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Running Head: Social Environment and Eating Behavior

AN EXPERIMENTAL ANALYSIS OF THE IMPACT OF ADVERTISING AND FOOD  
PACKAGING ON WOMEN'S EATING BEHAVIOR

by

Amy S. Collings

Dissertation

Submitted to the Department of Psychology

Eastern Michigan University

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Clinical Psychology

Dissertation Committee:

Karen Saules, Ph.D., Chair

Flora Hoodin, Ph.D.

Kenneth Rusiniak, Ph.D.

Denise Tanguay, Ph.D.

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Ypsilanti, Michigan

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## Abstract

Obesity is considered a national epidemic and is associated with increased eating behavior and decreased physical activity. Research has demonstrated biological underpinnings, but the dramatic increase in prevalence rates in recent decades (Flegal et al., 2002) suggests that environmental influences also contribute (Hill et al., 2008). This led researchers to speculate about the impact of our purported “Toxic Environment,” in which high-calorie, energy-dense foods are readily available for consumption and technological advances have decreased physical activity (Wadden et al., 2002). Most of the literature examining the theory of the Toxic Environment is correlational in nature, limiting causal inference. A pilot study of five participants demonstrated that exposure to purported Toxic Environment cues elicited increased food consumption compared to exposure to Thin-Ideal or Neutral cues. Therefore, the present study aimed to explore the influence of two elements of the purported Toxic Environment on women’s eating behavior – advertising and food packaging size. Eighty-two participants were randomly assigned to a 2 (toxic vs. healthy food ad) x 2 (large vs. small package-size) design. Participants, deceived about the true aims of the study, were asked to find dots in the ad stimuli and were given food according to package-size condition to consume ad lib during the session. The next day participants were contacted to provide a 24-hour dietary recall. Results demonstrated that participants exposed to healthy ads and large package size consumed more calories in session than those in other conditions. There were no differences among conditions on caloric intake in the following 24 hours. When examining the pattern of consumption, it appears that participants may have regulated their food intake during the study. Results also suggest that overweight women may be more sensitive to Toxic Environment cues, whereas restrained eaters may be more sensitive to

packaging size as opposed to advertising. Binge-eaters appear to be sensitive to food cues in general, regardless of condition, compared to non-binge eaters. Results may have treatment implications for various weight-related populations. If further research supports the impact of our potentially Toxic Environment on eating behavior, implications for developing public health policies addressing the obesity epidemic may be warranted.

## TABLE OF CONTENTS

Acknowledgements.....	ii
Abstract.....	iii
List of Tables .....	viii
List of Figures.....	ix
Statement of the Problem.....	1
Literature Review.....	4
Definition and Measurement of Obesity.....	4
Biological and Social Contributions to Obesity .....	6
Biological Contributions to Eating Behavior.....	11
Social and Environmental Contributions to Eating Behavior.....	18
The Toxic Environment & Public Health Policy Initiatives.....	30
Summary.....	33
Pilot Study.....	34
Method.....	35
Results.....	38
Discussion.....	39
Statement of Research Hypotheses.....	41
Method: Screening Phase.....	44
Participants.....	44
Measures .....	45
Procedures.....	51
Results: Screening Phase .....	54

Method: Experimental Phase .....	57
Participants.....	57
Measures .....	61
Materials .....	63
Procedure .....	66
Informed Consent and Ethical Treatment.....	73
Statistical Analyses.....	74
Results.....	79
Preliminary Results.....	79
Hypothesis One: Experimental Effects on Immediate Eating Behavior.....	82
Hypothesis One: Exploratory Analyses.....	84
Hypothesis Two: Experimental Effects on Eating in the Following 24-hours.....	85
Hypothesis Two: Exploratory Analyses .....	87
Hypothesis One and Two: Exploratory Analyses.....	88
Hypothesis Three: Contributions of Cephalic Phase Salivary Response .....	90
Hypothesis Three: Exploratory Analyses .....	93
Hypothesis Four: Experimental Effects with Restrained Eaters.....	95
Hypothesis Four: Exploratory Analyses.....	101
Hypothesis Five: Exploratory Analyses .....	109
Discussion.....	120
Study Results .....	121
Limitations .....	138
Implications .....	142

References.....	147
Appendices.....	167



## List of Tables

<u>Table</u>	<u>Page</u>
Table 1. Demographics of Total Screening Sample .....	45
Table 2. Baseline Characteristics of Total Screening Sample .....	56
Table 3. Demographics and Baseline Characteristics of Total Experimental Sample .....	60
Table 4. Demographic and Baseline Characteristics of Participants by Experimental Condition.....	81
Table 5. Regression Coefficients of Mediation Model.....	92
Table 6. Regression Coefficients of Mediation Model.....	94
Table 7. Regression Coefficients of Moderation Model.....	95
Table 8. Regression Coefficients of Moderation Model.....	95
Table 9. Demographics and Characteristics of Participants by Eating-Restraint Status .....	97
Table 10. Demographics and Characteristics of Participants Exposed to Toxic-Large Condition according to Eating-Restraint Status.....	98
Table 11. Demographics and Characteristics of Participants Exposed to Healthy-Large Condition according to Eating-Restraint Status.....	103
Table 12. Demographics and Characteristics of Participants according to Weight Classification.....	110
Table 13. Demographics and Characteristics of Participants according to Binge-eating Behavior Status .....	116

## List of Figures

<u>Figure</u>	<u>Page</u>
<i>Figure 1.</i> Antecedents and mediators of food consumption volume (Wansink, 2004, p. 457).....	25
<i>Figure 2.</i> Total mean calories consumed by participants (n=5) according to experimental condition. ....	39
<i>Figure 3.</i> Total mean calories (+SE) consumed by participants (n=82) in session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve). ....	83
<i>Figure 4.</i> Total mean calories (+SE) consumed in the experimental session by participants (n=42) according to experimental condition and Binge-Eating Symptom status. ....	85
<i>Figure 5.</i> Total mean calories (+SE) consumed by participants (n=80) during the 24-hours following the experimental session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve). ....	86
<i>Figure 6.</i> Total mean calories (+SE) consumed in the 24-hours following the study by participants (n=8) who met criteria for Binge-Eating Symptoms according to experimental condition. ....	88
<i>Figure 7.</i> Total mean calories (+SE) consumed by non-binge eating participants (n=72) according to experimental condition. ....	89
<i>Figure 8.</i> Mediation analysis for Hypothesis Three .....	90

<i>Figure 9.</i> Total mean calories (+SE) consumed in the experimental session by participants (n=21) exposed to the Toxic-Large condition according to eating restraint status. ....	100
<i>Figure 10.</i> Total mean calories (+SE) consumed in the 24-hours following the study by participants (n=20) exposed to the Toxic-Large condition according to eating restraint status. ....	101
<i>Figure 11.</i> Total mean calories (+SE) consumed in the experimental session by participants (n=19) exposed to the Healthy-Large condition according to eating restraint status. ....	104
<i>Figure 12.</i> Total mean calories (+SE) consumed in the 24-hours following the study by participants (n=19) exposed to the Healthy-Large condition according to eating restraint status. ....	105
<i>Figure 13.</i> Total mean calories (+SE) consumed by eating-restrained participants (n=22) in session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve). ....	106
<i>Figure 14.</i> Total mean calories (+SE) consumed by eating-restrained participants (n=21) in the 24-hours following the experimental session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve). ....	107
<i>Figure 15.</i> Total mean calories (+SE) consumed by eating-restrained participants (n=21) according to experimental condition and time. ....	108

<i>Figure 16.</i> Total mean calories (+SE) consumed by participants (n=82) in the experimental session according to experimental condition and weight status. ....	111
<i>Figure 17.</i> Total mean calories (+SE) consumed by participants (n=80) in the 24-hours following the experimental session according to experimental condition and weight status. ....	112
<i>Figure 18.</i> Total mean combined calories (+SE) consumed by participants (n=80) in both the experimental session and the following 24-hours according to experimental condition and weight status. ....	113
<i>Figure 19.</i> Total mean calories (+SE) consumed by overweight participants (n=27) according to experimental condition and time. ....	114
<i>Figure 20.</i> Total mean calories (+SE) consumed by participants (n=82) in the experimental condition according to experimental condition and Binge-Eating Behavior status. ....	118
<i>Figure 21.</i> Total mean calories (+SE) consumed by Binge-Eating Behavior participants (n=18) according to experimental condition and time. ....	120

# An Experimental Analysis of the Impact of Advertising and Food Packaging on Women's Eating Behavior

## Statement of the Problem

Obesity is a national epidemic, with results from the National Health and Nutrition Examination Survey (NHANES) suggesting that 34 percent of Americans are overweight and an additional 31 percent are obese (United States Department of Health and Human Services, 2001). This equates to approximately 65 percent of the US population having a Body Mass Index (BMI) greater than  $25 \text{ kg/m}^2$ , the definition of being overweight. These prevalence rates have skyrocketed from previous rates of 46% in 1980 and 56% in 1994 (Flegal, Carroll, Ogden, & Johnson, 2002). The state of Michigan is not immune to the problems with obesity as 61 percent of the state's population falls into the overweight category (CDC, 2004).

Many studies have shown that those who carry excess weight have significant increased risks of morbidity and mortality. It is estimated that, in any given year, about 280,184 deaths in the United States may be attributable to obesity (Allison, Fontaine, Manson, Stevens & VanItallie, 1999). However, these statistics may be somewhat outdated as more recent evidence demonstrates that approximately 365,000 deaths in 2000 were due to poor diet and physical activity among overweight and obese individuals (Mokdad, Marks, Stroup, & Gerberding, 2005). Additionally, the health outcomes of overweight or obese Americans are not favorable. As BMI increases, risk factors for many diseases including cardiovascular disease, type II diabetes, gallstones, and osteoarthritis also increase (Field, Barnoya, & Colditz, 2002). For example, it is estimated that 67% of people diagnosed with type II diabetes have a BMI greater than  $27 \text{ kg/m}^2$ , classifying them as overweight or obese (United States Department of Health and Human Services, n.d). Many other obesity-related

medical complications have also been identified, including hypertension, stroke, dyslipidemia, respiratory disease, and gout (Must, Spadano, Coakley, Field, Colditz, & Dietz, 1999; Pi-Sunyer, 2002). Other epidemiological studies have shown that obesity is a risk factor for many cancers, including post-menopausal breast cancer, colon cancer, kidney cancer, pancreatic cancer, hepatic cancer, and gallbladder cancer to name a few (Pischon, Nothlings, & Boeing, 2008).

With these increased prevalence rates and high morbidity and mortality associated with obesity, it is not surprising that the economic costs are skyrocketing as well. The Surgeon General's Obesity Report estimated that, in the year 2000, the annual national cost of obesity was \$117 billion (United States Department of Health and Human Services, 2001), which includes both direct costs associated with doctor and hospital visits and indirect costs such as lost wages and future earnings lost by premature death. Mello (2008) also reported that obesity accounts for about \$75 billion in a given year for direct costs, with government sponsored programs (i.e., Medicaid/Medicare) paying about half of these bills. Elmer, Brown, Nichols, and Oster (2004) add to this argument by demonstrating that weight gain (i.e., greater than or equal to 20 pounds) after a weight loss was associated with increased utilization of medical care services and costs. These costs associated with obesity and weight gain are strikingly similar to the increased costs associated with cigarette smoking (Max, 2001). Despite Michigan having a slightly lower prevalence rate of obesity than the national average, Upton (2004) reports that it is spending more than average on obesity-related medical care with approximately \$3 billion contributed annually. These staggering statistics clearly warrant further research aimed at addressing this epidemic.

Many theories purport to account for the dramatic increase in obesity prevalence in recent decades. Evolutionarily speaking, human biology favors food intake – not food restriction – where those who consume food survive. However, the dramatic changes in prevalence rates of obesity in recent years cannot be accounted for by biological contributions alone, suggesting significant contributions from environmental, societal, and economic influences (Hill, Peters, Catenacci, & Wyatt, 2008; Hill, 2002; Institute of Medicine, 1995).

In the late 1990s, researchers began speculating how the environmental factors may be contributing to the obesity epidemic and consequently labeled the American society a “Toxic Environment” (Wadden, Brownell, & Foster, 2002). According to this theory, Americans, who have easy access to a wide variety of relatively inexpensive food products, are inundated with messages to consume large portions of heavily-advertised high-fat, high-sugar, energy-dense food. In addition, Americans are becoming increasingly more dependent on technological advances that reduce overall physical activity levels, which include remote controls, escalators, elevators, and so on, and overall promote a sedentary lifestyle. Frazier (2007) has contended that the high prevalence of fast food in Westernized societies has been a catalyst for the current obesity epidemic. All in all, our society does not effectively promote healthy choices that could reduce obesity prevalence rates.

Unfortunately, the theory of the Toxic Environment has not been a focus of experimental research, and therefore empirical support is lacking for the claim that today’s Toxic Environment has a causal effect on eating behavior. Of course, there is considerable correlational evidence supporting the link between environmental factors and increasing obesity rates, but such data do not provide direct support for causality, hence, the impetus of

the current study. Developing a better understanding of the causal effects of the purported Toxic Environment on eating behavior is a crucial first step in organizing the most effective public health policies that address the obesity epidemic.

### Literature Review

To provide a context for this study, the relevant empirical literature will be reviewed. Initially, an overview of obesity research will be presented, including its biological and environmental contributions. Then the psychology of eating literature will be reviewed to provide a background and justification for the study. This section will focus primarily on the social influences of eating behavior, but the relevant biological contributions will be briefly reviewed as well to ensure a comprehensive understanding of this literature. Furthermore, the available literature examining the Toxic Environment will be reviewed with a focus on the increased portion sizes prevalent in today's environment and the effects of marketing and advertising of food on eating behavior.

### *Definition and Measurement of Obesity*

Obesity is typically defined as an excess accumulation of adipose tissue in the body resulting from an energy intake exceeding energy expenditure for prolonged periods (Cope, Fernandez, & Allison, 2004). According to the World Health Organization (WHO, 2002), BMI is the preferred classification system for obesity and is equal to weight in kilograms divided by height in meters squared. A BMI ranging from 18.5 to 24.9 kg/m<sup>2</sup> constitutes the normal weight classification; a BMI ranging from 25.0 to 29.9 kg/m<sup>2</sup> constitutes overweight classification, and a BMI greater than 30 kg/m<sup>2</sup> constitutes obesity (WHO). The WHO further subdivides the obese category into Obese Class I (BMI of 30.0 to 34.9), Obese Class II (BMI of 35.0 to 39.9), and Obese Class III (BMI >40.0). Several other organizations have



adopted this classification system, including the National Institute of Diabetes and Digestive and Kidney Diseases, the National Heart, Lung, and Blood Institute, and the National Center for Chronic Disease Prevention and Health Promotion. In part, the BMI-based obesity classification system is widely used because of its empirical support with respect to identifying weight-related medical complications (Manson, Skerrett, & Willett, 2002). Yet some have criticized the BMI system because it fails to distinguish fat tissue from muscle tissue, sometimes resulting in extremely muscular people being classified as overweight, which may not be accurate (Foreyt, Poston, McInnis, & Rippe, 2003). Likewise, those with high bone density may also be misclassified. Nonetheless, BMI remains an inexpensive and practical classification system for most obesity research.

There are several alternatives to the measurement of obesity that are not as prevalent as the BMI classification system. Measurement of waist circumference has been used in obesity research because it correlates closely with BMI and with risk factors for obesity-related diseases (WHO, 2002). A waist circumference greater than 102 centimeters for men and 88 centimeters for women represents overweight status (WHO). The use of this measurement is most helpful in distinguishing visceral obesity from gluteofemoral obesity (Bjorntorp, 2002). Visceral obesity occurs when the majority of excess adipose tissue is located in the abdominal area and surrounds the organs of the body; hence the term “apple-shaped” is often used to describe these overweight individuals. In contrast, gluteofemoral obesity occurs when the majority of excess adipose tissue is located on the periphery of the body, typically in the hips, thighs, gluteus, and legs. These individuals are often referred to as “pear-shaped.” Research indicates that individuals with more visceral fat have increased risk factors of morbidity than those with gluteofemoral fat (Bjorntorp, 2002; Despres, 2002; Pi-

Sunyer, 2002; Manson, Skerrett, & Willett, 2002). Overall, it can be concluded that waist circumference measurements can be useful in obesity research and can be an additional option for researchers interested distinguishing different classifications of excess adiposity.

There are other methods of measuring obesity or, more accurately, body fat. These techniques include bioelectrical impedance, dual-energy X-ray absorptiometry, and measuring total body water and total body potassium (CDC, 2002). Although advances in technology have made the bioelectrical impedance method more reliable, their use in severely overweight individuals is sometimes deemed inaccurate, and the CDC (2002) does not recommend it. The other measurement techniques mentioned previously have limited clinical use due to expense and burden on the participant. Overall, BMI is the recommended measurement tool for obesity.

### *Biological and Social Contributions to Obesity*

Obesity is often hypothesized to be an interaction of both environmental and genetic influences. Obesity is often referred to as a positive energy balance where the individual consumes more energy than he or she expends. Although this is a simple conceptualization of obesity, the factors that contribute to this energy imbalance are complex and poorly understood. Generally, this energy imbalance is often understood as the individual consuming more calories than he or she burns through physical or metabolic activity, hence the focus on getting individuals to “eat less and exercise more.” Unfortunately, the solution to this problem is not that simple, and researchers continue to explore the more complex biological and environmental contributions to “eating more and exercising less.”

Research supports the existence of biological or genetic contributions to this energy imbalance based on twin studies and adoption studies. Atkinson (1999) has reported that

identical twins reared both together and apart have a high degree of concordance in body weight. Likewise, in adoption studies, it has been shown that adopted individuals tend to have body types more similar to their birth parents than their adoptive parents (Stunkard et al., 1986). However, although these studies do support a biological view of obesity, they do not preclude environmental influences that may be contributing to this epidemic.

The research on genetic factors associated with obesity has been plentiful and is continually evolving. Animal studies have identified multiple genes that contribute to obesity (Price, 2002) with researchers attempting to extend this research to humans. Given the dramatic technological advances in genetic research recently, it is not surprising that significant progress has been made on mapping the human obesity gene. As of October of 2005, researchers have demonstrated that 176 types of human obesity can be accounted for by single-gene mutations in 11 different genes and 50 loci have been mapped in regard to Mendelian obesity disorders (Rankinen et al., 2006). The number of genes and loci that have been mapped has increased dramatically since this research began thirteen years ago. Although tremendous advances have been made in understanding these genotypes, they do not fully explain the phenotypic outcomes, which result from both the genetic and environmental influences. This means that although there are a number of genes speculated to be responsible for obesity, these genes are also highly dependent on environmental influences that remain poorly understood.

The degree to which biology or genetics contributes to obesity has been hotly debated in recent years as the line between biology and the environment is often fine and difficult to define, suggesting a significant interaction between these two factors. Bouchard (2002) has estimated that biology accounts for 25% to 40% of the variance in human body weight,

whereas Segal and Allison (2002) have suggested that up to 50-70% of the variance in human body weight is accounted for by genetic influences. Despite the contention about exact contributions, it remains clear that obesity is a multifaceted problem that has both biological and environmental contributions.

Research on environmental influences on obesity has been much more limited and has traditionally focused on childhood obesity. In fact, van der Horst et al. (2007) recently completed a review of the environmental correlates of obesity-related dietary behaviors in children aged 4 to 18 and found that most of the literature examined the associations between parental food intake and child food intake. Studies that examined other environmental factors in schools, neighborhoods, or cities were minimal, highlighting the need for future research. In addition, all of the studies in the review were observational in design, a significant limitation when trying to determine causal influences. Furthermore, it remains unclear what environmental influences may have been crucial in the parental food intake, highlighting the need to study environmental influences of obesity in adults as well as children.

One of the most poignant illustrations of the impact of the environment on body weight is the study of the Pima Indians. This cultural group has its roots in Mexico, but many Pima Indians immigrated to the United States, with a substantial population in the state of Arizona. Researchers have examined the differences in body weight in the two groups based on location and have found that Pima Indians living in Arizona have a significantly higher BMI than Pima Indians living in Mexico (Ravussin, Valencia, Esparza, Bennett, & Schulz, 1994). Although it did not involve an experimental design, this study has been used to demonstrate the impact of environmental factors on obesity, as the genetic and biological factors were controlled. Researchers have inferred from this research that “genetics may

permit obesity to occur, but a ‘toxic’ environment causes it occur” (Brownell, 2002, p. 434).

The Institute of Medicine also highlights the extensive role of the environment in the past couple of decades by stating, “There has been no real change in the gene pool during this period of increasing obesity. The root of the problem, therefore, must lie in the powerful social and cultural forces that promote an energy-rich diet and a sedentary lifestyle” (1995, p. 152). These are clear arguments for better understanding the role of the environment in the obesity epidemic.

One of the more popular theories examining the environmental contributions of obesity has been the “Toxic Environment” of today’s society (Horgen & Brownell, 2002). According to this theory, the typical American lifestyle is permeated by a ubiquity of inexpensive, high-fat, high-calorie, and highly palatable food. Fast-food chains, notorious for unbalanced meals and gigantic portions, have become an integral part of American society. In addition, technological advances such as elevators, escalators, shuttle buses, and remote controls have made Americans’ lives less physically demanding, possibly contributing to the obesity epidemic. The literature associated with the Toxic Environment will be more thoroughly reviewed as it pertains to this study in a later section.

Coupling the increased energy intake and the decreased physical activity of today’s society, it is presumed that these environmental effects contribute significantly to the increased prevalence rates of obesity. However, research in this area has been limited to cross-sectional and longitudinal survey designs that do not permit causal influences. The experimental empirical literature examining the environmental contributions of obesity is essentially nil, which could be contributing to the difficulties addressing this epidemic thus far.

Traditionally, solving the problem of the obesity epidemic has been studied through the medical model, with the focus being on treating the obese individual through pharmacological approaches, behavioral interventions, or surgery (Henderson & Brownell, 2004). Yet these efforts – be they through formal treatment approaches or self-directed dieting attempts – have had a limited impact on decreasing the prevalence rates of obesity, suggesting that the focus on treatment is not appropriate for a problem that has largely social or environmental contributions. It is well documented that many weight loss programs have low success rates for continued maintenance of weight (Anderson, Konz, Frederich, & Wood, 2001; Grodstein, Levine, Troy, Spencer, Colditz, & Stampfer, 1996; Wing & Phelan, 2005).

It is possible that a public health model, with its focus on prevention, will have a greater impact on addressing the obesity epidemic (Henderson & Brownell, 2004). Public health policies have been adopted to address other societal problems, such as deaths associated with not wearing a helmet when riding a motorcycle and deaths associated with not putting a child in a car seat (Brownell & Horgen, 2004). Another interesting public health intervention that has been successful in other areas is the adding of fluoride to the water to prevent dental caries. Clearly, individuals could brush their teeth, floss, minimize sweets that are consumed, and so on to prevent dental caries, but when this personal responsibility fails, public health interventions can address the issue at a societal level (Bray 2002). Towards this end, experimental research on environmental factors associated with obesity is warranted to clearly delineate appropriate targets of change for prevention efforts.

### *Biological Contributions to Eating Behavior*

The research examining biological contributions to eating behavior has been plentiful. Physiological psychologists have long been examining food intake and appetite in animals and humans to better understand the physiology of ingestive behavior. Given the complex and voluminous nature of this literature and its limited application to the present proposal, only a cursory review of the literature will be presented. Therefore, this section will focus on the homeostasis model, the brain regions associated with eating behaviors, and the appetite hormones associated with eating. In addition, the related research on cephalic phase salivation response will be explored, given its applicability in eating behavior.

The homeostasis model of eating behavior has been a dominant paradigm in the biological sciences for understanding eating behavior since Claude Bernard discussed the “constancy of organisms’ internal state” in the 19th century (Rowland, Li, & Morien, 1996, p. 174). Over the years, researchers have examined various biological variables that may be the crucial determinant for the regulation of eating behavior. These have included glucose levels, which resulted in the glucostatic hypothesis (Mayer, 1953); the body fat levels, which resulted in the lipostatic hypothesis (Kennedy, 1953); and more recently amino acid levels (Leibowitz, 2002). These hypotheses state that when the biological level dips below a certain predetermined level, the animal or human becomes hungry, which prompts eating behavior, and then increases the biological level and allows the body to return to a homeostatic state. There are criticisms of this early model of homeostasis as it neglects to fully explain the physiological processes involved in maintaining body weight as well as the environmental implications on the model (Rowland, Li, & Morien, 1996). Yet it did provide a framework

for future research in this area, leading to many discoveries about the brain's involvement in eating behavior.

It is well documented that the hypothalamus plays a crucial role in eating behavior as it has been determined that it is associated with hunger and satiety (Leibowitz & Hoebel, 1998). More specifically, the lateral hypothalamus has been associated with hunger as evidenced by research examining the effect of electronically stimulating and lesioning this area of the brain. When stimulated, animals that are well-fed begin eating and, when lesioned, starving animals have no interest in food. Alternatively, the ventromedial hypothalamus has been associated with satiety. Animals who are electronically stimulated in this area of the brain will stop eating and animals who have this area of the brain lesioned will begin eating food more rapidly resulting in obesity (Duggan & Booth, 1986; Hoebel & Teitelbaum, 1966).

There are some criticisms to these studies as it is often difficult to ascertain precisely what particular behavior has been affected by the lesions or stimulations (Logue, 2004) given the interconnection of brain functioning. It is possible that the areas that were stimulated or lesioned have more to do with other types of functioning (i.e., motor functioning) rather than hunger and satiety. Other criticisms of these early studies surround the idea that it is quite difficult to precisely define what areas of the brain were stimulated or lesioned. For example, a particular neuron may have extensions that exceed the targeted area. Subsequent research on the ventromedial hypothalamus has demonstrated that when lesions are more precisely confined to this area, they are less effective at promoting obesity as opposed to when the lesions are not as confined to this area (Stellar & Stellar, 1985). Despite the criticisms, this



line of research does demonstrate the utility of further understanding the role of the hypothalamus in hunger and satiety.

It also appears that the hypothalamus works in conjunction with other digestive organs and brain areas to trigger hunger and satiety signals in humans. For example, researchers have shown that cells in the liver monitor glucose levels and provide this information to the hypothalamus via the vagus nerve (Russek, 1971). In addition, an empty stomach secretes an appetite hormone called ghrelin, which is detected by areas of the hypothalamus and may be implicated in the sensation of hunger (Wren & Bloom, 2007). However, many researchers caution that there are many other appetite hormones, including insulin, leptin, orexin, and peptide YY that influence hunger and satiety signals detected by the hypothalamus (Dhillon, 2007). Clearly, the physiological processes involved in eating behavior are complex, and our understanding of these processes is evolving with technological advances and refined research methodology.

Historically, the impact of salivation on eating behavior has been examined. It is well-known that salivation is a component of the eating response as it acts in concert with gastrointestinal responses to promote efficient digestion and absorption of nutrients from foods consumed (Giduck, Threatte, & Kare, 1987). Indeed, Mattes (2000) notes many nutrition-related functions of saliva including the moistening of solid foods promoting more efficient digestion, the coating of food particles to ease swallowing and passage through the gastrointestinal tract, and influencing the sensory properties of food such as its textural and “mouthfeel” components. In addition, salivation is a part of a greater physiological response to food, which includes variability in heart rate, blood pressure changes, skin conductance

changes, and increased gastric activity (Mattes, 1997). However, much of the available research has focused on salivation responses, which will be the focus of this review.

