), in giving your answers. (If you never exercise, please skip this section.)

1. To be slim¹
2. To improve muscle tone
3. To cope with sadness, depression³
4. To improve my cardiovascular fitness²
5. To improve my appearance¹
6. To meet new people
7. To redistribute my weight¹
8. To lose weight¹
9. To improve my strength²
10. To cope with stress, anxiety³
11. To improve my over-all health²
12. To be sexually desirable¹
13. To socialize with friends
14. To improve my over-all body shape¹
15. To maintain my current weight
16. To improve my endurance, stamina²
17. To increase my energy level²
18. To increase my resistance to illness and disease²
19. To be attractive to members of the opposite sex¹
20. To have fun³
21. To alter a specific area of my body¹
22. To improve my flexibility, coordination²
23. To improve my mood³
24. To maintain my physical well-being²

¹Appearance/Weight Management (total scores range from 7-56)

²Fitness/Health Management (total scores range from 7-56)

³Stress/Mood Management (total scores range from 4-28)

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