Salivation responses are not only important during ingestion, but researchers have been examining its impact before ingestion of food, or the cephalic phase. This line of research has its roots in the early work by Pavlov (1910), and it has resulted in many experimental studies examining the influences of this response. Traditionally, cephalic phase salivation has been defined as “the rapid release of saliva following cognitive or sensory stimulation” (Mattes, 2000, p. 177). In other words, when an individual is hungry, the thought or presence of food can stimulate salivation in anticipation of eating the food. Researchers have primarily used cephalic phase salivation as a psycho-physiological measure of appetite (Tepper, 1992) as it has been associated with reports of hunger (Wooley & Wooley, 1981). In fact, it appears that researchers have favored this measure of appetite because of its more objective nature than that of self-report questionnaires and visual analog methods for determining hunger and appetite.

Despite its objectivity, the measurement of cephalic phase salivation has limitations where slightly different procedures are used for collecting data, which has the potential to affect generalizability and may account for mixed findings in the literature. One of the earliest procedures described is the Stongin-Hinsie Peck procedure (Peck, 1959), which calls for three dental swabs to be placed in the mouth after the individual swallows. One dental swab is placed under the tongue and the other two swabs are placed on each side of the mouth between the cheek and the teeth. Other researchers have modified this procedure and have used a single swab under the tongue (Bruntrom, Yates, & Witcomb, 2004), whereas others have used only the two swabs on the sides of the mouth (Karhunen, Kappalainen,

Tammela, Turpeinen, & Uusitupa, 1997). Although the original Stongin-Hinsie Peck procedure called for the placement of the swabs to be exactly two minutes, the duration of the placement of the swabs has varied across studies from a minimum of thirty seconds (Brunstrom et al., 2004) to three minutes (Staiger, Dawe, & McCarthy, 2000).

In addition to the Stongin-Hinsie Peck procedure, there are other methods for obtaining data on cephalic phase salivation. Engelen, Wijk, Prinz, van der Bilt, and Bosman (2003) utilized a whole saliva flow technique where participants were asked to expectorate into preweighed containers at 30-second intervals for a five-minute period. The amount of saliva was then weighed to determine saliva flow. Tepper (1992) used a different methodology where participants tilted their heads forward over a funnel fitted to a preweighed test tube. Saliva directly flowed into the tube for a three-minute period when the participant also expectorated all remaining saliva into the funnel. In a review of the literature using cephalic phase salivation as a dependent variable, Mattes (2000) summarizes that the different procedures of collecting salivation have hindered the progress of understanding how cephalic phase salivation contributes to eating behavior and suggests that researchers clearly delineate the methodology to allow for better interpretation of the results.

Despite the lack of clearly established methodologies, there has been a significant amount of experimental research examining how salivation affects eating behaviors with most of the literature examining salivation patterns in different eating-related populations. For example, it has been suggested that restrained eaters may be more responsive to food as evidenced by a higher salivation rate following cuing than unrestrained eaters (Klajner, Herman, Polivy, & Chhabra, 1981; Le Goff, & Spigelman, 1987; Tepper, 1992; Brunstrom, Yates, & Witcomb, 2004). These results have been interpreted to mean that a heightened

responsiveness to food cues may create a tendency to overeat, which may in turn result in the necessity to cognitively restrict dietary intake (Fedoroff, Polivy, & Herman, 2003).

Cephalic phase salivation in obese individuals also has been a focus in the literature. Early studies suggested that obese individuals tend to salivate more than the non-obese (Wooley, Wooley, & Dunham, 1976; Wooley, Wooley, & Woods, 1975). In contrast, however, Powers, Holland, Miller, and Powers (1982) found no differences in salivation responses between the obese and the non-obese. The authors attributed this finding to the possible lack of statistical power. In related research, Epstein, Paluch, and Coleman (1996) examined salivation responses to repeated trials of food exposure and demonstrated that obese individuals have a slower decline in salivation over the course of repeated exposure than non-obese individuals. Salivation patterns in obese children have also been a focus of study; cue-elicited salivation flow in obese children has been linked to overeating compared to normal-weight children (Jansen, et al., 2003). With these mixed findings, it is clear that further research is needed to explain how salivation is linked to eating behaviors in obese adults and children.

The cephalic phase salivation response has also been studied in individuals with various binge-eating patterns. It has been speculated that cephalic phase responses may provide a physiological basis for craving after a food exposure, resulting in binge-eating (Vogele & Florin, 1997). Unfortunately, most of the research examining cephalic phase salivation in binge-eaters has been equivocal with no significant differences between binge-eaters and non-binge eaters (Karhunen, Lappalainen, Tammela, Turpeinen, Uusitupa, 1997). This may be due, however, to the methodological limitations of the variations in collecting saliva. Clearly, further research examining cephalic phase salivation response in binge-eating

individuals is warranted to understand the discrepancy in the results found for both binge-eaters and obese individuals.

Although cephalic phase salivation has been predominantly viewed as a physiological response to food related cues, it is important to recognize that these responses may be conditioned or learned responses, which has implications for understanding the current literature. Considering the possibility that cephalic phase salivation may be a conditioned response warrants that this literature is understood in the context of the broader literature examining cue reactivity across different domains. The concept of cue reactivity will be discussed later in this study in the context of discussing social and environmental influences of eating behavior. However, this does highlight the need to consider both physiological and environmental contributions to eating behavior as they appear to be interdependent.

Overall, considerable research has been conducted to better understand the physiology of eating behavior, and, clearly, many different mechanisms contribute. Despite limitations, research has demonstrated that the homeostasis model of eating regulation contributes to our eating behaviors. In addition, specific brain regions influence and regulate our eating behavior, along with specific hormones and neurotransmitters. In addition, cephalic phase salivary responses in preparation of eating contribute to our understanding of the complex nature of the physiology underlying eating behavior. Despite these significant contributions, however, it is clear that humans are social beings and the impact of environmental and social influences on eating behavior must be considered in conjunction with physiology.

### *Social and Environmental Contributions to Eating Behavior*

Considering the limitations of examining only the physiological contributions to eating behavior, this section will focus on the social environmental influences. This area of literature is relatively new and sparse, which is surprising given the plethora of research on environmental determinants of so many other behaviors and psychological factors. In fact, most of the research in this area is not found within the psychological literature, but rather can be found within the marketing and nutrition literature. This literature primarily focuses on better understanding the factors that increase food intake and consumption volume.

One of the first attempts at understanding the influence of environmental factors associated with eating behavior was Schachter's (1968) seminal theoretical work that was later referred to as the Internal – External Hypothesis. In this early report, Schachter provided preliminary evidence suggesting that obese individuals may not be sensitive to internal cues of hunger, but rather rely on external cues to prompt eating behavior. Early case studies by Bruch (1961) also provided support for this argument where it was speculated that obese children never learned to associate internal gastric experiences with hunger and eating behavior. From this early hypothesis, much research was conducted examining the environmental factors associated with eating behavior, most of which was included in the book *Obese Humans and Rats* (Schachter & Rodin, 1974). The different eating patterns between obese individuals and non-obese individuals were examined in a variety of different situations, including situations where food was relatively easy to obtain and situations where time was manipulated. One of the most pertinent studies was conducted by Schachter, Friedman, and Handler (1974), in which experimenters went into several Chinese restaurants to record who used chopsticks versus silverware in an attempt to understand differences

between obese and non-obese people's choices related to ease of food access. Researchers categorized patrons as obese, "chubby," or normal based on their physical appearance. The investigators also recorded what type of eating utensil each patron used. In this observational study, virtually no obese individuals elected to use chopsticks, suggesting that obese individuals may be sensitive to the relative ease of access to food. This early research suggested that obese individuals were more responsive to external cues than non-obese individuals.

Despite the early support for the Internal – External Hypothesis, there are several limitations. First, subsequent research has provided evidence that obese individuals' response to external cues may be a consequence rather than a cause of eating. For example, dieting is often associated with being overweight, and there is evidence that dieting is associated with a heightened responsiveness to external cues (Heatherton & Baumeister, 1991). In addition, others have shown that those who are moderately overweight, but not obese, may also experience heightened sensitivity to external cues (Rodin, 1981). Finally, there is considerable heterogeneity within the obese population, which makes a parsimonious theory, such as the Internal – External Hypothesis, incomplete. Regardless of the limitations of this hypothesis, much of what is known about the impact of environmental factors on eating behavior can be traced back to this early work.

Other early psychological studies on environmental factors associated with eating behavior have focused on how learning influences hunger and, consequently, eating behavior. In fact, Weingarten (1983) successfully classically-conditioned rats to eat in response to a buzzer and a light as opposed to a different tone. Interestingly, these rats ate in response to the stimuli even when they were fully satiated. This study has been subsequently

replicated in a human population where similar results of classical conditioning were found in school-aged children (Birch, McPhee, Sullivan, & Johnson, 1989). These studies provided an early appreciation for understanding the importance of learning and environmental stimuli on eating behavior and laid the groundwork for an understanding of environmental cuing of eating behavior.

The literature associated with cue reactivity is quite applicable in understanding the role of environmental stimuli on eating behavior. Originally, cue reactivity was most prominent in the addictions literature, which demonstrated that individuals have behavioral responses to environmental triggers. Examples include the findings that seeing a cigarette can lead to subsequent smoking (Baumann & Sayette, 2006), and being exposed to cocaine paraphernalia can lead to subsequent cocaine use (Saladin et al., 2006). Other researchers have extended this theory to eating behavior, mostly associated with maladaptive eating patterns such as binge-eating and disordered eating (Jansen, 1998; Nederkoorn & Jansen, 2002). These studies have shown that when individuals are confronted with food cues, they respond by consuming more calories, thus highlighting a classical-conditioning model of eating.

In the addictions literature, it is implied that the environmental stimuli (i.e., the cue) elicits a craving for the desired substance, which results in the subsequent behavior (Childress, Ehrman, Rohsenow, Robbins, & O'Brien, 1992). It appears that this paradigm can be used to better understand eating behavior as well, where the cuing and the subsequent eating behavior is mediated by a craving for food. Previous research has provided preliminary support for applying this model to eating behavior. For example, Carter, Bulik, McIntosh, and Joyce (2002) recently examined cue-elicited craving and found that food cues



resulted in increased craving for food. Interestingly, physiological responses, such as the cephalic phase salivary response, have been the primary measure of craving in eating studies, which highlights the importance of understanding how physiology interacts with environmental factors to promote eating behaviors (Nederkoorn, Smulders, & Jansen, 2000). The next step is to better understand how the cue-elicited craving impacts subsequent eating behavior, and many researchers have postulated that this craving will increase the probability of food intake (Jansen, 1998; Wardle, 1990). Fedoroff, Polivy, and Herman (1997) provide early evidence for this theory where they found that restrained eaters did report a significantly greater subjective craving and did consume more food than non-restrained eaters. Further evidence examining the relationship between cue-elicited cravings and food intake is warranted.

Related to the cue reactivity literature, the priming literature associated with addiction research also may be applicable to eating behavior (de Wit, 1996). Preliminary research has demonstrated that individuals who ingest a small amount of certain foods increase their subsequent consumption of those foods even if they are satiated (Cornell, Rodin, & Weingarten, 1992). This manipulation highlights how the individual may be “primed” to eat, which provides evidence of another environmental factor that contributes to eating behavior.

Considering the findings from the cue reactivity literature and the priming literature, it is not surprising that food advertising is big business in today’s society. It is estimated that food manufacturers spent \$7 billion in advertising in 1997, with fast food restaurants spending 95% of their advertising budgets on television commercials (Gallo, n.d.). More recent estimates of influential companies have noted that McDonald’s restaurant has a yearly marketing budget of \$1.1 billion and Coca-Cola, \$866 million (Brownell, 2002). Comparing

the figures of just these two companies to the National Cancer Institute's \$1 million budget for healthy food advertising shows what type of advertising is most prevalent in today's society. It also has been reported that children watch on average 10,000 television advertisements for food each year, and Dibb (1996) examined the content of these food commercials. The bulk of the advertisements aimed at children (approximately 95%) were for soft drinks, candy, fast food, sugary cereals, and high-fat or high-sugar snack foods. In addition, there is correlational evidence that the intake of these types of food (i.e., chips/crackers/popcorn/pretzels) tripled from the mid-1970s to the mid-1990s, and the intake of soft drinks doubled during the same time period for children aged 6 to 11 (Enns, Mickle, & Goldman, 2002). Not surprisingly, other researchers have found similar trends among all age groups (Nielsen, Siega-Riz, & Popkin, 2002). These findings highlight the increased presence of a possibly Toxic Environment.

Unfortunately, there is limited empirical research that examines the effect of this heavy advertising on eating behavior. However, given the framework of the cue reactivity literature, many have speculated that individuals exposed to this advertising are likely to increase their food consumption (Wadden, Brownell, & Foster, 2002), especially advertising of the Toxic Environment. In addition, Hoek and Gendall (2006) argue that advertising plays the role of reinforcing and normalizing behavior, making it more likely that individuals will indulge in the heavily-advertised junk food products.

Although Toxic Environment advertising has not been empirically investigated, other types of advertising on eating behaviors have been examined, primarily within the restrained eating literature. Restrained eaters are often characterized as individuals who repeatedly attempt to lose weight through the restriction of food intake (Herman & Polivy, 1980). These

individuals are often classified according to self-report measures that tap many cognitive strategies that the individual engages in to attempt to restrict food intake. Seddon and Berry (1996) completed a seminal study on this topic and exposed women to television images that depict thin-ideal images. They found that eating-restrained women consumed more available food afterward than controls, and more recent research has supported these findings (Mills, Polivy, Herman, & Tiggemann, 2002; Harrison, Taylor, & Marske, 2006). It has been suggested that the exposure to thin-ideal media has a disinhibiting effect on restrained eaters where they cannot cognitively control their food intake, which results in increased food consumption in these situations (Seddon & Berry, 1996).

Strauss, Doyle, and Kreipe (1994) also used eating behavior as an outcome in their work on the impact of diet commercials. In their research, they exposed women to diet-related commercials, neutral commercials, and no commercials and found that eating restrained women who viewed the diet commercials consumed more food than participants in the other groups. It appears that the diet-related commercials, similar to the thin-ideal literature above, lowered dietary disinhibition in eating-restrained women, resulting in increased food intake. The authors speculate that the diet commercials may have served a feedback function where the restrained eater was reminded that she had not stayed on her diet and was not able to attain the thin-ideal images displayed in the commercial. Therefore, these diet commercials served as disinhibitors rather than stimuli to “reinhibit” their food intake.

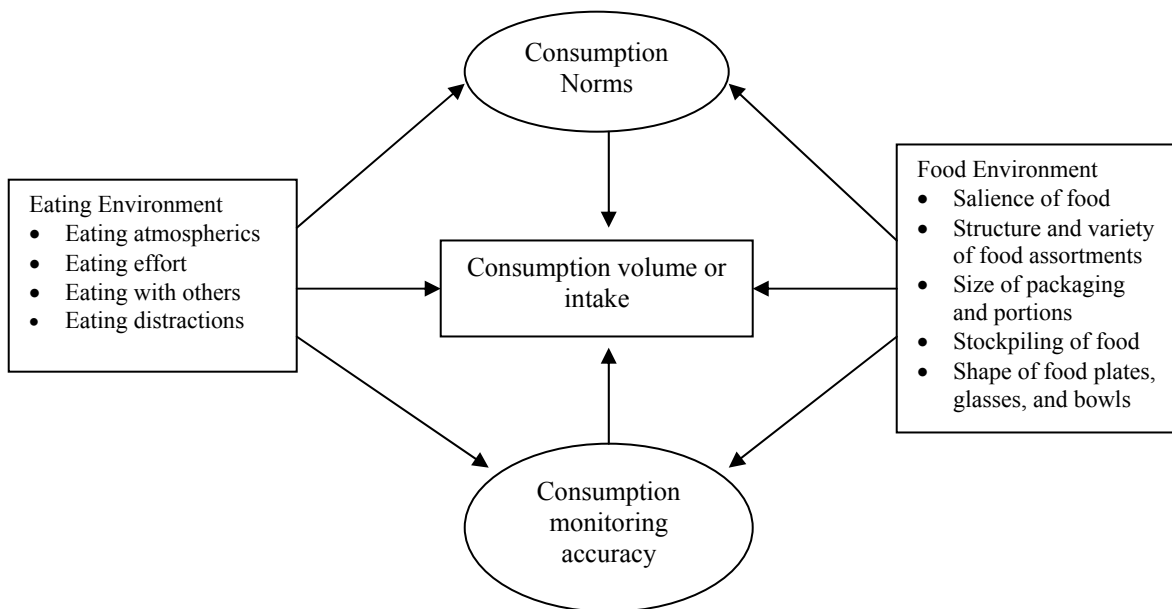
The dramatic behavior changes seen in these studies in such short periods of time demonstrate the provocative nature of today’s media. Yet the mechanisms underlying the demonstrated behavioral changes are currently unclear. It is important to note that in these studies, the increased eating behavior occurred immediately following the exposure while the

participant was in session, whereas it is unknown what effects this exposure had on future eating behavior. Future research should examine if latency is a factor in this process as this author is not aware of any empirical studies examining this hypothesis.

There is other research demonstrating the impact of many different types of environmental factors on eating behavior. The presence of others is one such factor and has also been shown to influence eating behavior. De Castro and de Castro (1989) examined this phenomenon by asking participants to record food intake as well as the number of people present while they were eating. There was a strong positive correlation between the number of people present and the amount of food consumed. In addition, it has been demonstrated that eating with others often extends the duration of the meal, which often results in increased consumption of food (Bell & Pliner, 2003). It also has been demonstrated that when one eats with other people, he or she observes what and how much others are eating, which provides a range of normative amounts of food that is to be consumed. This can influence eating behavior in normal weight individuals (de Castro, 1994), but this effect may be particularly salient for obese individuals (Herman, Olmsted, & Polivy, 1983).

Recently, Wansink (2004) reviewed the literature examining how environmental factors influence eating, particularly food intake and consumption and provided a model to better understand the complex interactions of many variables on eating behavior. Figure 1 shows this model, which is an interdisciplinary model that draws from many fields including psychology, economics, consumer research, marketing, and consumer science, which highlights the complexity involved in understanding our eating behavior. On closer examination, it is clear that many of the model's components directly relate to the theory of the Toxic Environment, and the preliminary research in these more general areas has

provided a framework to better understand how today's Toxic Environment may influence eating behavior and ultimately obesity rates.



*Figure 1.* Antecedents and mediators of food consumption volume (Wansink, 2004, p. 457).

This model distinguishes between the food environment and the eating environment, and shows how these two categories influence how much food is consumed. In terms of better understanding the influences of the eating environment, many of the factors have been discussed previously, such as the influence of the presence of others. However, drawing from the consumer research literature, Wansink (2004) also adds that the atmosphere where one eats can influence one's eating behavior. Temperature, lighting, odors, and noise levels all influence the duration of meals and subsequently food intake. For example, Caldwell and Hibbert (2002) found that when soft music was playing, restaurant patrons tended to stay longer and consume more food than when patrons were not exposed to soft music. Similar results were found when individuals were exposed to dimmed or soft lighting (Lavin & Lawless, 1998). Although the application of atmospherics to eating behavior is relatively new

and is generally associated with the marketing literature, it is clear that individuals are susceptible to subtle environmental factors that have the potential to influence eating behavior. To this author's knowledge, there is no literature that has examined the impact of atmospherics within the Toxic Environment literature. However, it would be interesting to determine if aspects of the fast food restaurant atmosphere may contribute to increased eating consumption.

Wansink (2004) also discusses the role of distractions during a meal as an environmental influence on eating, where these distractions can initiate eating, obscure the amount eaten, or extend the duration of the meal. It has been noted that many individuals do other activities while eating, such as watching television and reading magazines. In fact, Tuomisto, Tuomosto, Hetherington, and Lappalainen (1998) found that obese individuals used the end of a television program as a cue for ceasing to eat, while virtually ignoring any physiological satiation signals. In addition, Wansink and Park (2001) studied individuals eating popcorn at the movie theater. Individuals who reported that they were paying attention to the movie ate more popcorn than those individuals who claimed they were paying attention to how much they ate. Clearly, these studies demonstrate the association between distraction and food consumption. When this plausible finding is coupled with today's Toxic Environment of highly prevalent foods in a media-rich society, it is not surprising that obesity rates have skyrocketed. Yet these studies do not provide sufficient causal evidence for asserting the role of the Toxic Environment on eating behavior, which warrants future research.

Wansink (2004) also discusses how effort may affect eating behavior, which is directly related to the Toxic Environment theory. The ease, access, or convenience of food

has been demonstrated to affect eating behavior. For example, Meyers, Stunkard, and Coll (1980) found that individuals ate more ice cream when the lid of the ice cream cooler was left open than when it was closed. In other words, the physical effort to obtain the food was minimized, which resulted in increased consumption. Numerous other studies have demonstrated this effect with various foods in various ways (Painter, Wansink, & Hieggelke, 2002; Chandon & Wansink, 2002). Now if one considers the high density of fast food restaurants, which offer quick convenient foods that are easily unwrapped, this literature is quite applicable to the understanding of the Toxic Environment. Unfortunately, it is difficult to test this theory in an experimental manner, hence the dearth of empirical research on this topic. However, this type of research is clearly warranted to better understand how effort may be an environmental influence on eating behavior.

Aspects of food itself also have been examined in the research to determine what factors influence eating behavior. Clearly, the salience of the food is important as discussed previously with the cue reactivity literature. However, little empirical work has tested the differences between being exposed to healthy food and being exposed to Toxic Environment food. In addition, a line of research examining the impact of variety on eating behavior has been an important variable of study. Rolls, Rowe, Rolls, Kingston, Megson, and Gunary (1981) were one of the first research groups to demonstrate the effect of having a larger variety of food on increased food consumption. Considering that individuals are living in an increasingly more varied food environment that seems to expand daily, this research has clear implications for why obesity rates are rising.

The size of packaging also has been a focus in the eating and the public health research area. It has been well-documented that the packaging size of common foods has

increased significantly in recent years. Nielson and Popkin (2003) documented that food portion sizes increased in the years between 1977 and 1998. Jahns, Siega-Riz, and Popkin (2001) report similar results for a similar timeframe. In response, Rolls (2003) purports that increased packaging size is related to the obesity epidemic as it creates a social norm of larger portion sizes, which in a sense gives individuals permission to overeat. Rolls, Morris, and Roe (2002) also completed an experimental study where individuals were given four different portion sizes of macaroni and cheese on different days. The results showed that individuals ate more when served larger portions, but reported similar ratings of hunger and fullness across conditions. In other words, individuals ate more in the large portion condition, but did not report the higher satiety ratings that would be expected with eating more. In a similar study, Wansink and Park (2001) examined the effect of popcorn bucket sizes on consumption in a movie theater. They found that those who received a 240-gram container of popcorn ate more than those who received a 120-gram container. Several years later, Wansink and Kim (2005) replicated this study to determine if the palatability of the food confounded the effects of the portion sizes. In order to study this phenomenon, they used a 2x2 experimental design where participants were given a 120-gram container or a 240-gram container of either fresh or stale popcorn. Interestingly, the results showed that the container size had a more powerful effect as individuals ate more popcorn from the large container even if it was stale (i.e., five days old and placed in a sterile environment). Rolls, Roe, Kral, Meengs, and Wall (2004) also completed a similar study with potato chips offered to participants in five varying sizes ranging from 28 grams to 170 grams. Consistent with the other literature in this area, individuals given the larger packages consumed more than those given the smaller packages.



In related literature, the size of serving bowls also has been demonstrated to affect food consumption. Wansink and Cheney (2005) demonstrated that if food was presented in large containers, individuals served themselves more food and also subsequently consumed more food as opposed to when food was presented in smaller containers. More specifically, individuals were exposed to food that was offered in 2 large serving bowls or 4 medium serving bowls that were equated on weight. Wansink and Cheney (2005) concluded that the larger containers may have suggested to the participants that a proportionately larger amount is appropriate to consume in this particular setting. This literature demonstrates the “stockpiling” phenomenon that is detailed in Wansink’s (2004) model of environmental influences on eating behavior.

It also appears that not only the serving containers but also the individual use containers influence food consumption. Wansink, van Ittersum, and Painter (2006) gave participants either a small (17 ounce) bowl or a larger (34 ounce) bowl to serve themselves ice cream with either a 2- or a 3-ounce ice cream scoop. The results showed that those who had larger bowls and larger serving scoops consumed more food than those who had smaller bowls and smaller scoops. These findings may be interpreted in light of common illusions that may distort the amount of food consumed. Wansink (2004) suggests that the size-contrast illusion may be most salient where individuals have a tendency to underestimate the amount of food on a larger plate than on a smaller plate.

Relating this literature to the Toxic Environment theory, Brownell and Horgen (2004) have expressed that economics play a vital role in this process with the increased prevalence of “supersizing” of french fries or sodas in fast food restaurants. It is well-known that supersizing a “value meal” only adds a few more cents to the cost of the meal, but gives the

consumer considerably more food. This marketing lure is hard for consumers to resist and once they have the larger portion, they are probably more likely to consume more food. In addition, Levitsky (2002) has noted that over-consumption at one meal does not necessarily lead to a subsequent reduction in food intake at later meals. Packaging and portion sizes appear to be quite salient issues for understanding the environmental influences of eating behavior especially in today's environment where "supersizing" is normative.

Much of what was outlined by Wansink (2004) in his environmental model of food consumption directly applies to the theory of the Toxic Environment that has been purported by researchers in recent years. The distractions that affect consumption, the reduced effort it takes to eat, the salience and advertising of food, the increased variety of foods, and the larger packaging of foods all are related to consumption. Clearly, it is necessary to understand how the Toxic Environment contributes to, and may cause, eating behavior.

#### *The Toxic Environment & Public Health Policy Initiatives*

As described previously in terms of the impact of the social environment on obesity and eating behaviors, the Toxic Environment theory has only been ubiquitous for approximately the last two decades. Unfortunately, much of the work completed on this concept has been theoretical, with limited empirical evidence supporting the phenomenon. However, this theory has been prompting significant public health policy changes that modify today's Toxic Environment, with the ultimate goal of addressing the obesity epidemic. Several articles outline possible public health policy initiatives that aim to address the obesity epidemic including Jeffrey (2002), Brownell (2002), Horgen and Brownell (2002), and Henderson and Brownell (2004). These initiatives are explained and justified below.

Initially, it is suggested that an initiative aimed at regulating the portion sizes of high-calorie foods be sought. Henderson and Brownell (2004) justify this initiative by citing the regulation of chemicals that are potentially toxic according to concentration. This justification asserts that high-calorie foods are analogous to chemical toxins by having the same effect on health only through different mechanisms. In addition, considering the literature discussed on portion sizes and subsequent eating behavior, it is promising that regulation of portion sizes across the industry might have an impact on the obesity prevalence rates. However, future experimental research needs to be conducted to provide additional causal evidence that this initiative would have a direct impact on eating behavior and ultimately obesity prevalence rates.

It has also been suggested that advertising of unhealthy food items be regulated. Considering the huge amounts of money spent on advertising, this initiative is extremely important to pursue. Henderson and Brownell (2004) argue that many other products, such as tobacco and alcohol, are required to have a warning label to inform consumers of the potential risk associated with consuming the product. In addition, tobacco advertising has been restricted to ensure that companies were not directly advertising to children who do not have the knowledge or capacity to make healthy choices without assistance. The regulation of food advertising should also be extended to the schools to further protect children. However, before such an initiative would be widely adopted, it is clear that further research demonstrating a causal effect of advertising on unhealthy eating habits should be conducted. Using this additional evidence to support this initiative is important to addressing the obesity epidemic.

Others have suggested that unhealthy foods should be taxed and healthier food choices should be subsidized. The revenue created by the taxes could be used to subsidize the healthy foods (Jacobson & Brownell, 2000). Horgen and Brownell (2002b) recently conducted a study examining the effect of changing prices on food choice. They found that decreasing the price of a healthy item resulted in an increased purchasing of that item. This study provides preliminary support for subsidizing healthy food choices, but it is clear that further research should be conducted examining the impact of taxing unhealthy foods on food choice and consumption.

Related to the literature on the effort associated with obtaining food, another policy initiative has been proposed to eliminate the availability of soft drinks, fast foods, and unhealthy foods in schools. Clearly, if the unhealthy foods are not available, children will not consume them. However, further research needs to be conducted to determine if this policy initiative would be effective in decreasing caloric intake. In addition, it would be imperative to demonstrate that this initiative would influence healthy eating behaviors in other environments, such as at home.

Given the pervasiveness of the Toxic Environment in today's society, it is clear that a sole initiative is unlikely to be effective in addressing the obesity epidemic. Therefore, combining all plausible policy initiatives would be most successful in addressing the various environmental contributors of unhealthy eating behaviors discussed previously in this literature review. Clearly, a simple solution to this complex problem is not the answer, but addressing all environmental variables demonstrated to influence eating behavior may be the most plausible answer.

*Summary*

In review, it is clear that many factors contribute to obesity and eating behavior. There are many physiological influences that initiate and cease eating behavior, but the environmental contributions to eating behavior has been much more limited. However, these environmental contributions often override physiological signals of eating, which imply that these factors are most important to initially address the obesity epidemic. Given the limited success addressing this epidemic at the individual level, it is plausible that approaching this problem at the societal level with public health policy initiatives may be more fruitful.

Unfortunately, little experimental research has been conducted to support the theory of the Toxic Environment that has been purported to be prevalent in today's society. In addition, even less experimental research has been conducted to support various public health policy initiatives that have been proposed to address the environmental contributions of obesity. As Wang and Brownell (2005, p. 235) eloquently stated, there is "a need to marry science with advocacy" to ensure that the best approaches to addressing the obesity epidemic are firmly rooted in scientific evidence. It is clear that there is strong correlational evidence suggesting that the Toxic Environment contributes to the obesity epidemic, but this is not sufficient to warrant full-scale national policy initiatives. The Toxic Environment is a complex concept composed of many factors that requires a comprehensive approach in addressing the issue.

It is anticipated that this study will provide additional support for the policy initiatives aimed at regulating food advertising and regulating portion sizes of unhealthy foods by using an experimental approach. This experimental research has the potential to demonstrate that these factors have a causal relationship with increased eating, which may result in higher

rates of obesity. In addition, this is the first study, to this author's knowledge, that aims to address two of the components of the Toxic Environment simultaneously by examining the impact of advertising as well as portion sizes. This study also aims to better understand this effect in relation to a physiological determinant (i.e., salivation), thereby highlighting the relative contributions of physiology and environment to eating behavior. The results of this study have the potential to better understand what components of today's Toxic Environment are important determinants of eating behavior. A better understanding of the factors associated with eating behavior has the potential to have significant implications in the quest to address today's obesity epidemic. Clearly, obesity's prevalence and detrimental impact in today's society make this study a timely and necessary endeavor.

#### Pilot Study

Prior to stating the hypotheses of the present study, it is important to explain a pilot study that was conducted to assist in the development of hypotheses and methodology. Considering the research demonstrating that media exposure to thin-ideal images elicits increased food consumption in women (Harrison, Taylor, & Marske, 2006), and that others have postulated that exposure to today's Toxic Environment also may increase food consumption (Jansen, 1998), the following pilot study was conducted. In light of the association between rising prevalence rates of obesity and the proliferation of media depicting exceptionally thin individuals (i.e., the thin-ideal) and the Toxic Environment food advertisements, it was experimentally tested whether such stimuli might influence acute eating behavior. It was hypothesized that when exposed to Toxic Environment or thin-ideal images, women would consume more food than when exposed to neutral images.

*Method*

Five adult women were recruited from the staff at a community mental health agency through interdepartmental email solicitations. Permission from the executive director was obtained prior to recruitment. Detailed demographic information was not assessed at the time of the experimental study, but this information was obtained from participants retrospectively approximately one year later. The five participants all reported being Caucasian, working full-time, and being married/living with a partner. They ranged in age from 32 to 57, with an average age of  $46.0 \pm 10.5$  and had an average education level of  $13.2 \pm 1.8$ . Four of the five participants were non-smokers. The height and weight they reported for the time of the study equaled an average BMI of  $31.0 \pm 8.2$ , which is in the obese range. Participants were exposed to three experimental conditions in counterbalanced order separated by one week: a Thin-Ideal condition (i.e., a February 2007 Vogue magazine), a Toxic Environment condition (i.e., a compilation of food coupons and advertisements from newspapers), and a Neutral condition (i.e., a 2007 Consumer Reports car magazine). The Vogue magazine was selected to depict the Thin-Ideal condition because previous research has suggested that the content of this magazine has the highest number of thin-ideal images among popular commercial magazines (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Because it was not possible to identify a Toxic Environment magazine equivalent to the thin-ideal magazine, research staff compiled food coupons and advertisements from the inserts of newspapers into a binder. Any coupons or advertisements that depicted thin-ideals were not included in the stimuli. The Neutral condition magazine was selected because it had no thin-ideal or food images and would be of some interest to the participants. All stimuli were approximately 280 pages in length.

Participants were exposed to these stimuli under the guise of a study designed to examine the effects of hunger on attention and were instructed to complete an “attention task” by finding dots in each of the stimuli. The same food, consisting of sweet and savory snacks, was available for ad lib consumption across conditions. Participants were given between 86 and 88 grams of Snyder’s Sourdough pretzels ( $M=87.73\pm0.7$ ), between 182-190 grams of Great Value gummi bears ( $M=184.53\pm2.32$ ), between 184 and 188 grams of M&M candies ( $M=185.87\pm0.9$ ), and between 66 and 68 grams of Doritos nacho flavored chips ( $M=66.13\pm0.5$ ). Participants were also given 13 small Dolly’s Glazed donut holes, which varied in weight between 140 and 176 grams ( $M=156.53\pm9.8$ ). They also were given 12 Chips Ahoy Chewy cookies, which varied in weight from 164 to 174 grams ( $M=169.6\pm3.0$ ). Refrigerated cheese cubes weighing between 134 and 192 grams ( $M=174.8\pm13.2$ ), and red seedless grapes weighing between 190 and 262 grams ( $M=231.33\pm20.9$ ) were also given to the participants during each experimental condition. These unwrapped foods were in identical cardboard serving containers on one tray. Participants were assured that the food was fresh and not used with previous participants. Across conditions, no participant ran out of any type of food, thereby eliminating any potential ceiling effects.

Participants completed the study on three separate times one week apart at the same time. At each time, participants were asked to come to the study hungry and then complete an “attention task.” Being hungry was defined as not eating for five hours prior to the start of the experimental session. Participants were allowed to have one cup of coffee, however, within this time frame, but not two hours prior to the start of the session. The “attention task” consisted of looking through one of the three stimuli described previously and locating 40 dots that were placed on various pages by the investigator. The participants were asked to



record the dot number, page number where the dot was located, and the content of the page where the dot was located on a separate sheet of paper. During all sessions, the participant was alone while completing the task (i.e., the researcher left the room immediately). After 15 minutes, the researcher brought in the food described previously and asked the participant to eat as much of the food as she would like. It was also stressed that she should eat until she was no longer hungry. At this point, she was given a different color pen to continue working on the attention task as she consumed the food. This was implemented to keep up with the guise of looking at the effects of hunger on attention.

After a total of 30 minutes had elapsed (15 minutes with the food), the researcher took away the first stimuli and gave the participant another copy of the identical stimuli with dots in a different order. Again, participants were asked to record the dot number, page number, and content of where the dot was located. After 45 minutes had elapsed (30 minutes with the food), the researcher took the food away, gave the participant a different color pen, and informed the participant that she had 15 more minutes to complete the task. This last section was to continue with the guise of examining the effects of hunger on attention. At the end of the session, the food was weighed, using a digital food scale calibrated to measure to the nearest gram. This measurement took place in a different room, unknown to the participant.

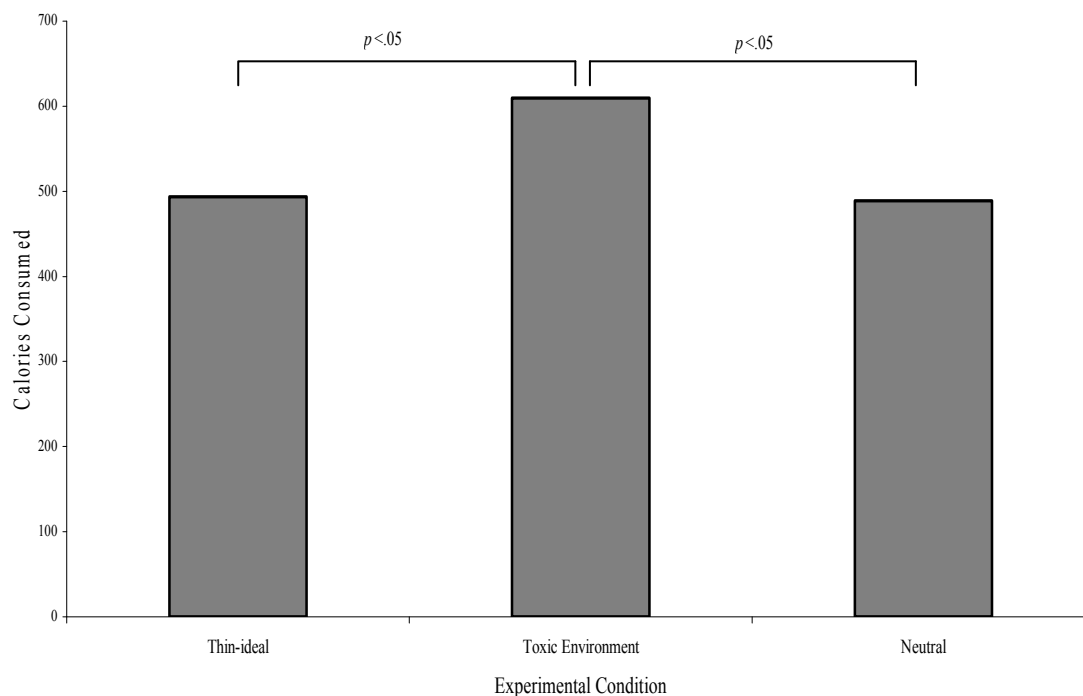
One week later, the participant returned to complete the same procedure again using a different stimulus. One week after that, the participant returned a final time to complete the same procedure with the final stimulus. The order of conditions was randomly assigned.

After the experimental sessions, the researcher calculated caloric intake based on the obtained weights and the nutrition information available on the product. Considering the

nutrition information was not available for the grapes, this information was taken from the United States Department of Agriculture's Nutrient Database available online at <http://www.nal.usda.gov/fnic/foodcomp/search/>.

### *Results*

On average, participants consumed 493.4±467.6 calories in the Thin-Ideal condition, 609.8±501.7 calories in the Toxic Environment condition, and 488.8±339.5 calories in the Neutral condition. Significantly more food was consumed when exposed to the Toxic Environment condition than to both the Thin-Ideal and Neutral conditions,  $F(1,4) = 7.818$ ,  $p < .05$ ,  $\eta^2 = .66$  (see Figure 2). Considering the wide range of calories consumed, evidenced by the large standard deviations, the data were reanalyzed, excluding one possible outlier. The results of this reanalysis were similar where more food was consumed when exposed to the Toxic Environment condition than to both the Thin-Ideal and the Neutral conditions,  $F(1,3) = 14.184$ ,  $p < .05$ ,  $\eta^2 = .83$ .



*Figure 2.* Total mean calories consumed by participants ( $n=5$ ) according to experimental condition.

Considering that food density may have influenced outcomes, the data were reanalyzed using weight (in grams) of food consumed as the dependent variable. Participants consumed  $225.6 \pm 4178.9$  grams of food during the Toxic Environment condition,  $169.6 \pm 99.6$  grams during the Thin-Ideal condition, and  $147.2 \pm 69.0$  grams during the Neutral condition. Similar results were found with more weight of food being consumed in the Toxic Environment condition,  $F(1,4) = 13.22, p < .05, \eta^2 = .77$ .

### *Discussion*

Pilot study results provided preliminary evidence for the impact of the Toxic Environment on women's eating behaviors. Participants consumed significantly more calories when exposed to this type of media. When quantifying the food consumed according

to food weight, the same results were found where participants in the Toxic Environment condition ate more food than when in other conditions. Therefore, whether food consumption was measured by calories or weight, a significant effect was found for the Toxic Environment condition, which strengthens the present findings.

Some limitations of the present study should be noted. First, it is possible that the Neutral condition did not adequately control for all desired effects. For example, it is possible that the Neutral condition should have included some type of food stimuli to differentiate between “toxic food” stimuli and other “healthy food” stimuli. In addition, the Toxic Environment condition consisted of a portfolio that was somewhat different from the other conditions where published magazines were used. Future research might aim to develop portfolios in a more consistent manner through the use of operational definitions for each classification of stimuli. Finally, the food choices available in the pilot study allowed for more healthy choices of foods in addition to “toxic foods.” Having both types of food available may have influenced the results in some unknown manner. Examining types of food separately from other manipulated variables is suggested.

Considering the small sample size, however, these significant results are quite encouraging and warrant further research. In addition, it appears that the methodology provided by the thin-ideal literature is applicable to studying the effects of today’s Toxic Environment. Addressing some of the pilot study’s limitations in future studies is warranted, and the primary study presented below was designed with these considerations in mind. Clearly, further research is necessary to better understand the impact of the Toxic Environment on women’s eating behavior.

## Statement of Research Hypotheses

This study sought to simultaneously explore the effect of advertising and package size on eating behaviors in non-eating-disordered women. Considering the review of the relevant literature, it is apparent that little causal evidence is available supporting the theory that today's Toxic Environment contributes to the current obesity epidemic. Much of the literature in this area is correlational or observational in nature, limiting the ability to draw causal inferences. Therefore, in the present study, participants were randomly assigned to one of two advertising conditions (toxic versus healthy) and one of two packaging-size conditions (large versus single-serve), which resulted in four conditions: (1) a "Toxic-Large" condition, wherein participants were exposed to "toxic" food advertisement stimuli and large food packaging; (2) a "Toxic-Small" group, wherein participants were exposed to the "toxic" food advertisement stimuli but single-serve packaging; (3) a "Healthy-Large" group, wherein participants were exposed to healthy food advertisements but large food packaging; and (4) a "Healthy-Small" group, wherein participants were exposed to healthy food advertisements and single-serve packaging. This 2x2 experimental design with random assignment to groups, which permits causal inferences, was used to test the following hypotheses.

### *Hypothesis One: Experimental Effects on Immediate Eating Behavior*

In accordance with the literature on cue reactivity and portion-sizes (i.e., Carter, Bulik, McIntosh, & Joyce, 2002; Rolls, 2003), the first hypothesis predicted group effects on participants' immediate eating behavior in the experimental session (i.e., the dependent variable). It was hypothesized that there would be a significant interaction effect between the advertising condition and the package-size condition, with participants exposed to the Toxic-Large condition consuming significantly more calories in session than participants exposed

to the three other conditions. In addition, significant main effects for both advertising condition and package-size condition were also anticipated. In other words, it was anticipated that those exposed to the Toxic-Small condition or the Healthy-Large condition would consume significantly more calories in session than participants in the Healthy-Small condition but would not exceed the calories consumed by those participants exposed to the Toxic-Large condition.

*Hypothesis Two: Experimental Effects on Eating in the Following 24 Hours*

This hypothesis was an extension of Hypothesis One and predicted that experimental condition would affect participants' eating behavior in the 24 hours following the experimental manipulation (i.e., the dependent variable). As discussed previously, there is little research examining the delayed effects of exposure to food-related stimuli on eating behavior. Similar to the first hypothesis, an interaction effect was expected, with participants in the Toxic-Large condition anticipated to consume significantly more calories in the 24 hours following exposure than the other three groups. In addition, similar to Hypothesis One, significant main effects for the advertisement and packaging conditions were also expected.

*Hypothesis Three: Contributions of Cephalic Phase Salivary Response*

Recognizing that both environmental and biological factors contribute to eating behavior, this hypothesis predicted that cephalic phase salivation would mediate the causal effect anticipated in Hypothesis One, wherein those in the Toxic-Large condition would consume the most calories in the experimental session. It was hypothesized that salivation would mediate eating across all conditions, with the most pronounced effect expected among those in the Toxic-Large condition who were expected to exhibit the greatest salivation response.

*Hypothesis Four: Experimental Effects on Restrained Eaters*

Considering that exposure to certain stimuli may have a disinhibiting effect on eating patterns in eating-restrained women (Seddon & Berry, 1996; Mills, Polivy, Herman, & Tiggemann, 2002), this hypothesis examined the effects of experimental condition on eating behavior both in session as well as in the 24 hours following the session. More specifically, it was hypothesized that, overall, eating-restrained participants would consume more food than non-eating-restrained participants would, both in session and during the 24 hours following study participation. It was expected that this effect would be most pronounced amongst restrained eaters who had been in the Toxic-Large condition. That is, it was hypothesized that these stimuli would have a disinhibiting effect on cognitive restraint, yielding over-consumption, particularly among eating-restrained participants.

*Hypothesis Five: Exploratory Analyses*

Additional exploratory hypotheses were tested to examine the differential impact of Toxic Environment variables on various weight-related subpopulations including overweight women, weight cyclers, and varying degrees of binge-eaters. It was hypothesized that members of these subpopulations would be particularly sensitive to the influence of the Toxic Environment, exhibiting different eating patterns relative to those who are not so classified. More specifically and similar to the previous hypotheses, it was anticipated that this effect would be most pronounced in the Toxic-Large condition.

Overall, it was anticipated that the present study would provide preliminary empirical support for the effects of the Toxic Environment on eating behavior. It was also anticipated that this study, which examined just two elements of this Toxic Environment, would provide

sufficient data to justify a more comprehensive study of the environmental contributions to the obesity epidemic.

#### Method: Screening Phase

##### *Participants*

For the screening phase of this study, a total of 619 participants were successfully recruited from undergraduate psychology classrooms at Eastern Michigan University. Initially, only women between the ages of 18 and 30 were recruited for this phase because this range constituted a cohort that came of age when the Toxic Environment became especially ubiquitous. This criterion was set to control for potential generational influences that may affect the results. After encountering some difficulty gaining access to classrooms for restricted recruitment, these inclusion criteria were lifted, and anyone who was interested in participating was welcome to complete the screening phase.

Overall, participants ranged in age from 18 to 59 ( $M=21.03\pm 4.95$ ) and were predominantly women (84.7%). Most reported being single (82.2%) and Caucasian (71.4%). Only 116 were daily smokers (18.7%), although most (75.9%) had reported smoking at least one hundred cigarettes in his/her lifetime, thereby meeting CDC criteria for “lifetime” smoking (CDC, 2005). Participants had an average BMI of  $24.69\pm 5.34$  kg/m<sup>2</sup>, a mean that borders on the CDC definition of being overweight (CDC, 2004). Table 1 lists demographic information of the screening participants.



Table 1

*Demographics of Total Screening Sample<sup>a</sup>*

	Total (N = 619)
Age (in years)	21.03±4.95
Race – Caucasian	442 (71.4)
Gender – Female	524 (84.7)
Relationship Status – Never Married	509 (82.2)
Employment Status – Unemployed, Full-Time Student	210 (33.9)
Smoking Status – Non-smokers	500 (80.8)
Smoked 100 cigarettes in lifetime	146 (23.6)
Level of Education (in years)	13.6±1.98
BMI (in kg/m <sup>2</sup> )	24.69±5.34

*Note.* <sup>a</sup>Values are expressed as n (%) or  $M\pm SD$ .

*Measures*

Several self-report measures were used to assess various psychological constructs. Careful consideration of the most important factors of the study resulted in the following criteria to select the measures. First, the measures had to possess valid and reliable psychometric properties. Second, they had to be brief self-report measures for the practical purpose of ease of administration. Third, they needed to be amenable to administration in an online format. Finally, they had to be appropriate for use with a college sample. In light of these requirements, the following measures were included in the screening phase of this study.

*Demographic and Background Questionnaire.* This brief questionnaire (Appendix A) was organized by the author with the intent to obtain demographics and background information about the participants. Age, educational status, economic status, racial/ethnic identity, smoking habits, sleeping habits, eating habits, height, weight, menstruation cycle status, and so on were assessed. In addition, many items on this questionnaire were used to

ensure that participants who met the experimental study inclusion and exclusion criteria could be identified and invited to participate in that phase, as described below.

Items were also included to ensure that preferences for the foods to be used in the experimental phase of the study were similar across participants. This was achieved by having the participants rate the degree to which they preferred the foods on a 5-point Likert scale (1 = *strongly dislike* to 5 = *strongly like*).

The demographic/background questionnaire also included several questions about attentional problems, to maintain the guise of examining the effects of hunger on attention. Finally, questions about availability to participate in the main study and contact information of the participant were asked at the end of the screening.

*Assessment of Hyperactivity and Attention (AHA)*. The AHA (Appendix B) is a 34-item self-report questionnaire designed to screen for adult Attention Deficit Hyperactivity Disorder (Mehring, Downey, Schuh, Pomerleau, Snedecor, & Schubiner, 2002). This rating scale was validated using the Structured Clinical Interview for DSM-III-R and it has established psychometric properties. More specifically, it has a sensitivity of .80 and a specificity of .60. It has a positive predictive power of .67 and a negative predictive power of .75. For the present study, this questionnaire was used to maintain the guise of the study examining the effects of hunger on attention.

*Power of Food Scale (PFS)*. The PFS (Appendix C) is a 21-item questionnaire designed to assess psychological sensitivity to the food environment, or more specifically, the sensitivity to environmental food cues (Didie, 2003). This measure requires responses on a 5-point Likert scale (1 = *don't agree at all* to 5 = *strongly agree*) with questions including “*I often think about what foods I might eat later in the day*” and “*When I see delicious foods*

*in advertisements or commercials, it makes me want to eat.*” Although this is a fairly new assessment tool measuring a relatively new construct, it has good psychometric properties. Reliability has been established by good internal consistency ( $\alpha = .93$ ) and adequate test-retest ( $r = .79$ ) and inter-item significant correlations ( $r = .39$  to  $.79, p < .001$ ). This measure also demonstrated adequate validity including convergent and discriminant validity (Didie, 2003; Forman, Hoffman, McGrath, Herbert, Brandsma, & Lowe, 2007). In the present study, this measure was used to clarify the effects of food cues on eating behavior.

*Center for Epidemiologic Studies – Depression Scale (CES-D)*. The CES-D (Appendix D) is a 20-item self-report questionnaire assessing depressive symptoms in non-clinical populations. This measure has good psychometric properties, including internal consistency reliability ( $\alpha = .84$  to  $.90$ ), test-retest reliability ( $r = .51$  to  $.54$ ) and convergent and discriminant validity (Radloff, 1977). Norms are based on several samples of more than one thousand community participants with a dichotomous cutoff score of sixteen for possibly clinically significant depression. However, other researchers have suggested alternative cutoff scores to differentiate differing levels of depression. Barnes and Prosen (1984) have suggested that scores from 0-15.5 indicate no depression, scores from 16-20.5 indicate mild depression, scores from 21-30.5 indicate moderate depression, and scores of 31 or higher indicate severe depression. Furthermore, it is well documented that in a college sample, rates of depression tend to be higher (Radloff, 1991). Given that college students tend to report more transient symptoms of depression than community samples, the cutoff scores posited by Barnes and Prosen may not be appropriate for a college sample. In a fairly recent study of Eastern Michigan University (EMU) students, King, Saules, and Irish (2007) found that college women’s depression scores were even higher than those reported by Radloff (1991).

Therefore, to be conservative but limit exclusion to those who were truly severely depressed, the college student cutoff score of 25 suggested by Radloff (1991) was used. In the current study, the CES-D was used to screen out participants who were currently experiencing significant symptoms of depression.

*Questionnaire on Eating and Weight Patterns – Revised (QEWP-R).* The QEWP-R (Appendix E) is a 28-item screening instrument designed to identify individuals who may meet DSM-IV criteria for Bulimia Nervosa and Binge-Eating Disorder (Spitzer, Yanovski, & Marcus, 1994). More specifically, the type and frequency of behaviors associated with overeating, binge eating, and weight control strategies are assessed. The QEWP-R also requests background information regarding current and past weight, dieting attempts, and weight cycling. In a sample of more than 1,700 individuals in weight loss groups, this measure has demonstrated good reliability (internal consistency  $\alpha = .75$  to  $.79$  and test-retest  $r = .70$ ). This measure also was validated with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) and has an overall predictive efficiency of approximately 70% (Spitzer, Yanovski, & Marcus, 1994). Overall, these psychometric properties indicate that this measure adequately assesses eating and weight-related concerns. This measure was used to classify participants as binge-eaters, weight-cyclers, and individuals who meet criteria for binge-eating disorder as well as to screen participants for bulimia.

*Eating Attitudes Test (EAT-26).* The EAT-26 (Appendix F) is a 26-item self-report standardized screening measure of eating disorder symptoms (Garner, Olmsted, Bohr, & Garfinkel, 1982). This questionnaire was developed from a factor analysis of the original 40-item Eating Attitudes Test. The shortened version has demonstrated adequate psychometric properties (Garner, Olmsted, Bohr, & Garfinkel, 1982) and recently had its criterion validity

evaluated by comparing the EAT-26 to diagnostic interviews of the DSM-IV eating disorders criteria. The overall accuracy rate of the EAT-26 was excellent, with 90% of individuals being correctly classified using a cutoff score of 20 (Mintz & O'Halloran, 2000). The EAT-26 was used in the present study to assess disordered eating patterns in the sample.

*Three Factor Eating Questionnaire (TFEQ).* The TFEQ (Appendix G) is a 51-item self-report questionnaire that assesses three dimensions of human eating behavior: cognitive restraint of eating, disinhibition, and hunger (Stunkard & Messick, 1985). This questionnaire was originally developed by combining two existing questionnaires of “restrained eating” and “latent obesity” and was subsequently factor analyzed resulting in the present scale with three subscales. This questionnaire has demonstrated adequate psychometrics (Stunkard & Messick, 1985), and its cognitive restraint subscale has been demonstrated to have superior validity than other measures of eating restraint including the Herman and Polivy’s Restraint Scale, the Dutch Eating Behavior Questionnaire, and the Current Dieting Questionnaire (Laessle, Tuschl, Kotthasu, & Pirke, 1989; Williamson, Martin, York-Crowe, Anton, Redman, Han, & Ravussin, 2007). Researchers have used the TFEQ to classify restrained eaters and have suggested a cutoff of 10 on the cognitive restraint scale as indicative of significant dietary restraint (Tepper, 1992). In the present study, this questionnaire was used to dichotomize restrained eaters from non-restrained eaters, using the recommended cutoff score.

*Multidimensional Body Self-Relations Questionnaire-Appearance Scale (MBSRQ-AS).* The MBSRQ-AS (Appendix H) is a 34-item self-report subscale of a 69-item questionnaire measuring attitudinal aspects of body image (Cash, 2000). This subscale specifically measures the cognitive, affective, and behavioral components of appearance and

body image. This subscale is further divided into five components. First, Appearance Evaluation assesses feelings of satisfaction or dissatisfaction with one's looks. Higher scores are indicative of more satisfaction. Second, Appearance Orientation assesses the extent of investment in one's appearance. Higher scores are indicative of placing more importance in how one looks. Third, Body Areas Satisfaction assesses satisfaction with discrete aspects on one's appearance. Higher scores indicate more satisfaction. Fourth, Overweight Preoccupation assesses level of "fat anxiety," weight vigilance, dieting, and eating restraint. Higher scores indicate more preoccupation with being overweight. Fifth, Self-Classified Weight assesses how one perceives and labels one's weight from very underweight to very overweight. Higher scores reflect higher perceived weight.

The MBSRQ-AS has demonstrated excellent psychometric properties. According to the published manual (Cash, 2000), it is reliable based on internal consistency ( $\alpha = .73$  to  $.89$  at the subscale level) and test-retest reliability ( $r = .74$  to  $.91$ ). It also has strong discriminant, convergent, and construct validity (Cash, Counts, Hangen, & Huffine, 1989) and has been standardized using a community population numbering over two thousand, including overweight individuals. This measure is intended for use with participants over the age of eighteen. It was used in the present study to assess cognitive and affective components of body image.

*Physical Activity Assessment Tool (PAAT).* The PAAT (Appendix I) is a 5-item questionnaire that assesses an individual's degree of participation in moderate and vigorous physical activity (Meriwether, McMahon, Islam, & Steinmann, 2006). This questionnaire asks participants to provide the minutes per day and days per week that they engage in moderate and vigorous physical activity during the past week. This measure also provides a

list of exercises that help participants to differentiate between the two levels of intensity. Finally, the measure asks the participant to compare this week's activity level to usual activity levels. This measure has demonstrated adequate validity when compared to another self-report physical activity measure, the long version of the International Physical Activity Questionnaire and when compared to accelerometer readings (Meriwether, McMahon, Islam, & Steinmann, 2006). In the present study, this measure was used to assess participants' physical activity levels.

*Away-From-Home Eating Habits.* Two questions from the Coronary Artery Risk Development in Young Adults (CARDIA) epidemiological study were used to assess participants' away-from-home eating habits (see Appendix J; Duffey, Gordon-Larsen, Jacobs, Williams, & Popkin, 2007). Fast food consumption was assessed using the question: "*How often do you eat breakfast, lunch, or dinner in a place such as McDonald's, Burger King, Wendy's, Arby's, Pizza Hut, or Kentucky Fried Chicken?*" Restaurant use was assessed with the following question: "*How many times per month do you eat breakfast, lunch, or dinner in a restaurant or cafeteria?*" To the author's knowledge, psychometrically tested measures of frequency of fast food and restaurant use have not yet been established.

### *Procedures*

Initially, the measures previously described were identified as meeting the criteria for inclusion in the study and then were configured to allow for administration in an online format using SurveyMonkey.com, a commonly-used vendor for deployment of web-based surveys. SurveyMonkey belongs to Safe Harbor, an organization that certifies websites according to their privacy policies. SurveyMonkey meets Safe Harbor's standards because the data that are collected and stored are only made available to an account holder who is

required to keep a confidential password on the account. SurveyMonkey also assures that all information collected is kept confidential and is not shared with any third parties. The measures on the survey were as follows: the Demographics and Background Questionnaire, the CES-D, the PFS, the QEWP-R, the EAT-26, the TFEQ, the MBSRQ-AS, the PAAT, and the Away-From-Home Questionnaire.

When the online survey was ready to launch and IRB approval had been obtained, adult participants were recruited through announcements via email or in psychology undergraduate courses under the guise of an experiment examining the effects of hunger on attention. It was important that participants were deceived about the true aims of the study to avoid any social desirability effects on their responses and eating behavior. Researchers went to 41 psychology classrooms across two academic semesters (26 from Fall of 2007 and 15 from Winter of 2008) to recruit participants by announcing the pertinent details of the study and then by passing around a sign-up sheet instructing those interested in participating to provide their name, EMU identification number, and their current email address (see Appendix K). During this announcement, the researcher announced the inclusion criteria for the screening study and the procedures to participation. The researcher also stated that participants might be eligible for participation for the experimental phase of the study, which included a \$25 participation incentive.

Once the email addresses were collected, the principal investigator sent potential participants the link to the web-based survey and encouraged the participant to complete it as soon as possible. A script of the email message is available in Appendix L. Because of the web-based nature of data collection, a waiver of signed informed consent was requested and authorized. Instead, participants were asked to read a web page that detailed the usual



elements of informed consent (see Appendix M), and, if they were comfortable with the study procedures, they were instructed to click the “next” button, which served as a substitute for the usual signature. Clicking that button took them to the beginning of the survey. Participants were free to skip items or discontinue participation at any time. Participants were also free to print out the informational sheet for their records.

If participants were interested in obtaining extra credit for their participation, they were instructed to provide their name, EMU identification number, course number, and instructor’s name at the end of the survey (see Appendix N). This information was used by the principal investigator to verify whether a particular student completed the survey and to provide a list of student’s names and EMU identification numbers to the requested instructors prior to the end of the semester. Prior to completing the survey, participants were told that extra credit was to be awarded at the discretion of his/her instructor, and the researchers’ sole role in this process was to provide the instructor the verification of participation, not any of his/her responses to the surveys. To ensure confidentiality, once participation was verified and recorded, all identifying information was deleted from the survey responses. Lists of participant names and identification numbers by instructor were kept separate from survey responses in a locked file cabinet only accessible by the principal investigator. In addition, once the data were downloaded from the internet, all data were deleted from the internet site to further protect the participants’ privacy.

As a part of the screening survey, participants were also asked if they were interested in participating in the experimental phase of the study (see Appendix O). If they expressed interest, questions pertaining to the participants’ sleeping schedule and breakfast eating schedule were asked to determine the times they would be eligible to complete the

experimental portion of the study. In addition, participants were given a choice of locations at which to complete the study, because the principal investigator had secured two locations to collect data – the EMU Psychology Clinic and the University of Michigan Nicotine Research Lab. If interested in participating in the main study, participants also were asked to provide their names, EMU identification numbers, electronic mail addresses, and telephone numbers. At the end of the survey, they were told that if they met the inclusion/exclusion criteria of the study, they would be contacted shortly by a researcher to schedule a time to come into their preferred laboratory. This portion of the screening was optional, and participants could elect not to participate in the experimental phase of the study without penalty.

Participants were assigned a study identification number that was used throughout the duration of the study. A list of participants' names, study identification number, EMU identification number, and contact information was used by the principal investigator to link the data obtained during the screening and experimental phases of the study. Participant data sheets used during the study had only the study identification number on it to preserve confidentiality, and a list coordinating the names and study identification numbers was kept locked in a separate file cabinet away from any study data. Once the participant had been assigned a study number, the identifying information that the participant entered into the survey was deleted to ensure confidentiality. In addition, as discussed previously, all data were deleted from the SurveyMonkey website once they had been properly downloaded.

#### Results: Screening Phase

Screening data were collected from October of 2007 to March of 2008, with a break in data collection over the winter holidays from the end of December to the end of January. During the screening phase of the study, 1102 personal email invitations were sent to

students who had expressed an interest in participating during their classes. However, 54 of these emails were duplicates, resulting in 1048 non-duplicate email invitations. A total of 728 surveys were started, but only 619 non-duplicate surveys were completed. Thus, a 59.1% response rate is estimated for the screening phase of the study (619 responses / 1048 invitations). However, it is possible that some students participated through indirect invitations from peers, so this response rate may be a slight overestimate.

Characteristics of the 619 participants were examined. On average, participants were slightly above the CES-D clinical depression threshold of 16 ( $M=16.75\pm 10.97$ ), but did not typically engage in clinical patterns of disordered eating as assessed by the EAT-26 ( $M=9.92\pm 9.65$ ). There was a wide range of sensitivity to food cues, as assessed by the PFS ( $M=46.17\pm 18.69$ ). Overall, 201 reported Binge-Eating Behavior (32.5%), but only 15.0% of these individuals also endorsed a sense of loss of control over what they were eating. Four participants met clinical research criteria for Binge-Eating Disorder (0.6%), and none met clinical criteria for Bulimia Nervosa as assessed by the QEWP-R. Other participant characteristics are summarized in Table 2.

Table 2

*Baseline Characteristics of Total Screening Sample<sup>a</sup>*

	Total (N = 619)
<i><u>Eating Characteristics</u></i>	
Disordered Eating Score (EAT-26)	9.92±9.65
Sensitivity to Food Cues Score (PFS)	46.17±18.69
Reported being on a special diet (QEWP-R)	33 (5.3)
Reported Binge-Eating Behavior (QEWP-R)	201 (32.5)
Reported Binge-Eating Symptoms (QEWP-R)	93 (15.0)
Classified as having Binge-Eating Disorder (QEWP-R)	4 (0.6)
Cognitive Restraint Score (TFEQ)	8.07±5.13
Disinhibition Score (TFEQ)	5.85±3.53
Hunger Score (TFEQ)	5.23±3.57
Fast Food Frequency (times/wk)	2.02±2.80
Restaurant Frequency (times/wk)	4.03±4.10
<i><u>Body Image Characteristics</u></i>	
Appearance Evaluation (MBSRQ)	3.35±0.87
Appearance Orientation (MBSRQ)	3.59±0.65
Body Areas Satisfaction (MBSRQ)	3.33±0.75
Overweight Preoccupation (MBSRQ)	2.60±0.93
Self-Classified Weight (MBSRQ)	3.29±0.68
<i><u>Other Characteristics</u></i>	
Moderate Exercise (min/wk)	159.7±254.6
Vigorous Exercise (min/wk)	81.8±189.8
Depression Score (clinical cutoff of 16)	16.75±10.97

*Note.* <sup>a</sup>Values are expressed as n (%) or  $M\pm SD$ .

From the 619 screening phase participants, 157 (or 25.4%) met all of the inclusion/exclusion criteria for the main study as defined in the methodology section below. These participants were emailed an invitation to participate in the experimental phase of the study and were the pool from which the 83 experimental participants were drawn (52.9% retention rate).

## Method: Experimental Phase

### *Participants*

Consistent with the aims of the study, the following inclusion/exclusion criteria were used to select participants from the screening for this portion of the study.

1. First, pregnant women were excluded because of variations in regular eating behaviors and the ethical issues inherent in manipulating this vulnerable population's regular eating patterns.
2. Second, women with clinical levels of depression as assessed by the CES-D were excluded. Previous research has suggested that mood can impact food choice and eating restraint (Gibson, 2006), and it is well-known that difficulties with appetite are a criterion for diagnosis of depression (APA, 2000). In addition, there is evidence that depression can affect salivation levels during the cephalic phase (Bulik, Lawson, & Carter, 1996), which is an important component of the study. The specific cutoff used in this study was a score of 25 and over, which indicates significant depressive symptoms. Previous studies with EMU undergraduates and national studies of college students have noted higher than average levels of depression, further justifying this more liberal exclusion criterion (King, Saules, & Irish, 2007; Radloff, 1991).
3. Third, participants with a history of an eating disorder (anorexia nervosa, bulimia nervosa, or another eating disorder) as assessed through self-report were also excluded, because this study aimed to study the social environmental effects on eating patterns in non-eating-disordered women. In addition, the QEWP-R was used to screen for bulimia nervosa, and a BMI below 18.5 kg/m<sup>2</sup> was used to identify those with possible anorexia nervosa.

4. Fourth, participants who reported having food allergies, medical diagnoses, or who were taking any medications that would limit their eating behavior during the main study were excluded.
5. Fifth, to ensure that food preferences were similar across experimental conditions, participants who “disliked” or “strongly disliked” more than one of the available foods or more than one of the beverages in the experimental phase of the study were excluded.
6. Sixth, participants who reported smoking daily were also excluded because of the appetite suppressing effects of nicotine (Jessen, Buemann, Toubro, Skovgaard, & Astrup, 2005; Winders & Grunberg, 1990) as well as the effects of nicotine on cephalic phase salivation (Perkins, Mitchell, & Epstein, 1995).
7. Finally, to control for generational influences in eating patterns, participants had to be between the ages of 18 and 30.

To enroll in the main experimental study, all participants were required to have understood and consented to the procedures involved. They were also required to have given permission to be contacted by phone twenty-four hours after the experimental session to provide follow-up data. Participants received study-related food free of charge to consume during the experimental session and \$25 for completing all portions of the study. Participants also were eligible for additional extra credit for this phase of the study per their individual instructor’s guidelines.

Eighty-three participants completed the experimental portion of the study under the guise of a study examining the effects of hunger on attention. However, one participant was not included in the following results as there was experimenter error in recording which

condition she completed. Therefore, the results presented in this study will be of the 82 participants who have accurate information. This sample size was targeted as the result of a power analysis conducted prior to beginning data collection.

Participant demographics and characteristics are presented in Table 3. Participants ranged in age from 18 to 30 ( $M=19.73\pm 2.40$ ) and were predominantly single (81.7%) and Caucasian (75.6%). None were daily smokers, but six (7.3%) reported smoking at least one hundred cigarettes in her lifetime. Participants had an average BMI (measured in session) of  $24.18\pm 5.23$  kg/m<sup>2</sup>. Although those with severe depression (score of 25 or greater) were excluded from experimental study, participants still endorsed somewhat elevated CES-D depressive symptoms ( $M=12.88\pm 6.22$ ). However, on the EAT-26, they did not report engaging in clinical patterns of disordered eating ( $M=7.80\pm 5.77$ ). As assessed with the PFS, there was a wide range of sensitivity to food cues as assessed by the PFS ( $M=46.21\pm 16.71$ ). Eighteen women endorsed items suggestive of Binge-Eating Behavior (22.0%), but only 9.8% of the total sample also endorsed a sense of loss of control over what they were eating (i.e., Binge-Eating Symptoms). None of the participants met clinical research criteria for Binge-Eating Disorder or Bulimia Nervosa as assessed by the QEWP-R.

Table 3

*Demographics and Baseline Characteristics of Total Experimental Sample<sup>a</sup>*

	Total (N = 82)
<u>Demographics</u>	
Age (in years)	19.73±2.4
Race – Caucasian	62 (75.6)
Relationship Status – Never Married	67 (81.7)
Employment Status – Unemployed, Full-time Student	29 (35.4)
Smoked 100 cigarettes in lifetime	6 (7.3)
Level of Education (in years)	13.52±2.11
BMI (in kg/m <sup>2</sup> )	24.18±5.23
<u>Eating Characteristics</u>	
Disordered Eating Score (EAT-26)	7.80±5.77
Sensitivity to Food Cues Score (PFS)	46.21±16.71
Reported being on a special diet (QEWP-R)	5 (6.1)
Reported Binge-Eating Behavior (QEWP-R)	18 (22.0)
Reported Binge-Eating Symptoms (QEWP-R)	8 (9.8)
Classified as having Binge-Eating Disorder (QEWP-R)	0 (0.0)
Cognitive Restraint Score (TFEQ)	7.70±4.34
Disinhibition Score (TFEQ)	5.69±3.09
Hunger Score (TFEQ)	5.47±3.56
Fast Food Frequency (times/wk)	1.83±1.83
Restaurant Frequency (times/wk)	4.71±4.97
<u>Body Image Characteristics</u>	
Appearance Evaluation (MBSRQ)	3.51±0.73
Appearance Orientation (MBSRQ)	3.60±0.61
Body Areas Satisfaction (MBSRQ)	3.43±0.66
Overweight Preoccupation (MBSRQ)	2.55±0.79
Self-Classified Weight (MBSRQ)	3.20±0.59
<u>Other Characteristics</u>	
Moderate Exercise (minutes/week)	186.5±252.6
Vigorous Exercise (minutes/week)	129.7±400.9
Depression Score (cutoff of 25)	12.88±6.22

Note. <sup>a</sup>Values are expressed as n (%) or  $M\pm SD$ .

In this 2 x 2 experimental design, participants were randomly assigned to one of two advertising conditions (toxic advertisement vs. healthy advertisement) and one of two food-packaging conditions (large vs. single-serving). Randomization was accomplished by using a Java Script random number generator available free to the public at



<http://www.randomizer.org/index.htm>. A “blocked” design was used to yield equal number of participants in each condition.

Random assignment resulted in four experimental conditions. The first condition was the Toxic Environment condition (referred to henceforth as Toxic-Large), which was composed of the toxic food advertisements and the large packaging. The second condition was the toxic advertisement group (referred to as Toxic-Small), which was composed of the toxic food advertisements and single-serving packaging. The third condition was the toxic packaging group (referred to as Healthy-Large), which was composed of the healthy food advertisements and the large packaging. Finally, the fourth condition was the Healthy-Small condition (referred to as such), which was composed of the healthy food advertisements and the single-serve packaging. Due to experimenter error in initially recording the conditions assigned, the conditions did not have equal numbers of participants. There were 21 participants randomly assigned to the Toxic-Large group, 19 assigned to the Healthy-Large group, 21 assigned to the Toxic-Small group, and 21 assigned to the Healthy-Small group for the total main study sample of 82.

### *Measures*

Data gathered during the screening were used to form many of the variables used in the main experimental study. Again, careful consideration of the measures psychometrics and applicability for the sample described above resulted in the following measures being used for the experimental portion of the study.

*Questionnaire on Eating and Weight Patterns – Revised (QEWP-R)*. The structure and psychometric properties of this measure were discussed previously in the screening

phase of the study. In this phase, this measure was used to classify participants as binge-eaters, weight-cyclers, and individuals who met criteria for binge-eating disorder.

*Three Factor Eating Questionnaire (TFEQ)*. The structure and psychometric properties of this measure were discussed previously. In this phase of the study, this questionnaire was used to dichotomize restrained eaters from non-restrained eaters using the established cutoff score.

*24-hour Dietary Recall Interview*. To obtain a record of the food consumed 24 hours following the experimental portion of the study, participants were interviewed by telephone, guided by software from the University of Minnesota Nutrition Data System for Research organization. This software is available for purchase online at <http://www.ncc.umn.edu> for researchers interested in obtaining 24-hour dietary recall information on participants. The software provides an interview, a data-entry system designed to facilitate standardized collection of information about specific food intake, and reports of many levels of nutritional intake. This system uses a multiple-pass method that is composed of four separate passes. Initially, the participant is asked to provide a quick list of the foods consumed in the last 24 hours. Then the individual is queried to provide information about missed foods or missed eating occasions, followed by prompts about added foods to the initially recalled foods (i.e., milk added to coffee) and more specific ingredients in prepared foods (i.e., type of oil used in fried dishes). Finally, the participant is asked to listen to a review of what was recorded and is encouraged to make any corrections or additions of potentially forgotten foods. In addition, the participant is encouraged to look at a visual stimulus of common food measurements to assist in accurate recall of portion sizes. The software provides the standardized prompts and allows for data-entry while on the telephone with the participant. This system has been used

in many large-scale studies examining nutrition intake, most recently the Minnesota Heart Survey (Lee, Harnack, Jacobs, Steffen, Luepker, & Arnett, 2007). This methodology is similar to other 24-hour dietary recall systems including the USDA's Automated Multiple Pass Method (Raper, Perloff, Ingwersen, Steinfeldt, & Anand, 2004). Once food data were collected, a report of total calories consumed during the 24-hour follow-up period was obtained for each participant.

### *Materials*

Participants were exposed to one of two food advertisement stimuli: a “toxic” food stimuli portfolio, which was composed of visual images of high-fat, energy-dense foods, or a “healthy” food stimuli portfolio that was composed of visual images of healthy foods. The toxic food portfolio was a compilation of photos and images that were downloaded from the internet using the website <http://images.google.com>, in response to searches for “junk food,” “fast food,” and “unhealthy food.” To meet criteria for inclusion in the portfolio, the images were required to meet the pre-determined criteria as described below. The images included in the healthy food portfolio were obtained in a similar fashion as the toxic food portfolio through the same internet image search engine in response to searches for “healthy food.”

To compile the portfolios, the principal investigator started with 345 toxic food images and 420 healthy food images that both were approximately 200 letter-size pages in length. Five research assistants were asked to independently rate each image according to the following criteria. Toxic images were required to meet all four of the following criteria: (1) the image depicts food that must be prepackaged, ready-made, or processed, (2) the image depicts food judged to be high in calories, fat, or sugar, (3) the image depicts food that is

generally advertised through multiple outlets (i.e., print media and television, for example), and (4) the image depicts food in large portions (i.e., supersized, family-sized, etc.).

For images to be included in the healthy condition portfolio, they had to meet all four of the following criteria: (1) the image depicts food that is not processed, (2) the image depicts food judged to be low or moderate in calories, fat, or sugar, (3) the image depicts food that is generally not heavily advertised (in no more than one outlet typically), and (4) the food is depicted in small packages or in single-serving portions. This wave of material development resulted in retaining 170 toxic and 181 healthy images.

Results of this wave were somewhat inconsistent among raters, where many of the images were excluded because only one rater determined it was unacceptable. Therefore, the author asked the five raters to provide qualitative data about their decision-making process when applying the above criteria to the image. From this information, it became clear that the above criteria were somewhat ambiguous and needed to be revised so that more consistency among raters could be obtained. Several weeks later, the images were independently rated again by five research assistants using the following revised criteria.

Final images for inclusion in the toxic stimuli had to meet the first criterion: (1) the image depicts food that is generally advertised through multiple outlets (i.e., print media and television, for example) or it is usually associated with some type of marketing strategies (such as an advertising icon or a specific type of packaging/wrapping). In addition, images had to meet at least two of the following three criteria: (2) the image must depict food that is prepackaged, ready-made, or processed in some manner (i.e., the food is known to have additives that preserve its shelf-life or it is boxed, microwavable, or “quick to eat”), (3) the image depicts food judged to be high in calories, fat, or sugar (high is calories is defined as

more than 600 calories/serving; high in fat is defined as more than 6 grams/serving; high in sugar is defined as more than 12 grams/serving or 3 teaspoons/serving – typically less than in one 12-ounce can of soda), and (4) the image depicts food shown in large portions (i.e., supersized, family-sized, etc.) or is more than a single serving of food.

To be included in the final healthy food stimuli, the images were required to meet the first criterion: (1) the image depicts food that is generally not heavily advertised (i.e., in no more than one outlet typically) or it is not usually associated with some type of marketing strategies (such as an advertising icon or a specific type of wrapping/packaging). The image also had to meet at least two of three following criteria: (2) the image must depict food that is not prepackaged, ready-made, or processed in any manner, (3) the image depicts food judged to be low or moderate in calories, fat, or sugar (calories are defined as less than 600 calories/serving; fat is defined as less than 6 grams/serving; sugar is defined as less than 12 grams/serving or 3 teaspoons/serving), and (4) the image depicts food in single-serving portion sizes.

The results of the second wave of material development resulted in the retention of 137 toxic and 164 healthy food images. These images were then organized in a word document, with pages printed and placed in non-glare sheet protectors and bound together by 1 ½ inch white binders. Many of the images were duplicated to make portfolios that were 200 pages in length.

Participants were also exposed to one of two package-size conditions. One condition provided food that was easily accessible and in larger serving size packaging. The other condition provided participants with the same types and overall amounts of food, but they were available as individually wrapped single serving sizes. For example, depending on the

condition to which she was randomly assigned, a participant may have had available a large family-size bag of Doritos™, or several single-serve bags of Doritos™, with the amounts available in each condition equated on weight and calories. Likewise, a participant may have had available a 2-liter of Coca-Cola™ or several 12-ounce cans that equate on calories and volume. In both conditions, food packages were opened to account for possible social desirability effects involved in opening the packages. In the large package condition, all packages were opened in front of the participant. In the small package condition, one of the packages of each type of food/beverage was opened by the researcher in front of the participant.

Food available for consumption by participants during the study included pre-measured sweet and savory snacks and beverages. More specifically, the types of food available to participants were Nacho Cheese Doritos™, M&M™ candies, Oreo™ Cookies, Snyder's Sourdough Pretzels™, Coca-Cola™ (non-diet), and Sprite™ (non-diet). Specific quantities of food available by condition are provided in Appendix P. In addition, if participants requested water to drink during the study, it was to be provided. The justification for not initially having water available to all participants was to minimize the tendency of participants to drink a lot of water in an attempt to inhibit eating behavior. However, no participants requested water in the present study.

### *Procedure*

Data obtained in the screening phase of the study were examined to identify which participants met the inclusion/exclusion criteria for the main study and were willing to complete the experimental phase of the study. Potential participants were contacted via electronic mail using a prepared script to schedule a time to come to the laboratory for the

main experimental portion of the study (Appendix Q). Efforts were made to have all participants come in for the experimental portion of the study on the same schedule, which was defined as approximately 2-5 hours after awakening from the night. Participants were also asked to come to the session hungry, which was operationally defined as not eating for at least five hours prior to the start of the experimental session. This resulted in running experimental sessions between the hours of 10am and 2pm Tuesday through Thursday.

Participants were emailed the day before their scheduled appointment and were telephoned the morning of their scheduled appointment to remind them of the study. All participants chose the EMU Psychology Clinic as their preference, so all data collection was conducted at this facility. Sessions were run in one of four therapy rooms by one of three research assistants or the principal investigator. Prior to the participant arriving, research assistants took out the wastebaskets to ensure that participants did not throw out any food during the course of the session. Research assistants were required to use a standard script with all participants to promote consistency across research assistants. This script is available in Appendix R. Research assistants were also required to run through the entire study with the principal investigator at least one time prior to running a session with a participant. This was also done to promote consistency across research assistants.

Once the participant arrived, she was taken to a private room and given the informed consent. There she was asked to read the document, question any ambiguities, and sign the informed consent agreement (see Appendix S), which specified that she could withdraw from the study at anytime without penalty. Each participant was also required to report understanding of all the procedures of the study including the experimental phase and the follow-up telephone call phase. Participants were assured that their information would be

kept strictly confidential with data identified only by a study identification number. This identification number was matched to the number used during the screening phase of the study. Only the principal investigator had access to personally identifiable information (i.e., the signed informed consent document), and this information was stored separately from other data in a secure locked location.

After obtaining informed consent, the researcher measured the participant's cephalic phase salivary response using the methods of Razran (1939), which has also been used satisfactorily in other studies examining cephalic phase salivary response (Brunstrom, Yates, & Witcomb, 2004). Prior to the participant coming into the session, the researcher weighed three separate labeled Ziploc™ bags that each contained a single 1 ½ inch Patterson Brand™ Non-Braided dental swab to obtain a pre-weight. These dental swabs were weighed using a Mettler™ Analytical Balance scale, which measures to the nearest one-thousandths of a gram. The three separate Ziploc™ bags were also sealed in a larger Ziploc™ bag in order to minimize any effects of evaporation of the saliva. In session, participants were asked to remove a single dental swab from the bag and place it under the center of her tongue and leave it there for exactly thirty seconds, which was timed by the research assistant using a stopwatch. The participant was then asked to remove the swab from her mouth and reseal it in the labeled bag. The dental swabs in the bag were re-weighed separately to obtain a post-weight after the participant had left the session. Cephalic phase saliva response was defined as the difference between the pre-weight and the post-weight. Once the measurement had been properly recorded, the dental swabs and bags were discarded in a biohazard container. All dental swabs were weighed within two hours after the completion of the session in order to prevent the effects of evaporation.



At this point, the researcher reviewed the inclusion/exclusion criteria to ensure the information provided in the screening was accurate. In addition, this precaution accounted for the possibility that participants may have had changes (such as pregnancy) during the lag time between the screening and the experimental phase.

Next, the researcher asked the participant to state the last time she consumed any food or beverages besides water. This procedure was to ensure that participants had not eaten anything in the preceding five hours. If they had eaten food or had any caloric beverages within the past five hours, an alternative time to complete the experimental portion of the study was scheduled and the salivary response data were discarded. Participants were allowed into the study if they had consumed a minimal amount of caloric beverages within this five hour time period. More specifically, participants were included if they had consumed less than two cups of coffee or two cans of soda within the previous five hours. However, if the participant consumed this beverage within the two hours immediately prior to the experimental session, she was asked to return at an alternate time. If she had not eaten or had drunk only the minimal amounts of caloric beverages specified in the preceding five hours, the researcher continued with the next procedure. All food and/or beverages consumed were recorded by the research assistant on an experimental data collection sheet (see Appendix T). Interestingly, only one participant reported having eaten or drunk anything in the five hours prior to the study, and she was successfully rescheduled to complete the study at a later time.

Next, the participant was randomly assigned to a 2x2 experimental design manipulation with conditions involving food advertisements and food packaging size, as

described previously. A list of the conditions by participant identification number is available in Appendix U.

Participants were then asked to complete an “attention task,” which involved looking at either the toxic food portfolio or the healthy food portfolio. Two identical portfolios in each condition were used to keep up with the guise of examining the effects of hunger on attention. Participants were asked to locate a total of 80 dots (40 in each portfolio) that were placed on various pages by the principal investigator, and document the location of the dot on a separate sheet (see Appendix V). This procedure was to ensure that the participants were adequately and consistently exposed to the stimuli. The location of the dots was somewhat arbitrary, but five researcher assistants were timed completing the attention task for each portfolio to ensure that the time to complete one portfolio was similar to the time it took to complete the second portfolio. Each research assistant took approximately 15 minutes with each portfolio.

Participants worked on the task with the first portfolio for 15 minutes alone before the research assistant came back into the room to measure her cephalic phase salivary response again, using the same procedure as before. Immediately following this measurement, the research assistant brought in the food (according to the food packaging condition described in the materials section) and placed it on the table where the participant was working. Then the participant was instructed to eat as much food and beverage as she would like. It was also stressed that she should not be hungry when the food would be taken away, which was included to keep up with the guise of the study.

After 15 minutes of exposure to the food and the stimuli, the research assistant brought in an identical food advertisement portfolio with dots placed in different locations

for the participant to continue to work on. The participant was instructed to continue eating and to continue working on the attention task. After an additional 15 minutes, the researcher returned to the room to again measure the participant's cephalic phase salivary response using the same procedure. In addition, immediately thereafter, the research assistant took away all the food. The participant had a remaining 15 minutes to finish the attention task.

The food and beverages used in the experimental portion of the study were measured before and after presentation to the participant with a digital scale that allowed for measurement to the nearest gram. This procedure was completed in a separate room away from the participant, so she was unaware that the food was measured. Food intake was recorded on the experimental data sheet that allowed the researchers to later calculate the nutritional content of the food consumed during the data analysis phase of the study. Specific algorithms were developed using the nutritional content on the food packages to determine the nutritional content of the food consumed by the participant. These algorithms will be discussed in the statistical analysis section.

Next, the research assistant obtained the participant's weight and height using a calibrated Tanita BWB-800 scale that allows for measurement to the nearest tenth of a pound. This scale was in a different room from where the experimental manipulation took place to avoid any influences on eating behavior. Height and weight were assessed at the end of the experimental session to ensure that being weighed would not influence the participants' eating behavior. The participant kept her shoes and clothing on for these measurements. At this point, the participant was informed that this phase of the study was completed, and she was asked about her availability to complete a brief follow-up telephone interview the next day. This phone interview was scheduled at least 24 hours following the

end of the experimental session, but no longer than 48 hours post-session. To avoid any influences on her eating behavior, the participant was not told that the information to be collected was going to be a 24-hour dietary recall. The participant was also given an envelope containing visual stimuli to assist in estimating portion sizes and was instructed not to open this envelope until the researcher contacted her the next day. These stimuli were obtained from reputable internet sites and are available in Appendix W. Finally, the research assistant thanked the participant for completing the study thus far.

The next day, each participant was contacted by telephone to complete a 24-hour dietary recall questionnaire using the software from the University of Minnesota Nutrition Data System. Research assistants followed a script developed by the principal investigator to introduce the interview to the participant (see Appendix X) and then used the prompts within the software to complete the interview in a standardized manner. After the interview was completed, the research assistant informed the participant that her monetary incentive would be mailed to her shortly and that her instructor would be notified that she completed the study (with her permission) to determine if she were eligible for extra credit. The participant was also reminded that the researchers would be emailing her a summary of the results at the conclusion of the study. An outline summary and timeline of the study's methodology is provided in Appendix Y.

After the principal investigator collected all of the participant's data, she was emailed a summary of the results obtained and was also informed of the true aims of the study. Contact information for the principal investigator was provided and participants were encouraged to call/email the researchers if they experienced any adverse reactions during the course of the study.

*Informed Consent and Ethical Treatment*

All participants were ensured ethical treatment based on the Federal Guidelines for the Protection of Human Subjects ([www.ohrp.gov](http://www.ohrp.gov)), under the oversight and approval of the Eastern Michigan University Human Subjects Review Committee. Given the initial phase of this study was conducted online, it was impossible to obtain signed informed consent from participants. However, the informed consent narrative (Appendix M) preceded the questionnaires and detailed the nature of the study; consent was implied by continued participation. The final line in the informed consent instructed participants who do not to continue the study to close the browser window. Informed consent (Appendix S) for the experimental portion of the study was obtained before entry into the research project. This study involved minimal risk to participants. However, participants were informed of all risks and benefits of involvement with this study in the informed consent. Referrals to appropriate professional services were available at any time during the study should participants experience some emotional or psychological discomfort, but no participant expressed any discomfort. Participants were also informed of the expected benefits of the study and were aware that the information may be disseminated at conferences, poster sessions, and in the literature. The principal investigator also furnished the results to the participants at the conclusion of the study.

Additionally, human subjects review was completed at Eastern Michigan University to ensure safety and protection of the participants. This review examined the study's research-related risks to participants as well as informed consent and confidentiality. Approval was granted due to the minimal risk nature of this study, including involvement of non-vulnerable participants and noninvasive procedures (see Appendix Z). Participants were

initially deceived about the true aims of the study in order to obtain data free from social desirability effects. However, participants were not asked to engage in any activities beyond those in which people ordinarily engage, thereby minimizing any harm to participants. The human subjects review was completed prior to the commencement of participant recruitment and data collection to ensure the safety and protection of those involved in the study.

### *Statistical Analyses*

All measures were scored using the published algorithms. Missing data from the experimental participants (n=82) were somewhat infrequent in this sample, but when it did occur, it was handled by substituting an average item response for the missing point. On the CES-D, a measure of depressive symptoms, three participants missed one data point each. On the EAT-26, a measure of disordered eating, three participants missed one data point each. However, two additional participants missed five or six items on this measure. On the PFS, a measure of hypersensitivity to food cues, five participants missed one data point each. On the Cognitive Restraint scale of the TFEQ, one participant missed one data point, one participant missed two data points, and two participants missed four data points. On the Disinhibition scale of the TFEQ, one participant missed one data point and two participants missed four data points. On the Hunger scale of the TFEQ, one participant missed one data point and two participants missed three data points. On the Appearance Evaluation scale of the MBSRQ-AS, one participant missed one data point, and three participants missed one data point each on the Appearance Orientation scale of the MBSRQ-AS. In addition, one participant missed one data point on the Overweight Preoccupation scale of the MBSRQ-AS. All other scales were not missing any data points.

Calculation of the nutritional content of the food consumed in session was conducted as follows. First, the weight of each food after the experimental session was subtracted from the weight prior to the session to obtain the amount of food consumed. Second, the caloric content of the food was calculated using a developed algorithm based on nutritional content displayed on the package. For example, the algorithm used to calculate the caloric content of the Oreos™ consumed was equal to the weight of the Oreos™ consumed multiplied by the ratio of calories (160) to grams (34) based on the nutrition content. All other foods were calculated using this type of algorithm. See Appendix AA for specific formulas for all the food and beverages used in the experimental session. Finally, a composite of calories consumed was calculated by adding the caloric content of all the foods and beverages.

Despite randomization, it was possible that the experimental conditions could by chance differ on variables of interest, which could influence outcomes and necessitate the addition of covariates to subsequent analyses. Therefore, descriptive statistics of demographic variables and participant characteristics were compared across experimental conditions to identify any systematic bias. Analyses of the means of age, education level, racial identity, BMI, physical activity, and body image measures, among others, were completed using ANOVAs and nonparametric chi-square tests. Significant differences across conditions on any demographic variable were statistically controlled in the following analyses.

Recall that the first two hypotheses aimed to explore the effects of the advertising condition and the package-size condition on (1) eating behavior in session, and (2) eating behavior in the 24 hours following the study. Therefore, the first two hypotheses were initially assumed to be tested using two separate ANOVAs. One ANOVA was to have total

calories consumed during the experimental session as the dependent variable, with the independent variables being the food advertisement condition (toxic vs. healthy) and the food packaging condition (large vs. single-serving). The second ANOVA was to have the same independent variables, but the dependent variable was to be the total calories consumed in the 24 hours following the experimental session. The previous results were also reanalyzed using two separate ANCOVAs, incorporating any covariates that were of concern to ensure that the effects observed were not unduly influenced.

To test Hypothesis Three (i.e. the influence of salivation on eating behavior), a mediation model was tested using the steps outlined by Baron and Kenny (1986). Step one of the mediation model used a multiple regression analysis with the group condition predicting caloric intake during the experimental session. This was essentially demonstrating the same effect as Hypothesis One. The second step used a multiple regression analysis with the group condition predicting the cephalic phase salivary response (the hypothesized mediating variable). The third step used a multiple regression analysis with the cephalic phase salivary response predicting caloric intake during the experimental session. The fourth and final step also used a multiple regression analysis with both the group condition and cephalic phase salivary response predicting caloric intake during the experimental session. All four steps are required to demonstrate significant effects to support the inference of full mediation, according to Baron and Kenny (1986). However, Hypothesis Three only expected a partial mediation model, which requires that only the first three steps are met.

It has been suggested that Baron and Kenny's steps may not be appropriate in situations of low power (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) because of the probability of committing a Type I error at some point in the series of analyses.



Therefore, MacKinnon et al. (2002) suggest that the best balance may be the test of joint significance. Within this model, only two paths are required to be significant to demonstrate a mediating effect. With this model, steps two and three must be significant to declare a mediation effect. Therefore, results were also analyzed according to these criteria to examine potential mediation of food intake by salivation.

Hypothesis Four, which focused on eating patterns in restrained eaters, was tested using two separate 2x2 ANOVAs of just the Toxic-Large condition. In one analysis, the dependent variable was total calories consumed in the experimental session, and in the other analysis, the dependent variable was the total calories consumed during the 24-hour recall period. The independent variable in this analysis is the eating restraint group. Participants were classified as either restrained eaters or non-restrained eaters as determined by the TFEQ cutoff score of 10 or higher. Again, these analyses were reanalyzed using ANCOVAs to control for potentially important group differences that persisted despite randomization.

Hypothesis Five, regarded as exploratory, aimed to evaluate differences in eating patterns in populations that differed on weight-related variables, such as those who were (or were not) overweight, weight cyclers, or binge-eaters. The classification system for dichotomizing participants according to these characteristics is as follows. Participants were classified as overweight if BMI calculated from their measured height and weight in session was greater than or equal to  $25\text{kg/m}^2$ . They were classified as normal weight if their BMI was below this cutoff. This criterion is consistent with the World Health Organization (2002) standards discussed previously. As a reminder, underweight women (i.e., BMI below  $18.5\text{kg/m}^2$ ) were excluded from the experimental portion of the study. Weight cyclers were classified according to a response to one item of the QEWP-R. Participants who endorsed

losing twenty pounds or more and gaining it back at least once in their lifetime were classified as weight cyclers. This definition is quite liberal; however, it has been used as a criterion in other studies (Tsai, Leitzmann, Willett, & Giovannucci, 2007). The varying degrees of binge-eating status were classified according to specific algorithms developed by the authors of the QEWP-R. Binge-Eating Disorder was classified according to an algorithm based on responses to six questions about eating patterns. Binge-Eating Symptom was dichotomized according to positive endorsements of two items on the QEWP-R – (1) *“During the past six months, did you often eat within any two-hour period what most people would regard as an unusually large amount of food?”* and (2) *“During the times when you ate this way, did you often feel you couldn’t stop eating or control what or how much you were eating?”* Binge-Eating Behavior was dichotomized using simply a positive endorsement of the first item.

Hypothesis Five required initial descriptive statistics to ensure sufficient numbers of participants in each weight-related group to support analysis. If there were sufficient numbers in each cell, 2x4 ANOVAs were conducted, with the independent variables being the dichotomized weight-related variable and the experimental condition. The dependent variables were total caloric intake in session, total caloric intake in the 24-hours following the study, and the combined caloric intake.

For calculations of power, a p-value of less than 0.05 was regarded as statistically significant, with a power of at least 0.8 being desired. Sample Power software (Borenstein, Rothstein, & Cohen, 1997) was used to estimate the required sample sizes to achieve this level of power for each of the analyses. Hypothesis One and Two required the same sample size because of similar analyses. Both hypotheses used differences between group means

analyses requiring a sample of 15 per group, with a total minimum of 60 participants to detect a large effect size. To detect a medium effect, the analysis would require 25 participants per condition for a total of 100. For this study, a large effect size was expected, but the sample size was increased to 20 participants per condition for a total of 80 participants to enhance power while maintaining feasible recruitment goals.

## Results

Eighty-three participants completed the experimental portion of the study. One participant was excluded from the following analyses because of experimenter error in recording her condition, where it is unknown what condition she received. Another two experimental participants did not have follow-up data due to data collection errors, because these data were accidentally erased from the dietary recall computer software. Therefore, the following data analyses were derived from the 82 experimental participants, except when the dietary follow-up information was required, in which case, full information was only available from 80 participants.

### *Preliminary Results*

Descriptive statistical analyses were conducted to ensure that the randomization to experimental condition was successful (see Table 4). There were no significant differences between groups on any demographic variable or participant characteristic variable tested except for Binge-Eating Symptom, a positive endorsement on two QEWP-R items – (1) *“During the past six months, did you often eat within any 2 hour period what most people would regard as an unusually large amount of food?”* and (2) *“During the times when you ate this way, did you often feel you couldn’t stop eating or couldn’t control what or how much you were eating?”* Chi-square analysis indicated that there were significantly more

Healthy-Small condition participants ( $n=5$ ) endorsing these items than did those in the other conditions ( $n=0,0,3$ ),  $\chi^2(3) = 9.52, p < .05$ . It could be argued that this significant finding may be spurious, given the number of tests conducted. However, because Binge-Eating Symptoms could reasonably be anticipated to influence eating behavior, a conservative approach would be to address this possible concern after the initial analyses are run. Therefore, subsequent statistical analyses included this variable as a covariate to evaluate its possible impact on the primary outcomes of interest. Further descriptive information for participants by study condition is provided in Table 4.

Table 4

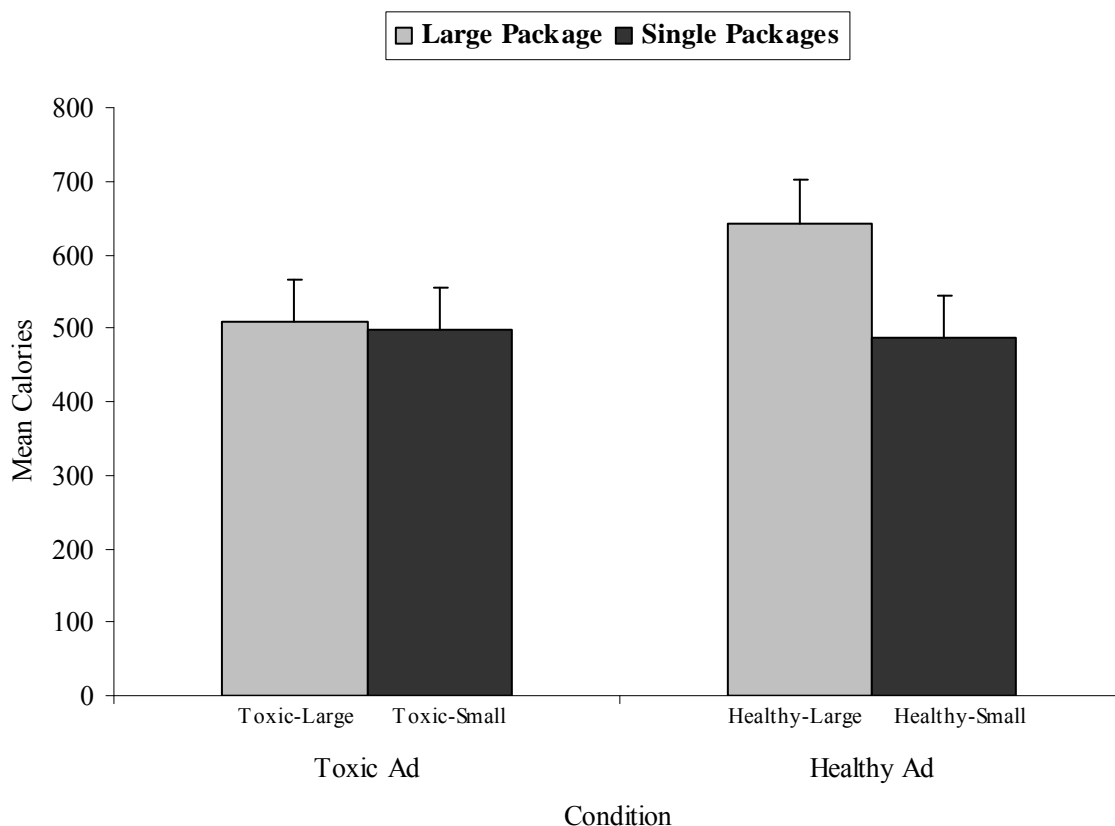
*Demographic and Baseline Characteristics of Participants by Experimental Condition<sup>a</sup>*

	Toxic- Large (n=21)	Toxic- Small (n=21)	Healthy- Large (n=19)	Healthy- Small (n=21)	<i>p</i>
<u>Demographics</u>					
Age (in years)	21.2±2.8	19.2±1.7	20.5±3.3	19.1±1.3	<i>ns</i>
Race – Caucasian	15 (71.4)	18 (85.7)	12 (63.2)	17 (81.0)	<i>ns</i>
Relationship Status – Never Married	17 (85.0)	17 (81.0)	15 (83.3)	18 (90.0)	<i>ns</i>
Employment Status – Unemployed, Full-time Student	11 (52.4)	5 (23.8)	3 (16.7)	10 (47.6)	<i>ns</i>
Smoked 100 cigarettes in lifetime	2 (9.5)	2 (9.5)	1 (5.3)	1 (4.8)	<i>ns</i>
Level of Education (in years)	13.4±1.9	13.5±1.6	14.3±3.1	13.0±1.4	<i>ns</i>
BMI (in kg/m <sup>2</sup> )	24.4±5.9	23.1±5.5	24.9±3.7	24.4±5.7	<i>ns</i>
<u>Eating Characteristics</u>					
Disordered Eating Score	6.6±4.7	8.3±6.2	8.4±5.6	7.9±6.6	<i>ns</i>
Sensitivity to Food Cues Score	46.6±18.7	46.5±17.2	42.9±15.6	48.5±15.8	<i>ns</i>
Reported being on a special diet	0 (0.0)	3 (14.3)	1 (5.3)	1 (4.8)	<i>ns</i>
Reported Binge-Eating Behavior	4 (19.0)	4 (19.0)	3 (15.8)	7 (33.3)	<i>ns</i>
Reported Binge-Eating Symptom Classified as having Binge-Eating Disorder	<b>3 (14.3)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>	<b>5 (23.8)</b>	<b>&lt;.05</b>
Cognitive Restraint Score (TFEQ)	8.2±4.4	7.4±4.9	7.9±3.5	7.3±4.6	<i>ns</i>
Disinhibition Score (TFEQ)	5.5±4.0	5.5±2.5	5.5±2.6	6.2±3.2	<i>ns</i>
Hunger Score (TFEQ)	5.1±3.8	5.2±3.5	5.2±3.2	6.4±3.7	<i>ns</i>
Fast Food Frequency (times/wk)	1.3±1.3	2.1±2.1	1.7±1.7	2.2±2.0	<i>ns</i>
Restaurant Frequency (time/wk)	4.0±3.9	5.7±6.2	4.4±3.9	4.8±5.6	<i>ns</i>
<u>Body Image Characteristics</u>					
Appearance Evaluation	3.4±0.8	3.4±0.7	3.5±0.8	3.7±0.7	<i>ns</i>
Appearance Orientation	3.7±0.6	3.7±0.5	3.5±0.7	3.5±0.7	<i>ns</i>
Body Areas Satisfaction	3.4±0.7	3.4±0.6	3.3±0.9	3.6±0.6	<i>ns</i>
Overweight Preoccupation	2.5±0.7	2.5±0.9	2.5±0.7	2.6±0.8	<i>ns</i>
Self-Classified Weight	3.2±0.6	3.1±0.6	3.3±0.5	3.2±0.8	<i>ns</i>
<u>Other Characteristics</u>					
Moderate Exercise (min/wk)	203±375	145±126	188±235	210±221	<i>ns</i>
Vigorous Exercise (min/wk)	106±364	66±101	84±109	258±688	<i>ns</i>
Depression Score (cutoff of 25)	12.1±6.9	13.0±6.6	12.4±5.6	13.9±5.8	<i>ns</i>

Note. <sup>a</sup>Values are expressed as n (%) or *M*±*SD*.

*Hypothesis One: Experimental Effects on Immediate Eating Behavior*

Hypothesis One sought to test the effects of the experimental conditions (i.e., advertising and package-size) on eating behavior during the experimental session. Mean calorie consumption was  $508.66 \pm 267.03$  calories for those assigned to the Toxic-Large condition,  $499.28 \pm 200.25$  calories for those in the Toxic-Small condition,  $643.47 \pm 182.59$  calories for those in the Healthy-Large condition, and  $487.57 \pm 350.95$  calories for those assigned to the Healthy-Small condition. Using a 2x2 ANOVA, no statistically significant group differences emerged for the advertising condition,  $F(1,78) = 1.14, p = .29, \eta^2 = .01$ , or the package-size condition,  $F(1,78) = 2.01, p = .16, \eta^2 = .03$ . In addition, there was no significant interaction between the advertising condition and the package-size condition,  $F(1,78) = 1.62, p = .21, \eta^2 = .02$ . Figure 3 depicts mean values for total calories consumed in session according to study condition.



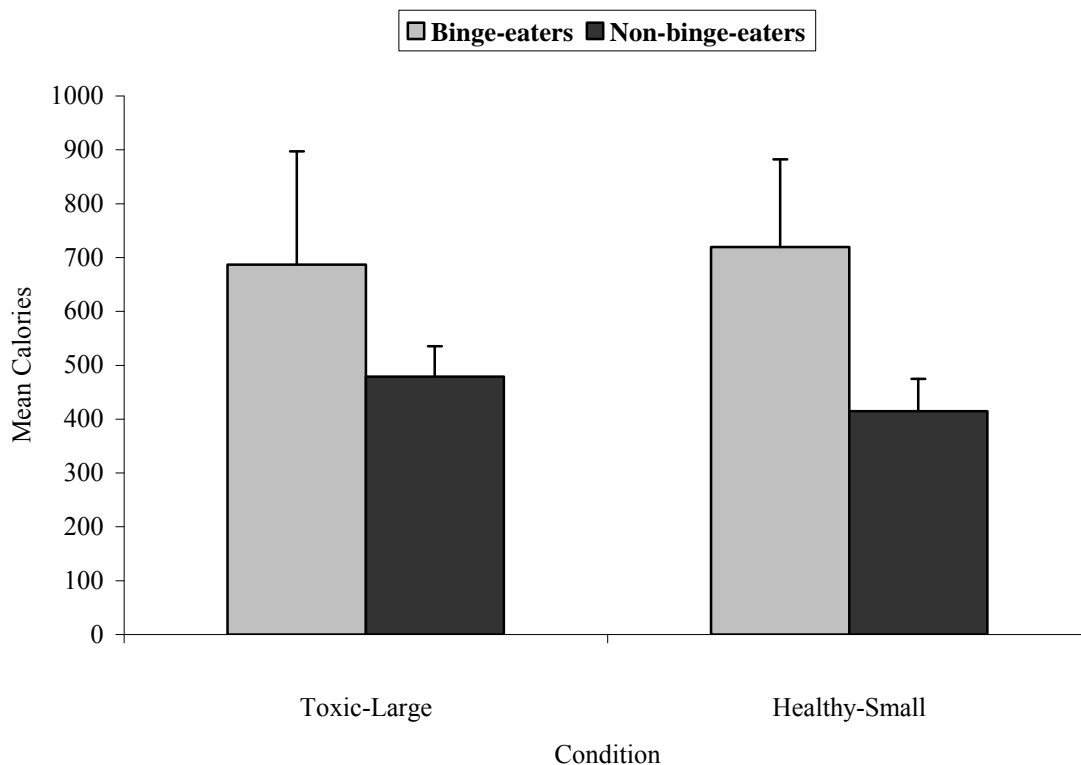
*Figure 3.* Total mean calories (+SE) consumed by participants (n=82) in session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve).

As noted earlier (see Table 4), there were significant differences between groups on Binge-Eating Symptom frequency, necessitating that this variable be accounted for in these analyses. When Binge-Eating Symptom status was entered into the initial 2x2 ANCOVA analysis, it was a significant covariate,  $F(1,78) = 7.17, p < .01, \eta^2 = .09$ , and it changed the effects of the conditions. There was a significant interaction between the advertising condition and the packaging-size condition on calories consumed in session,  $F(1,78) = 4.47, p < .05, \eta^2 = .06$ , and the main effect for packaging size on calories consumed in session approached significance,  $F(1,78) = 2.93, p = .09, \eta^2 = .04$ .

*Hypothesis One: Exploratory Analyses*

Considering that Binge-Eating Symptom may have been contributing to the effect of the experimental conditions on eating behavior in session, additional analyses were conducted to explore these relationships. There were three participants in the Toxic-Large condition and five participants in the Healthy-Small condition who met criteria for Binge-Eating Symptom. When examining the differences between those meeting criteria for Binge-Eating Symptom and those who did not according to these two conditions, a significant main effect was found for Binge-Eating Symptom status,  $F(1,38) = 4.48, p < .05, \eta^2 = .11$ , but not for condition,  $F(1,38) = 0.02, p = .90, \eta^2 = .00$ . There also was not a significant interaction between the two variables,  $F(1,38) = 0.16, p = .69, \eta^2 = .00$ . To clarify the effect of the conditions on eating patterns in the eight participants who met criteria for Binge-Eating Symptom, a univariate ANOVA was conducted. In the Toxic-Large condition, binge-eaters ate on average  $686.83 \pm 231.90$  calories, and  $719.83 \pm 414.58$  calories in the Healthy-Small condition. Not surprisingly, given the small sample size for this analysis, results were non-significant,  $F(1,6) = 0.02, p = .91, \eta^2 = .00$ . Figure 4 shows caloric intake in session according to condition.



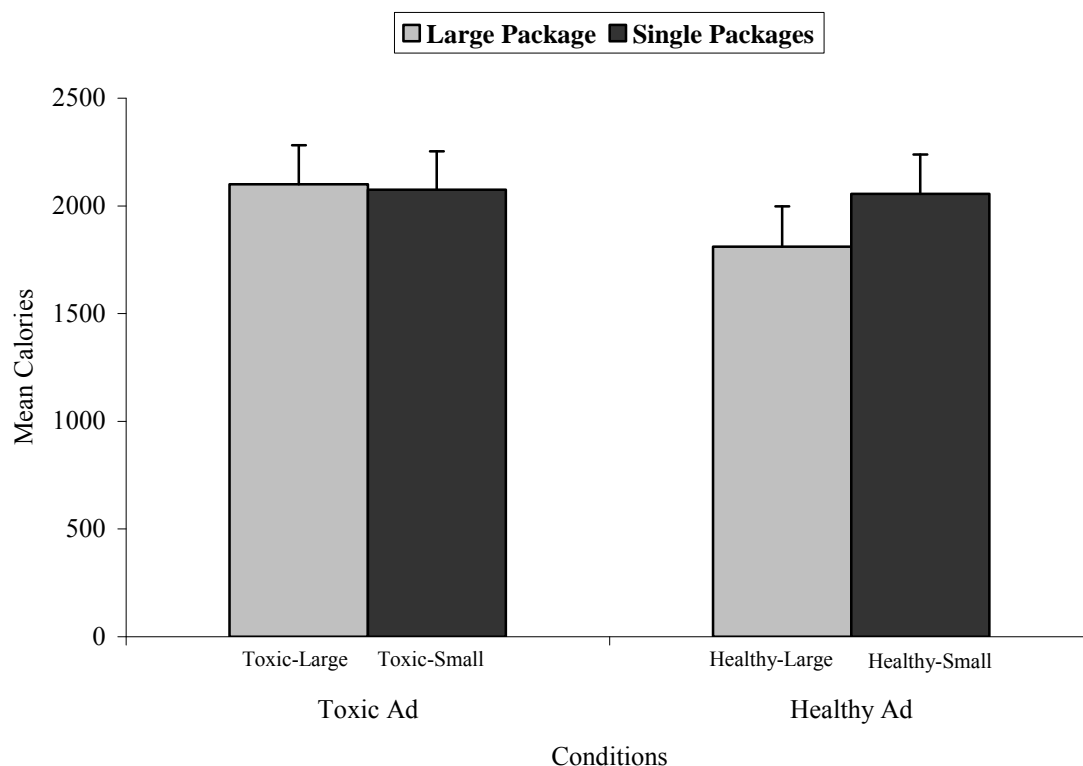


*Figure 4.* Total mean calories (+SE) consumed in the experimental session by participants (n=42) according to experimental condition and Binge-Eating Symptom status.

*Hypothesis Two: Experimental Effects on Eating in the Following 24 Hours*

Similar to Hypothesis One, Hypothesis Two sought to test the effects of the experimental conditions (i.e., advertising and package-size) on eating behavior in the 24 hours following the experimental session. Mean caloric intake was 2099.70±733.03 calories for those assigned to the Toxic-Large condition, 2075.19±924.15 calories for those in the Toxic-Small condition, 1811.37±867.05 calories for those in the Healthy-Large condition, and 2056.45±708.20 calories for those assigned to the Healthy-Small condition. Using a 2x2 ANOVA, no statistically significant group differences emerged for either the advertising condition,  $F(1,76) = 0.71, p = .40, \eta^2 = .01$ , or the package-size condition,  $F(1,76) = 0.37, p = .55, \eta^2 = .01$ . In addition, there was no significant interaction between the advertising

condition and the package-size condition,  $F(1,76) = 0.55, p = .46, \eta^2 = .01$ . Figure 5 shows the mean values for total calories consumed in session according to the two conditions.



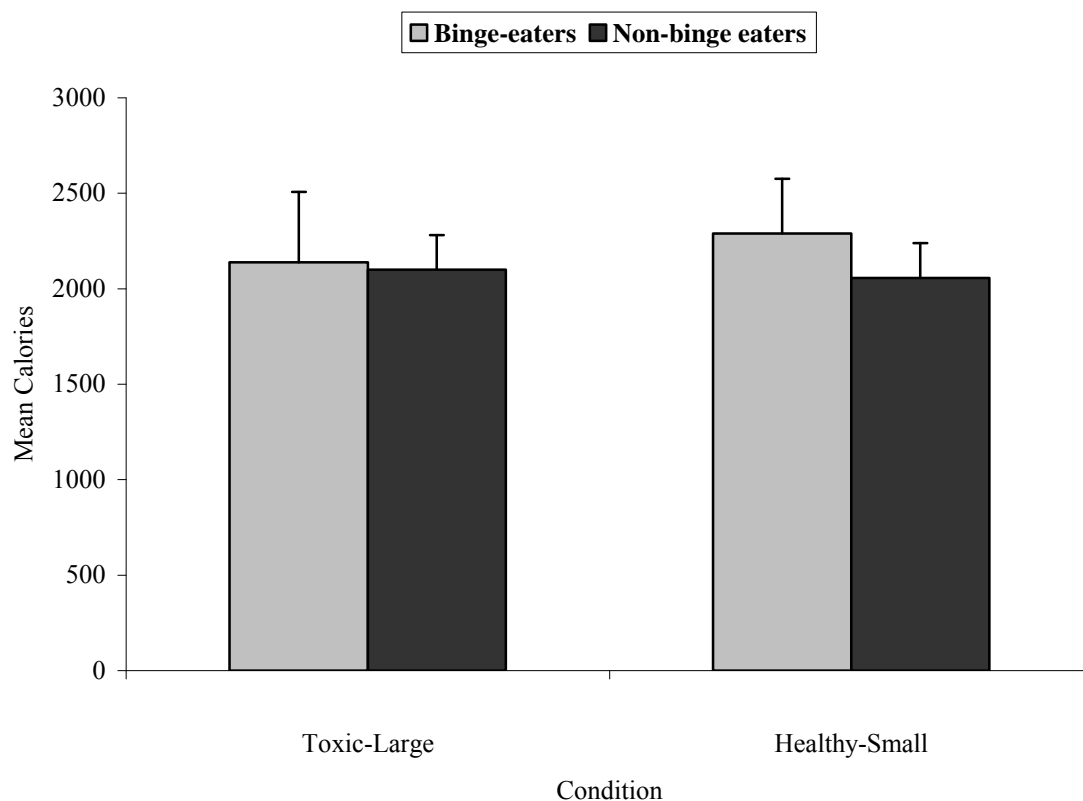
*Figure 5.* Total mean calories (+SE) consumed by participants (n=80) during the 24 hours following the experimental session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve).

As discussed in the preliminary results and above, under Hypothesis One, there were significant differences between conditions on Binge-Eating Symptoms, necessitating that this variable be accounted for in all analyses. When Binge-Eating Symptom status was entered into the initial 2x2 ANCOVA analysis, it was not a significant covariate,  $F(1,75) = 0.39, p = .54, \eta^2 = .01$ , and it did not change results of the initial data analysis. There was no main effect for advertising condition,  $F(1,75) = 0.80, p = .38, \eta^2 = .01$ , nor for package-size condition,  $F(1,75) = 0.30, p = .59, \eta^2 = .00$ . In addition, there was no interaction between

advertising condition and packaging condition on calories consumed in session,  $F(1,75) = 0.24, p=.63, \eta^2 = .00$ .

*Hypothesis Two: Exploratory Analyses*

Similar to Hypothesis One where it was possible that Binge-Eating Symptoms may have been contributing to eating behavior, it was also possible that participants with Binge-Eating Symptoms would consume more calories in the 24 hours following the study, compared to participants without Binge-Eating Symptoms. Again, there were three participants with Binge-Eating Symptoms who were exposed to the Toxic-Large condition and five participants who were exposed to the Healthy-Small condition. Results of a univariate ANOVA indicate no significant main effect for Binge-Eating Symptom status,  $F(1,36) = 0.36, p=.55, \eta^2 = .01$ , or for experimental condition,  $F(1,36) = 0.00, p=.95, \eta^2 = .00$ . In addition, there was not a significant interaction between these two variables,  $F(1,36) = 0.20, p=.66, \eta^2 = .01$ . On average, Binge-Eating Symptom participants consumed  $2138.33 \pm 535.73$  calories in the Toxic-Large condition and  $2289.20 \pm 686.06$  calories in the Healthy-Small condition. These mean values are presented in Figure 6 below. Results of the univariate ANOVA indicated no significant differences between conditions on eating behavior in the 24 hours following the study for those who met criteria for Binge-Eating Symptom,  $F(1,6) = 0.10, p=.76, \eta^2 = .02$ .



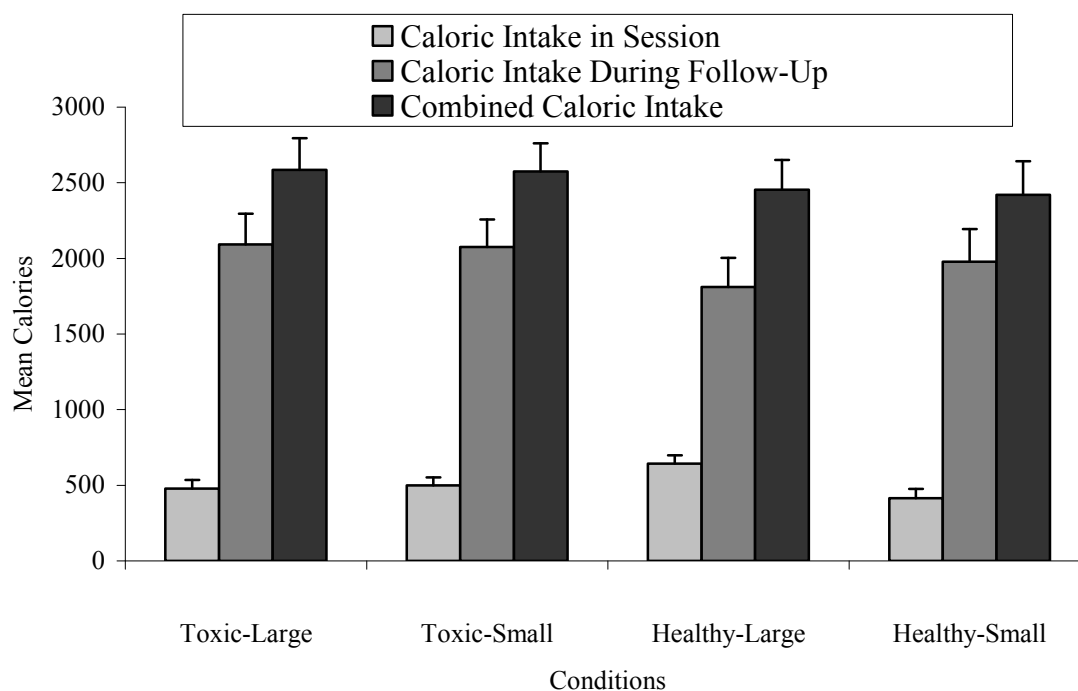
*Figure 6.* Total mean calories (+SE) consumed in the 24-hours following the study by participants (n=8) who met criteria for Binge-Eating Symptoms according to experimental condition.

#### *Hypothesis One and Two: Exploratory Analyses*

The process of food regulation may be contributing to the previous analyses, where participants who consumed larger quantities of food in session may have regulated this intake by decreasing the amount of food that they consumed in the 24 hours following the study.

Therefore, the effect of food condition on the combined eating in session and in the 24 hours following the study was also examined. For the following analyses, individuals who endorsed Binge-Eating Symptoms were excluded. On average, participants exposed to the Toxic-Large condition consumed  $2621.62 \pm 807.60$  combined calories, participants exposed to the Toxic-Small condition consumed  $2574.47 \pm 891.54$  combined calories, participants exposed to the

Healthy-Large condition consumed  $2454.84 \pm 911.50$  combined calories, and participants exposed to the Healthy-Small condition consumed  $2556.22 \pm 841.78$  combined calories. These mean scores are presented in Figure 7.



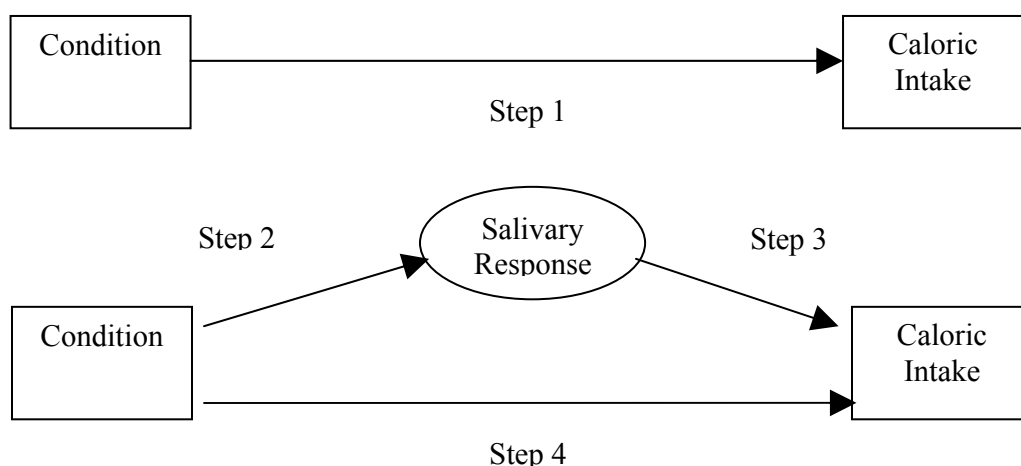
*Figure 7.* Total mean calories (+SE) consumed by non-binge eating participants (n=72) according to experimental condition.

Results of analyses testing Hypothesis One demonstrated that participants in the Healthy-Large condition consumed significantly fewer calories in session than participants exposed to the other conditions. Results of analyses testing Hypothesis Two demonstrated no significant differences between groups. A visual inspection of the graph, however, shows that those in the Healthy-Large condition consumed slightly fewer calories than participants in the other conditions. Therefore, a 2x2 ANOVA was conducted to examine the effects of the advertising condition and the packaging condition on combined eating behavior (calories

consumed in session plus calories consumed in the following 24-hours). No statistically significant group differences emerged for the main effect of advertising condition,  $F(1,68) = 0.48, p=.49, \eta^2 = .01$ , or the main effect of package-size condition,  $F(1,68) = 0.01, p=.91, \eta^2 = .00$ . In addition, the interaction between these two conditions was not significant,  $F(1,68) = 0.003, p=.96, \eta^2 = .00$ .

*Hypothesis Three: Contributions of Cephalic Phase Salivary Response*

Hypothesis Three sought to test the possible mediating effect of cephalic phase salivary response on the causal relationship between the experimental condition and the subsequent eating behavior in session. Cephalic phase salivary response was defined as the difference between the salivary response prior to any experimental manipulation and the salivary response after the presentation of the advertising stimuli (i.e., the toxic advertising vs. the healthy advertising) but prior to any food presentation. In addition, considering the effects of binge-eating on eating behaviors in session, participants ( $n=8$ ) endorsing Binge-Eating Symptoms as defined previously were excluded from the following analyses due to unequal distribution across conditions.



*Figure 8.* Mediation analysis for Hypothesis Three

As a first step in a mediation analysis, regression analysis was conducted to test the direct effect or the predictive value of the group condition on calories consumed in the experimental session (see Figure 8). The results for this step were not significant,  $F(1,72) = 1.48, p=.23$ . Regression coefficients for this step are provided in Table 5.

The second step in this mediation analysis also used regression to test the predictive value of the group condition on the cephalic phase salivary response (see Figure 8). Again results were not significant,  $F(1,72) = 0.57, p=.45$ . Specific regression coefficients for the condition variable are provided in Table 5.

Regression was also used to test the effect of step three, which examined the predictive value of cephalic phase salivary response on calories consumed during the experimental session (see Figure 8). Again, results were not significant,  $F(1,72) = 0.239, p=.63$ . Regression coefficients of cephalic phase salivary response are provided in Table 5.

The final step in the mediation analysis, step four, was tested using a step-wise multiple regression analysis. To predict caloric intake, group condition was entered in the first step, followed by cephalic phase salivary response entered in the second step. Again, results were not significant,  $F(1,71) = 0.92, p=.40$ . Regression coefficients for group condition and cephalic phase salivary response for this step are provided in Table 5.

Table 5

*Regression Coefficients of Mediation Model (n=74)*

	B (SE)	95% CI	$\beta$	t
<i>Step 1: Predicting Caloric Intake</i>				
Condition	-32.58 (26.71)	-85.83 to 20.67	-.142	-1.22 <i>ns</i>
<i>Step 2: Predicting Salivary Response</i>				
Condition	.018 (.023)	-.029 to .064	.089	.756 <i>ns</i>
<i>Step 3: Predicting Caloric Intake</i>				
Salivary Response	66.66 (136.27)	-205.0 to 338.3	.058	.489 <i>ns</i>
<i>Step 4: Predicting Caloric Intake</i>				
Condition	-34.02 (26.94)	-87.73 to 19.70	-.149	-1.26 <i>ns</i>
Salivary Response	81.91 (136.25)	-189.8 to 353.6	.071	.601 <i>ns</i>

Note. CI = confidence interval. *ns* = non-significant.

Step 1:  $R^2=.020$ ,  $R^2_{adj}=.007$ .

Step 2:  $R^2=.008$ ,  $R^2_{adj}=-.006$ .

Step 3:  $R^2=.003$ ,  $R^2_{adj}=-.011$ .

Step 4:  $R^2=.025$ ,  $R^2_{adj}=-.002$ .

Considering that all four steps of this mediation model must be significant to demonstrate a mediation effect for cephalic phase salivary response between the group condition and calories consumed in the experimental session, results do not support mediation.

As noted for Hypothesis One and Two, however, it is possible that lack of statistical power may have contributed to these non-significant results. Therefore, a more appropriate method of determining mediation in instances of low statistical power – the test of joint significance – was examined. Instead of requiring that all steps of the previous mediation model be significant, the test of joint significance only requires that steps two and three be significant to support an inference of mediation. Again, the data presented above do not support mediation based on this method, as both steps two and three were non-significant.



*Hypothesis Three: Exploratory Analyses*

Hypothesis Three demonstrated that the cephalic phase salivary response did not mediate the relationship between the experimental condition and subsequent eating behavior. It is possible that the use of the difference score between salivary responses may have contributed to these non-significant effects. Therefore, the previous mediation analyses were repeated, this time using the salivary response after exposure to the advertising stimuli but before exposure to the food stimuli in place of the difference score that was calculated previously. Unfortunately, this mediation model also was not statistically significant and did not support the hypothesis of salivary response, mediating the relationship between the experimental condition and caloric intake in session. Results of step two, where the experimental condition was regressed on salivary response, were not significant,  $F(1,72) = 0.00, p=.97$ . Step three, where salivary response was regressed on caloric intake, was also not significant,  $F(1,72) = 1.45, p=.23$ . The final step where both the experimental condition and the salivary response were regressed on caloric intake was also not significant,  $F(1,72) = 1.47, p=.24$ . Table 6 lists the specific regression coefficients of this model.

Table 6

*Regression Coefficients of Mediation Model (n=74)*

	B (SE)	95% CI	$\beta$	t
<i>Step 1: Predicting Caloric Intake</i>				
Condition	-32.58 (26.71)	-85.83 to 20.67	-.142	-1.22 <i>ns</i>
<i>Step 2: Predicting Salivary Response</i>				
Condition	-.001 (.03)	-.060 to .058	-.005	-.042 <i>ns</i>
<i>Step 3: Predicting Caloric Intake</i>				
Salivary Response	128.0 (106.1)	-83.59 to 339.5	.141	1.21 <i>ns</i>
<i>Step 4: Predicting Caloric Intake</i>				
Condition	-34.42 (26.63)	-85.52 to 20.68	-.142	-1.22 <i>ns</i>
Salivary Response	127.3 (105.8)	-83.58 to 338.2	.14	1.20 <i>ns</i>

Note. CI = confidence interval. *ns* = non-significant.

Step 1:  $R^2=.020$ ,  $R^2_{adj}=.007$ .

Step 2:  $R^2=.000$ ,  $R^2_{adj}=-.014$ .

Step 3:  $R^2=.020$ ,  $R^2_{adj}=.006$ .

Step 4:  $R^2=.040$ ,  $R^2_{adj}=.013$ .

Rather than mediation, it was possible that the relationship between experimental condition and caloric intake could have been moderated by salivary response. Initially, this hypothesis was tested using the difference score between baseline salivary response and salivary response after exposure to the advertising stimuli but before the food stimuli. This variable was one of the predictors of total caloric intake in the experimental session. In addition, the experimental condition and the interaction between the experimental condition and the difference salivary response score were predictors entered into a hierarchical regression analysis. The final model was not statistically significant,  $F(3,70) = 0.65$ ,  $p=.59$ , and did not support the hypothesis that salivary response was moderating the effect between experimental condition and caloric intake. Specific regression coefficients are provided below in Table 7.

Table 7

*Regression Coefficients of Moderation Model (n=74)*

	B (SE)	95% CI	$\beta$	t
<i>Step 3: Final Model</i>				
Condition	-35.88 (27.62)	-90.96 to 19.20	-.157	-1.30 <i>ns</i>
Salivary Response	-4.16 (279.7)	-562.0 to 553.7	-.004	-.015 <i>ns</i>
Condition x Salivary Response	37.96 (107.5)	-176.5 to 252.4	.086	.353 <i>ns</i>

Note. CI = confidence interval. *ns* = non-significant. Final Model:  $R^2=.027$ ,  $R^2_{adj}=-.015$ .

Again, it was possible that using a difference score may have limited the variance in the analysis. Therefore, the previous analysis was repeated using salivary response after exposure to the advertising stimuli but before exposure to the food stimuli as a predictor rather than the difference score. Results of this hierarchical regression analysis were also non-significant,  $F(3,70) = 1.35$ ,  $p=.27$ , and did not support the hypothesis of a moderating effect. Specific regression coefficients are presented in Table 8 below.

Table 8

*Regression Coefficients of Moderation Model (n=74)*

	B (SE)	95% CI	$\beta$	t
<i>Step 3: Final Model</i>				
Condition	-63.29 (39.66)	-142.4 to 15.81	-.276	-1.60 <i>ns</i>
Salivary Response	-86.91 (229.8)	-545.2 to 371.4	-.096	-.378 <i>ns</i>
Condition x Salivary Response	91.60 (87.24)	-82.40 to 265.6	.297	1.05 <i>ns</i>

Note. CI = confidence interval. *ns* = non-significant. Final Model:  $R^2=.027$ ,  $R^2_{adj}=-.015$ .

*Hypothesis Four: Experimental Effects with Restrained Eaters*

Restrained eaters were classified according to responses on the TFEQ. Table 9 lists the demographics and characteristics of all participants according to their self-reported eating restraint status (i.e., restrained eater = 10 and higher on TFEQ; non-restrained eater scored = below 10 on the TFEQ). There were significant differences between restrained eaters and non-restrained eaters on a variety of body image measures assessed by the MBSRQ-AS. On

the Appearance Orientation, restrained eaters had a stronger orientation towards their appearance than non-restrained eaters,  $t(80) = 2.08, p < .05$ . They also were less satisfied with parts of their bodies, as assessed by the Body Areas Satisfaction scale,  $t(57.4) = -3.05, p < .01$ . In addition, they also were more likely to be preoccupied with being overweight, as assessed by the Overweight Preoccupation scale,  $t(80) = 6.45, p < .001$ . Restrained eaters also endorsed a higher rate of disordered eating patterns as assessed by the EAT-26,  $t(27.9) = 3.12, p < .01$ .

Table 9

*Demographics and Characteristics of Participants by Eating-Restraint Status<sup>a</sup>*

	Restrained Eater (n=22)	Non- restrained Eater (n=60)	<i>p</i>
<i>Demographics</i>			
Age (in years)	19.5±2.8	19.7±2.3	<i>ns</i>
Race – Caucasian	19 (86.4)	43 (71.7)	<i>ns</i>
Relationship Status – Never Married	19 (90.5)	48 (82.8)	<i>ns</i>
Employment Status – Unemployed, Full-time Student	8 (36.4)	21 (35.6)	<i>ns</i>
Smoked 100 cigarettes in lifetime	1 (4.5)	5 (8.3)	<i>ns</i>
Level of Education (in years)	13.6±3.0	13.5±1.7	<i>ns</i>
BMI (in kg/m <sup>2</sup> )	25.0±4.6	23.9±5.4	<i>ns</i>
<i>Eating Characteristics</i>			
Disordered Eating Score (EAT-26)	<b>11.5±7.0</b>	<b>6.5±4.6</b>	<b>&lt;.01</b>
Sensitivity to Food Cues Score (PFS)	45.6±16.8	46.4±16.8	<i>ns</i>
Reported being on a special diet (QEWP-R)	1 (4.5)	4 (8.7)	<i>ns</i>
Reported Binge-Eating Behavior (QEWP-R)	5 (22.7)	13 (21.7)	<i>ns</i>
Reported Binge-Eating Symptom (QEWP-R)	2 (9.1)	6 (10.0)	<i>ns</i>
Disinhibition Score (TFEQ)	5.7±3.8	5.7±2.8	<i>ns</i>
Hunger Score (TFEQ)	4.7±2.9	5.8±3.7	<i>ns</i>
Fast Food Frequency (times/wk)	1.4±1.3	2.0±2.0	<i>ns</i>
Restaurant Frequency (time/wk)	5.0±4.2	4.6±5.2	<i>ns</i>
<i>Body Image Characteristics</i>			
Appearance Evaluation (MBSRQ)	3.3±0.7	3.6±0.7	<i>ns</i>
Appearance Orientation (MBSRQ)	<b>3.8±0.6</b>	<b>3.5±0.6</b>	<b>&lt;.05</b>
Body Areas Satisfaction (MBSRQ)	<b>3.1±0.5</b>	<b>3.5±0.7</b>	<b>&lt;.01</b>
Overweight Preoccupation (MBSRQ)	<b>3.3±0.7</b>	<b>2.3±0.6</b>	<b>&lt;.001</b>
Self-Classified Weight (MBSRQ)	3.3±0.5	3.2±0.6	<i>ns</i>
<i>Other Characteristics</i>			
Moderate Exercise (min/wk)	189.1±210.0	185.5±268.2	<i>ns</i>
Vigorous Exercise (min/wk)	194.1±619.7	106.1±286.2	<i>ns</i>
Depression Score (cutoff of 25)	12.5±6.5	13.0±6.1	<i>ns</i>

Note. <sup>a</sup>Values are expressed as n (%) or *M*±*SD*.

Hypothesis Four was primarily focused on eating-restrained participants who were exposed to the Toxic-Large condition (the combination of both the toxic advertising stimuli and the large packaging size of food). Therefore, the demographics and characteristics of those participants who were exposed to this condition were examined using independent

samples t-tests and chi-square analyses as appropriate, to compare restrained versus non-restrained eaters. Table 10 lists these characteristics.

Table 10

*Demographics and Characteristics of Participants Exposed to Toxic-Large Condition according to Eating-Restraint Status<sup>a</sup>*

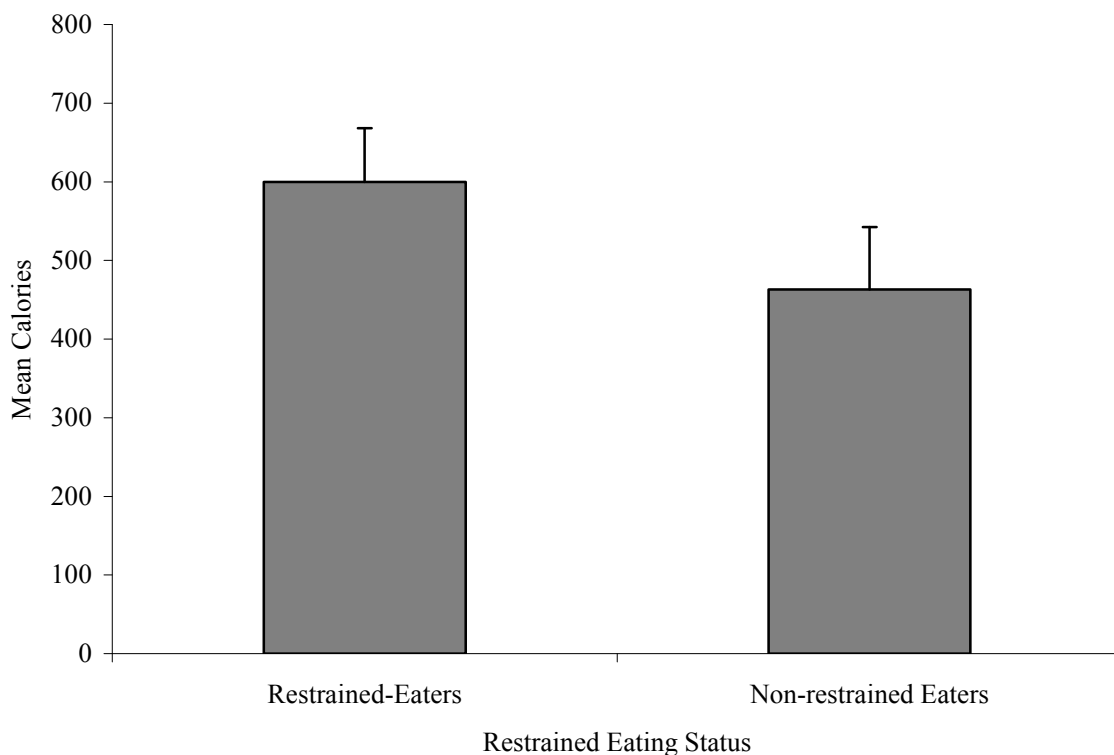
	Restrained Eater (n=7)	Non-restrained Eater (n=14)	<i>p</i>
<i>Demographics</i>			
Age (in years)	20.7±3.4	19.9±2.5	<i>ns</i>
Race – Caucasian	6 (85.7)	9 (64.3)	<i>ns</i>
Relationship Status – Never Married	4 (66.7)	13 (92.9)	<i>ns</i>
Employment Status – Unemployed, Full-time Student	2 (28.6)	9 (64.3)	<i>ns</i>
Smoked 100 cigarettes in lifetime	1 (14.3)	1 (7.1)	<i>ns</i>
Level of Education (in years)	14.1±2.0	13.1±1.8	<i>ns</i>
BMI (in kg/m <sup>2</sup> )	26.4±7.0	23.4±5.2	<i>ns</i>
<i>Eating Characteristics</i>			
Disordered Eating Score (EAT-26)	<b>9.4±6.1</b>	<b>5.2±3.2</b>	<b>&lt;.05</b>
Sensitivity to Food Cues Score (PFS)	47.1±23.3	46.4±16.9	<i>ns</i>
Reported being on a special diet (QEWP-R)	0 (0.0)	0 (0.0)	<i>ns</i>
Reported Binge-Eating Behavior (QEWP-R)	<b>3 (42.9)</b>	<b>1 (7.1)</b>	<b>&lt;.05</b>
Reported Binge-Eating Symptom (QEWP-R)	2 (28.6)	1 (7.1)	<i>ns</i>
Disinhibition Score (TFEQ)	6.3±6.2	5.1±2.4	<i>ns</i>
Hunger Score (TFEQ)	5.1±4.2	5.1±3.7	<i>ns</i>
Fast Food Frequency (times/wk)	1.4±1.3	1.2±1.4	<i>ns</i>
Restaurant Frequency (time/wk)	4.9±5.0	3.6±3.4	<i>ns</i>
<i>Body Image Characteristics</i>			
Appearance Evaluation (MBSRQ)	3.1±0.7	3.5±0.7	<i>ns</i>
Appearance Orientation (MBSRQ)	3.5±0.7	3.7±0.5	<i>ns</i>
Body Areas Satisfaction (MBSRQ)	3.1±0.6	3.6±0.7	<i>ns</i>
Overweight Preoccupation (MBSRQ)	2.9±0.7	2.3±0.7	<i>ns</i>
Self-Classified Weight (MBSRQ)	<b>3.6±0.6</b>	<b>3.0±0.5</b>	<b>&lt;.05</b>
<i>Other Characteristics</i>			
Moderate Exercise (min/wk)	75±63	267±449	<i>ns</i>
Vigorous Exercise (min/wk)	9±12	154±443	<i>ns</i>
Depression Score (cutoff of 25)	11.1±7.3	12.6±7.0	<i>ns</i>

Note. <sup>a</sup>Values are expressed as n (%) or *M*±*SD*.

Relative to non-restrained eaters, eating-restrained participants in the Toxic-Large condition were more likely to self-report disordered eating patterns as assessed by the EAT-

26,  $t(19) = 2.11, p < .05$ , and were more likely to classify themselves as overweight as assessed by the Self-Classified Weight scale of the MBSRQ-AS,  $t(19) = 2.27, p < .05$ . In addition, restrained eaters were more likely to endorse Binge-Eating Behavior,  $\chi^2(1) = 3.86, p < .05$ , but not Binge-Eating Symptom, which includes a loss of control over eating.

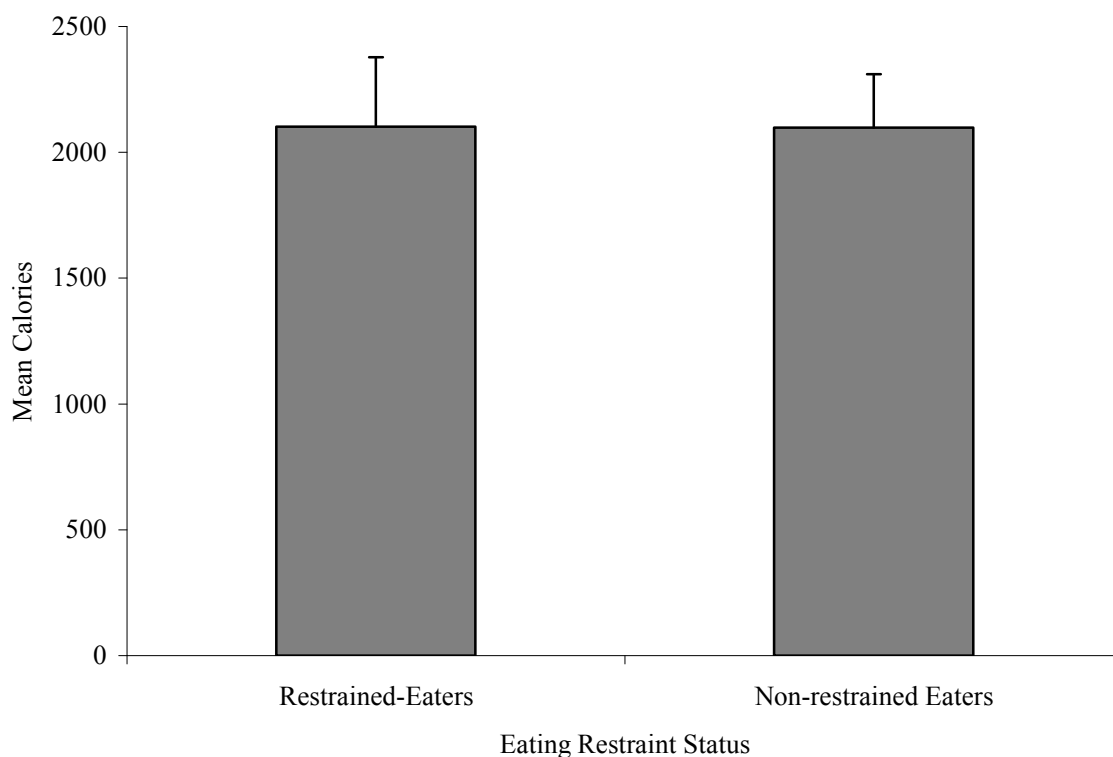
Analyses conducted to test Hypothesis Four sought to identify the effects of eating restraint status on eating behavior in the experimental session, specifically among those who were exposed to the Toxic-Large condition. On average, restrained eaters consumed  $599.74 \pm 181.34$  calories, whereas non-restrained eaters consumed  $463.12 \pm 296.35$  calories. Using a univariate ANOVA, no statistically significant group differences emerged for eating behavior in session,  $F(1,19) = 1.24, p = .28, \eta^2 = .06$ . Because observed power was only 0.18, however, the small sample size may have impacted the ability to detect a significant effect. Figure 9 shows the mean caloric intake in session according to eating-restraint status.



*Figure 9.* Total mean calories (+SE) consumed in the experimental session by participants (n=21) exposed to the Toxic-Large condition according to eating restraint status.

Analyses to test Hypothesis Four also sought to identify the effects of eating restraint status on eating behavior in the 24 hours following the study of those who were exposed to the Toxic-Large condition. On average, restrained eaters consumed  $2102.57 \pm 727.49$  calories and non-restrained eaters consumed  $2098.15 \pm 765.60$  calories. Using a univariate ANOVA, no statistically significant group differences emerged for eating behavior in the 24 hours following the study however,  $F(1,18) = 0.00$ ,  $p = .99$ ,  $\eta^2 = .00$ . Figure 10 shows the mean caloric intake in the 24 hours following the study according to eating-restraint status.





*Figure 10.* Total mean calories (+SE) consumed in the 24-hours following the study by participants (n=20) exposed to the Toxic-Large condition according to eating restraint status.

Certain covariates were regarded as relevant to these analyses, namely disordered eating patterns as assessed by the EAT-26, self-classified weight as assessed by the MBSRQ-AS, Binge-Eating Behavior, and Binge-Eating Symptoms as assessed by the QEWP-R. The previous analyses were repeated independently, using these variables as covariates, but none of these variables emerged as significant, and the results of the differences between restrained and non-restrained eaters remained non-significant in all analyses.

#### *Hypothesis Four: Exploratory Analyses*

Results of analyses conducted to test Hypothesis Four demonstrated no significant differences on eating behavior between eating-restrained participants and non-eating-restrained participants exposed to the Toxic-Large condition. However, results from analyses

testing Hypothesis One suggest there may be an effect for the Healthy-Large condition, because this was the condition that appeared to be prompting increased eating behavior in session. Therefore, the following analyses explored differences in eating behavior in eating-restrained participants versus non-eating-restrained participants who were exposed to the Healthy-Large condition. Table 11 lists the demographics and characteristics of these participants according to restrained-eating status. Preliminary analyses indicated that eating-restrained participants in the Healthy-Large condition were more likely to self-report feeling more overweight, as assessed by the MBSRQ-AS,  $t(17) = 3.62, p < .01$ , relative to non-restrained eaters. There were no other significant differences between restrained eaters and non-restrained eaters on any other demographic or characteristic variables.

Table 11

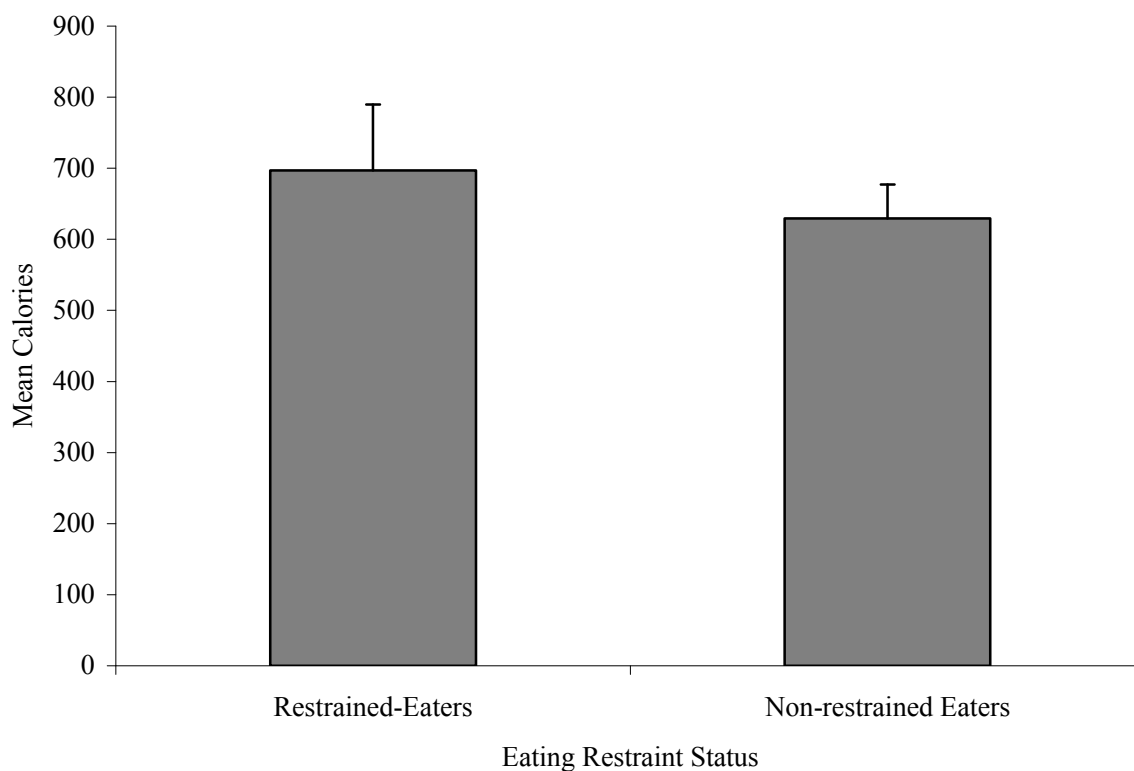
*Demographics and Characteristics of Participants Exposed to Healthy-Large Condition according to Eating-Restraint Status<sup>a</sup>*

	Restrained Eater (n=4)	Non-restrained Eater (n=15)	<i>p</i>
<u>Demographics</u>			
Age (in years)	20.3±4.5	20.4±3.2	<i>ns</i>
Race – Caucasian	3 (75.0)	9 (60.0)	<i>ns</i>
Relationship Status – Never Married	4 (100.0)	11 (78.6)	<i>ns</i>
Employment Status – Unemployed, Full-time Student	1 (25.0)	2 (14.3)	<i>ns</i>
Smoked 100 cigarettes in lifetime	0 (0.0)	1 (6.7)	<i>ns</i>
Level of Education (in years)	15.3±6.5	14.0±1.8	<i>ns</i>
BMI (in kg/m <sup>2</sup> )	25.8±1.0	24.7±4.1	<i>ns</i>
<u>Eating Characteristics</u>			
Disordered Eating Score (EAT-26)	9.3±7.7	8.2±5.3	<i>ns</i>
Sensitivity to Food Cues Score (PFS)	44.5±14.6	42.5±16.4	<i>ns</i>
Reported being on a special diet (QEWPR)	0 (0.0)	1 (6.7)	<i>ns</i>
Reported Binge-Eating Behavior (QEWPR)	0 (0.0)	3 (20.0)	<i>ns</i>
Reported Binge-Eating Symptom (QEWPR)	0 (0.0)	0 (0.0)	<i>ns</i>
Disinhibition Score (TFEQ)	6.3±0.5	5.3±2.9	<i>ns</i>
Hunger Score (TFEQ)	5.0±2.2	5.2±3.5	<i>ns</i>
Fast Food Frequency (times/wk)	1.3±1.0	1.9±1.9	<i>ns</i>
Restaurant Frequency (times/wk)	5.8±5.9	4.0±3.4	<i>ns</i>
<u>Body Image Characteristics</u>			
Appearance Evaluation (MBSRQ)	3.5±1.2	3.5±0.7	<i>ns</i>
Appearance Orientation (MBSRQ)	4.0±0.3	3.4±0.7	<i>ns</i>
Body Areas Satisfaction (MBSRQ)	3.3±0.7	3.3±0.9	<i>ns</i>
Overweight Preoccupation (MBSRQ)	<b>3.4±0.4</b>	<b>2.3±0.6</b>	<b>&lt;.01</b>
Self-Classified Weight (MBSRQ)	3.3±0.3	3.3±0.5	<i>ns</i>
<u>Other Characteristics</u>			
Moderate Exercise (min/wk)	79±51	218±258	<i>ns</i>
Vigorous Exercise (min/wk)	43±55	96±118	<i>ns</i>
Depression Score (cutoff of 25)	11.8±4.1	12.6±6.1	<i>ns</i>

Note. <sup>a</sup>Values are expressed as n (%) or *M*±*SD*.

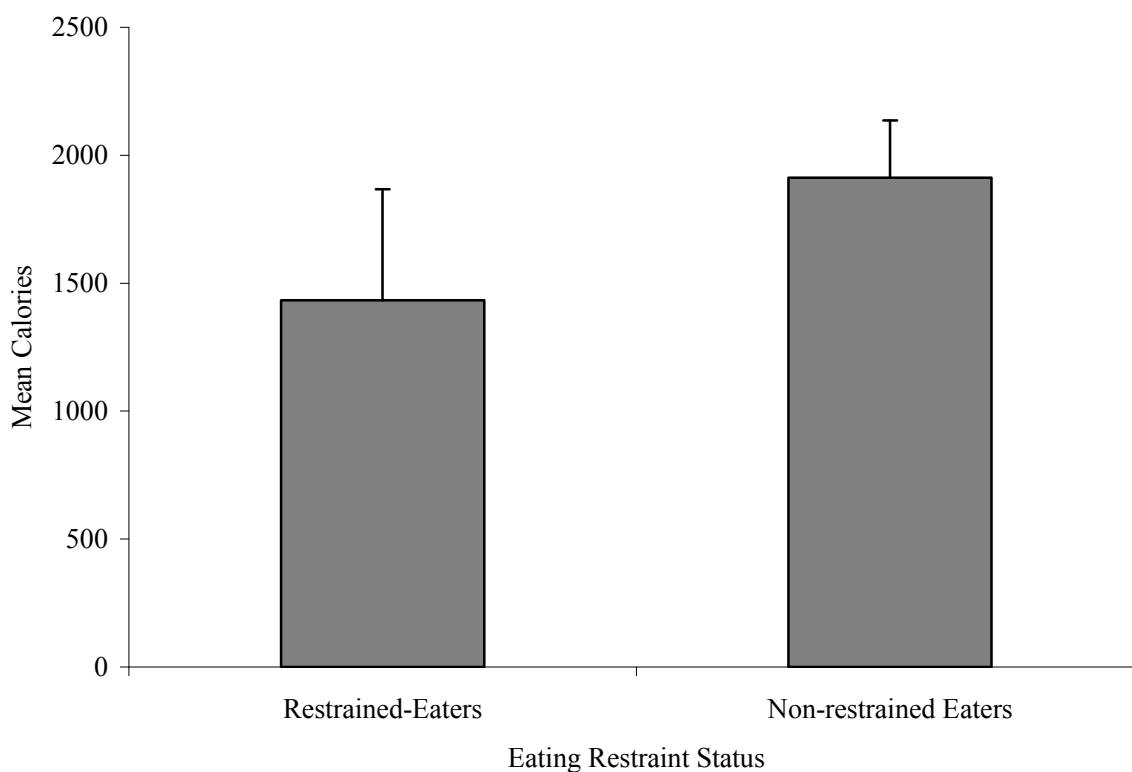
When examining Healthy-Large condition participants, restrained eaters consumed on average 696.99±233.99 calories, whereas non-restrained eaters consumed 629.20±173.48 calories. Using a univariate ANOVA, no statistically significant group differences emerged for eating behavior in session,  $F(1,17) = 0.421, p = .53, \eta^2 = .02$ . Considering the small sample

size, with observed power of only 0.09, these analyses may have lacked sufficient power to detect effects. Figure 11 shows the mean caloric intake in session according to eating-restraint status.



*Figure 11.* Total mean calories (+SE) consumed in the experimental session by participants (n=19) exposed to the Healthy-Large condition according to eating restraint status.

Caloric consumption in the 24 hours following the study for those assigned to the Healthy-Large condition was also of interest. On average, the restrained eaters consumed  $1433.75 \pm 106.44$  calories, and the non-restrained eaters consumed  $1912.07 \pm 955.26$  calories. Using a univariate ANOVA, no statistically significant group differences emerged for eating behavior in the 24 hours following the study,  $F(1,17) = 0.96$ ,  $p = .34$ ,  $\eta^2 = .05$ . Figure 12 shows the mean caloric intake in the 24 hours following the study according to eating-restraint status.

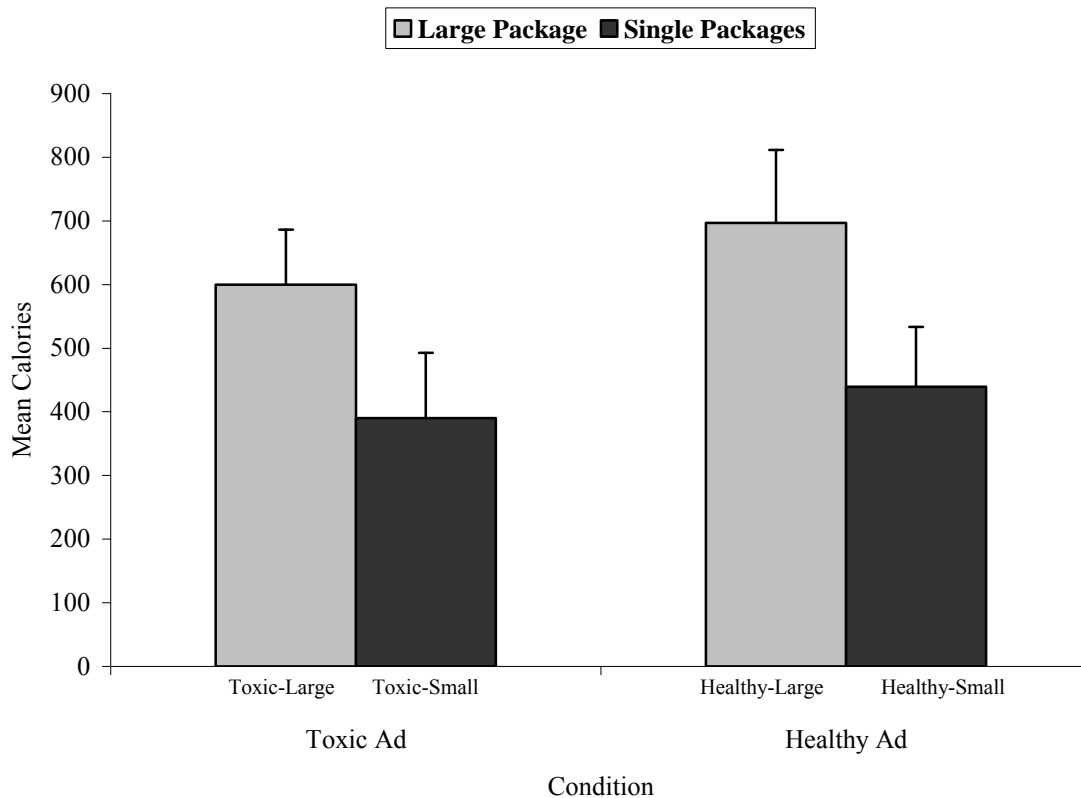


*Figure 12.* Total mean calories (+SE) consumed in the 24-hours following the study by participants (n=19) exposed to the Healthy-Large condition according to eating restraint status.

Overweight preoccupation, as assessed by the MBSRQ-AS, was also entered in to the previous analyses as a covariate to control its possible influence on the relationship between restrained-eating status and calorie consumption. The previous analyses were reanalyzed using this variable as a covariate, but it was not a significant covariate and the results of the differences between restrained and non-restrained eaters remained non-significant in all analyses.

It was also of interest to explore the eating patterns in only restrained eaters across experimental conditions. It was hypothesized that restrained eaters would eat more in session and in the following 24 hours when exposed to the Toxic-Large condition than to other conditions. To examine this hypothesis, a 2x2 univariate ANOVA was conducted, with

advertising group and packaging group as factors. On average, restrained eaters consumed  $599.74 \pm 181.34$  in the Toxic-Large condition and  $390.24 \pm 192.82$  calories in the Toxic-Small condition. In addition, they consumed  $696.99 \pm 233.99$  calories in the Healthy-Large condition and  $439.60 \pm 295.95$  calories in the Healthy-Small condition. Results yielded a significant main effect for package size,  $F(1,18) = 5.49, p < .05, \eta^2 = .23$ , but not for advertising condition,  $F(1,18) = 0.54, p = .47, \eta^2 = .03$ . In addition, there was no interaction effect between package size and advertising condition,  $F(1,18) = 0.06, p = .81, \eta^2 = .00$ . These results are graphically depicted in Figure 13.

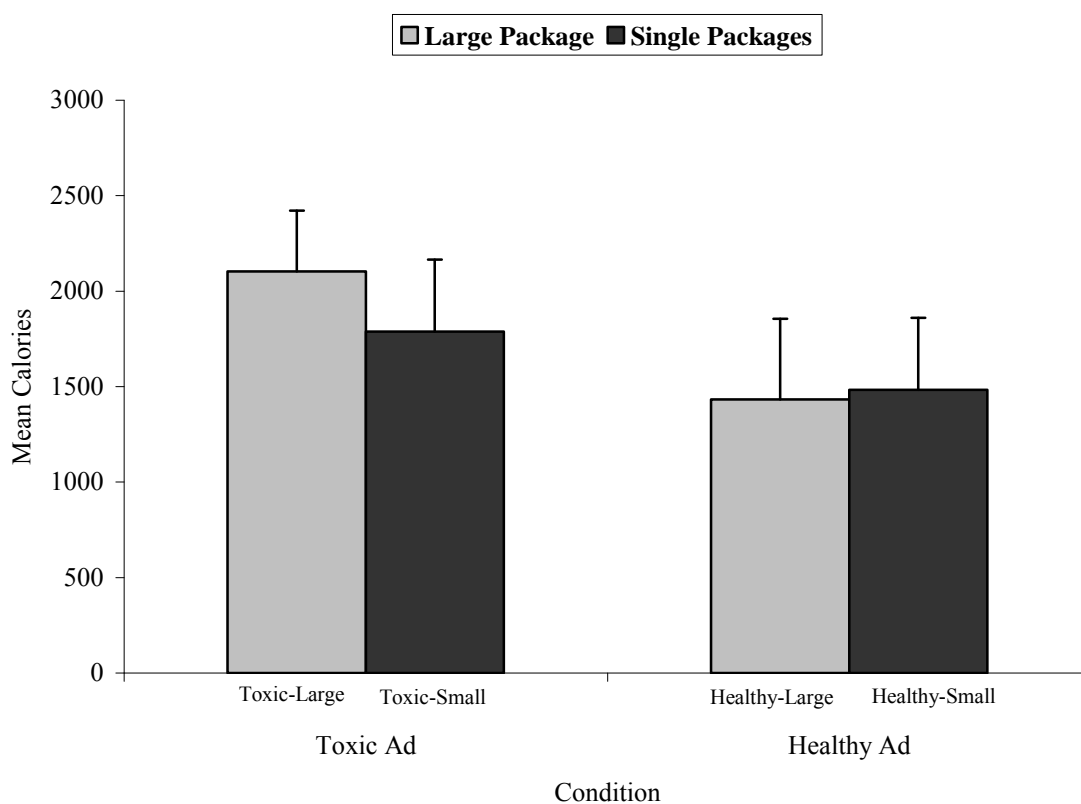


*Figure 13.* Total mean calories (+SE) consumed by eating-restrained participants ( $n=22$ ) in session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve).

A similar analysis was conducted to explore the effect of the experimental condition on eating behavior in the 24 hours following the study. On average, eating-restrained

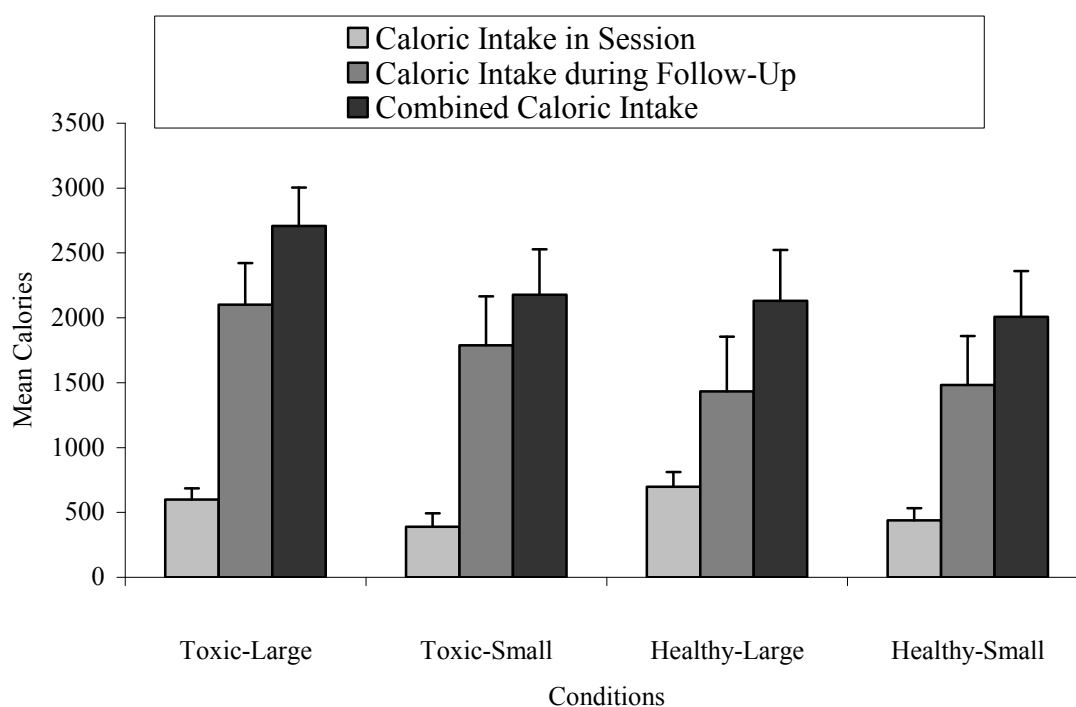
participants exposed to the Toxic-Large condition consumed  $2102.57 \pm 727.49$  calories,  $1787.60 \pm 1463.24$  calories when exposed to the Toxic-Small condition,  $1433.75 \pm 106.44$  calories when exposed to the Healthy-Large condition, and  $1482.80 \pm 284.90$  calories when exposed to the Healthy-Small condition.

Using a 2x2 ANOVA, no statistically significant group differences emerged for either the advertising condition,  $F(1,17) = 1.68, p = .21, \eta^2 = .09$ , or for the package-size condition,  $F(1,17) = 0.13, p = .73, \eta^2 = .01$ . In addition, there was not a significant effect for the interaction between these two variables,  $F(1,17) = 0.24, p = .63, \eta^2 = .01$ . These results are shown below in Figure 14.



*Figure 14.* Total mean calories (+SE) consumed by eating-restrained participants (n=21) in the 24-hours following the experimental session according to advertising condition (toxic vs. healthy) and package-size condition (large vs. single-serve).

Finally, a combined analysis was conducted to explore the effect of experimental condition on total eating behavior – that is, the summation of caloric intake in session and in the 24 hours following the study. On average, eating-restrained participants exposed to the Toxic-Large condition consumed  $2702.31 \pm 750.48$  calories,  $2177.84 \pm 1295.22$  calories when exposed to the Toxic-Small condition,  $2130.74 \pm 152.67$  calories when exposed to the Healthy-Large condition, and  $2008.60 \pm 271.59$  calories when exposed to the Healthy-Small condition. Figure 15 shows the mean combined caloric intake in addition to caloric intake in session and during follow-up according to experimental condition.



*Figure 15.* Total mean calories (+SE) consumed by eating-restrained participants (n=21) according to experimental condition and time.

Using a 2x2 ANOVA, no statistically significant group differences emerged for either the advertising condition,  $F(1,17) = 1.13, p = .30, \eta^2 = .06$ , or for the package-size condition,



$F(1,17) = 0.86, p=.37, \eta^2 = .05$  on combined caloric intake. In addition, there was no significant interaction effect between these two independent variables,  $F(1,17) = 0.33, p=.57, \eta^2 = .02$ .

*Hypothesis Five: Exploratory Analyses*

Analyses conducted to test Hypothesis Five aimed to identify the impact of the experimental conditions according to different weight-related characteristics. The initial characteristic of interest was weight status, classified as either normal weight or overweight. Initial descriptive statistics revealed a sufficient number of overweight participants ( $n=28$ ) to support preliminary statistical analysis. Independent samples t-tests and chi-square analyses were conducted to determine if there were significant differences between these two groups on various demographics and characteristics (see Table 12 for details).

Table 12

*Demographics and Characteristics of Participants according to Weight Classification<sup>a</sup>*

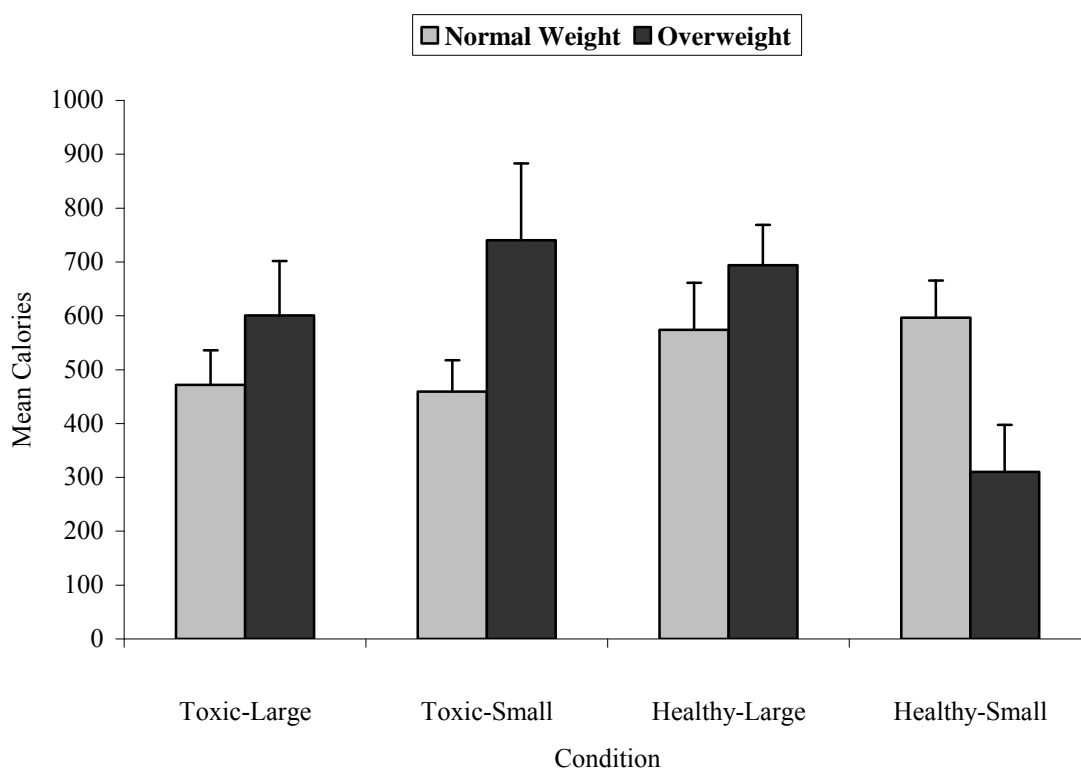
	Normal weight (n=54)	Overweight (n=28)	<i>p</i>
<i>Demographics</i>			
Age (in years)	19.8±2.2	19.7±2.8	<i>ns</i>
Race – Caucasian	44 (81.5)	18 (64.3)	<i>ns</i>
Relationship Status – Never Married	45 (86.5)	22 (81.5)	<i>ns</i>
Employment Status – Unemployed, Full-time Student	20 (37.7)	9 (32.1)	<i>ns</i>
Smoked 100 cigarettes in lifetime	5 (9.3)	1 (3.6)	<i>ns</i>
Level of Education (in years)	13.8±2.3	13.1±1.5	<i>ns</i>
BMI (in kg/m <sup>2</sup> )	<b>21.3±1.6</b>	<b>29.8±5.3</b>	<b>&lt;.001</b>
<i>Eating Characteristics</i>			
Disordered Eating Score (EAT-26)	7.3±5.5	8.8±6.3	<i>ns</i>
Sensitivity to Food Cues Score (PFS)	<b>48.8±18.1</b>	<b>41.2±12.4</b>	<b>&lt;.05</b>
Reported being on a special diet (QEWPR)	3 (5.6)	2 (7.1)	<i>ns</i>
Reported Binge-Eating Behavior (QEWPR)	13 (24.1)	5 (17.9)	<i>ns</i>
Reported Binge-Eating Symptom (QEWPR)	7 (13.0)	1 (3.6)	<i>ns</i>
Dietary Restraint Score (TFEQ)	<b>7.1±4.4</b>	<b>8.9±4.1</b>	<b>=.09</b>
Disinhibition Score (TFEQ)	5.8±3.3	5.5±2.8	<i>ns</i>
Hunger Score (TFEQ)	<b>6.0±3.9</b>	<b>4.5±2.7</b>	<b>&lt;.05</b>
Fast Food Frequency (times/wk)	1.8±2.0	2.0±1.6	<i>ns</i>
Restaurant Frequency (times/wk)	4.6±5.0	5.0±5.0	<i>ns</i>
<i>Body Image Characteristics</i>			
Appearance Evaluation (MBSRQ)	<b>3.6±0.7</b>	<b>3.2±0.7</b>	<b>&lt;.05</b>
Appearance Orientation (MBSRQ)	3.5±0.6	3.7±0.7	<i>ns</i>
Body Areas Satisfaction (MBSRQ)	<b>3.6±0.6</b>	<b>3.1±0.6</b>	<b>&lt;.01</b>
Overweight Preoccupation (MBSRQ)	2.5±0.8	2.7±0.8	<i>ns</i>
Self-Classified Weight (MBSRQ)	<b>3.0±0.5</b>	<b>3.7±0.5</b>	<b>&lt;.001</b>
<i>Other Characteristics</i>			
Moderate Exercise (min/wk)	156.0±157.1	245.2±370.9	<i>ns</i>
Vigorous Exercise (min/wk)	84.2±211.1	217.5±618.6	<i>ns</i>
Depression Score (cutoff of 25)	13.0±6.2	12.7±6.4	<i>ns</i>

Note. <sup>a</sup>Values are expressed as n (%) or *M*±*SD*.

Overweight women reported less satisfaction with their appearance,  $t(80) = 2.417$ ,  $p < .05$ , and less satisfaction with specific body areas as assessed by the MBSRQ,  $t(80) = 3.069$ ,  $p < .01$ , than normal weight women. Overweight women also classified themselves as more overweight than normal weight women,  $t(80) = -6.156$ ,  $p < .001$ . Interestingly, normal

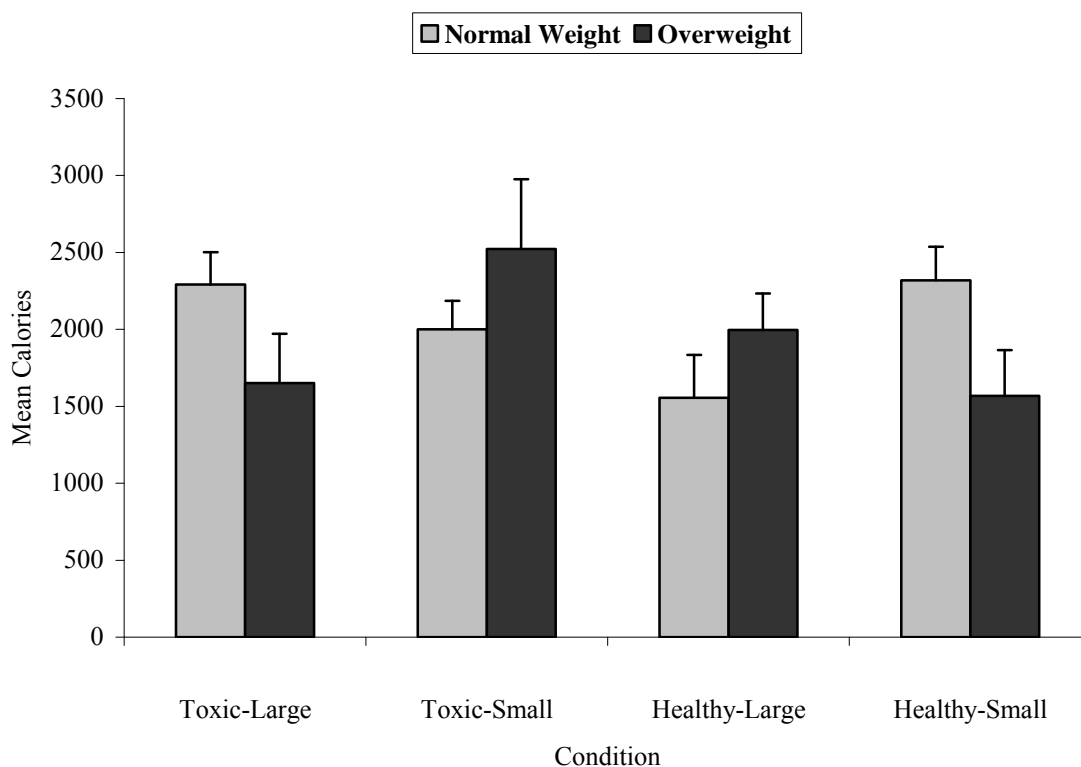
weight women reported being more sensitive to food cues as assessed by the PFS,  $t(74.0) = 2.233, p < .05$ , and being more hungry as assessed by the TFEQ,  $t(73.5) = 2.117, p < .05$ . There was a trend for overweight women to report higher levels of eating restraint as assessed by the TFEQ than normal weight women,  $t(80) = -1.76, p = .09$ .

Results of the 2x4 ANOVA examining caloric intake in the experimental session demonstrated no main effects for weight category,  $F(1,74) = 0.925, p = .34, \eta^2 = .01$ , or experimental condition,  $F(1,74) = 1.87, p = .14, \eta^2 = .07$ . There was, however, a significant interaction between experimental condition and weight category,  $F(3,74) = 4.01, p < .05, \eta^2 = .14$ . These results are graphically depicted in Figure 16.



*Figure 16.* Total mean calories (+SE) consumed by participants (n=82) in the experimental session according to experimental condition and weight status.

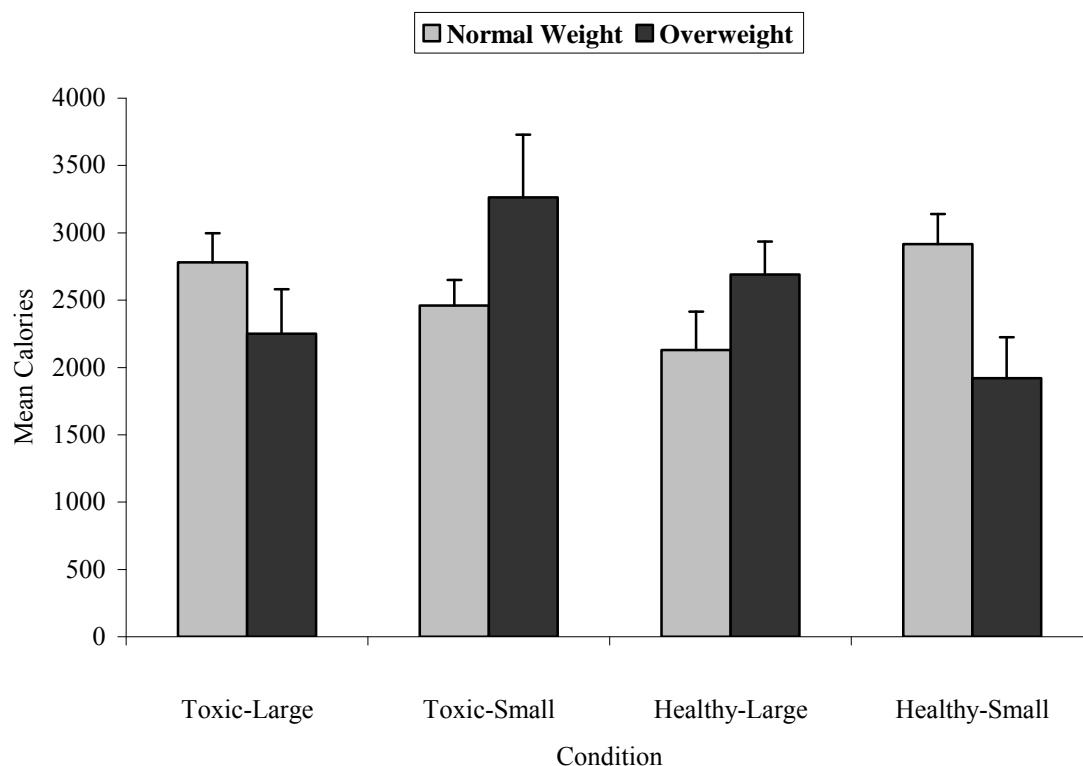
The effect of experimental condition and weight category on eating behavior in the 24 hours following the study was also of interest. Therefore, a 2x4 univariate ANOVA was conducted. Again, there were no main effects for either the weight category,  $F(1,72) = 0.284$ ,  $p = .60$ ,  $\eta^2 = .00$ , or experimental condition,  $F(3,72) = 0.843$ ,  $p = .48$ ,  $\eta^2 = .03$ . However, there was a significant interaction between these two variables,  $F(3,72) = 2.93$ ,  $p < .05$ ,  $\eta^2 = .11$ . These results are presented in Figure 17.



*Figure 17.* Total mean calories (+SE) consumed by participants ( $n=80$ ) in the 24-hours following the experimental session according to experimental condition and weight status.

Considering that regulation of eating may have been contributing to the outcome of these analyses, a 2x4 ANOVA was conducted using a combined caloric intake in session as the dependent variable. No statistically significant group differences emerged for weight category,  $F(1,72) = 0.038$ ,  $p = .85$ ,  $\eta^2 = .00$ , or experimental condition,  $F(3,72) = 0.820$ ,

$p=.49$ ,  $\eta^2 = .03$ . However, there was a significant interaction between these two variables,  $F(3,72) = 4.37$ ,  $p<.01$ ,  $\eta^2 = .15$ . These results are presented in Figure 18.



*Figure 18.* Total mean combined calories (+SE) consumed by participants ( $n=80$ ) in both the experimental session and the following 24-hours according to experimental condition and weight status.

Additional univariate ANOVAs were conducted using only the overweight participants to understand the effects of the experimental condition on eating behavior in this population. Results indicate significant differences between conditions,  $F(3,24) = 5.90$ ,  $p<.01$ ,  $\eta^2 = .43$ , on eating behavior in session. Post hoc analyses indicate overweight participants consumed significantly fewer calories in the Healthy-Small condition than the Toxic-Large condition ( $p<.05$ ), the Toxic-Small condition ( $p<.01$ ), and the Healthy-Large condition ( $p<.01$ ).

Results examining eating behavior in the 24 hours following the study demonstrated no significant differences between conditions,  $F(3,23) = .994, p = .41, \eta^2 = .12$ . In addition, there were no significant differences in conditions on combined eating behavior when calories consumed in session were added to the calories consumed in the 24 hours following the study,  $F(3,23) = 1.87, p = .16, \eta^2 = .20$ . However, when examining combined calories consumed in the Healthy condition opposed to the mean of all the other conditions using a univariate ANOVA, there was a trend towards those exposed to the Healthy condition consuming less combined calories,  $F(1,25) = 1.12, p = .09, \eta^2 = .11$ . Those in the Healthy-Small condition consumed  $1920.57 \pm 697.8$  calories in session and in the following 24 hours, and those in the other three conditions consumed  $2644.83 \pm 997.0$  combined calories. Mean caloric intake according to condition and time are displayed in Figure 19.

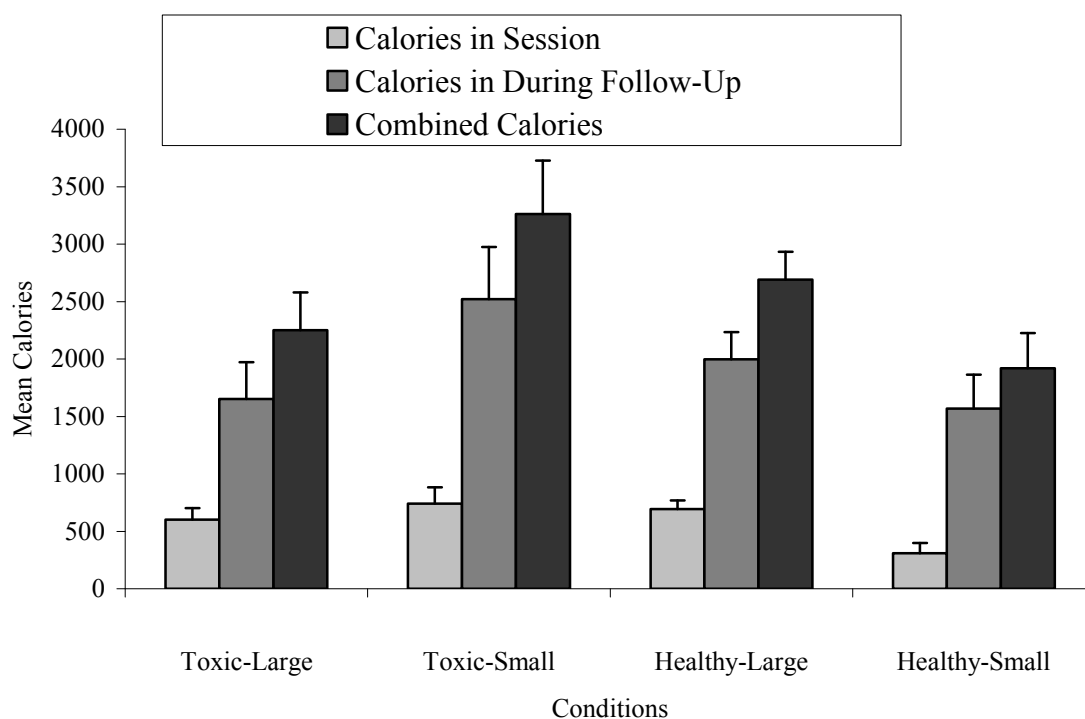


Figure 19. Total mean calories (+SE) consumed by overweight participants (n=27) according to experimental condition and time.

Another characteristic of interest for Hypothesis Five was weight cycling status. Initial descriptive statistics showed sufficient number of participants who endorsed weight-cycling (n=17) to support statistical analysis. However, further analyses demonstrated that only one weight-cycler was randomly assigned to the Toxic-Small condition, which limits the inferences which can be drawn. Therefore, further analyses examining weight-cyclers were not conducted.

Another population of interest was the group of participants who endorsed one item on the QEWP-R regarding eating large amounts of food in the absence of feeling a sense of a loss of control over eating. Participants were classified according to whether they engaged in this form of Binge-Eating Behavior for the following analyses. Initial descriptive statistics demonstrated that 18 participants endorsed this item, with four of them assigned to the Toxic-Large condition, four to the Toxic-Small condition, three to the Healthy-Large condition, and seven to the Healthy-Small condition. This fairly even distribution permitted further exploration of the data. Independent samples t-tests and chi square analyses were used to examine for differences between those with Binge-Eating Behaviors and those without these behaviors. Table 13 lists specific demographic and characteristics of the groups.

Table 13

*Demographics and Characteristics of Participants according to Binge-eating Behavior Status<sup>a</sup>*

	Binge-eating Behavior (n=18)	Non-binge Eating Behavior (n=64)	<i>p</i>
<u>Demographics</u>			
Age (in years)	19.7±2.7	19.8±2.3	<i>ns</i>
Race – Caucasian	13 (72.2)	49 (76.6)	<i>ns</i>
Relationship Status – Never Married	16 (94.1)	51 (82.3)	<i>ns</i>
Employment Status – Unemployed, Full-time Student	6 (33.3)	23 (36.5)	<i>ns</i>
Smoked 100 cigarettes in lifetime	0 (0.0)	6 (9.4)	<i>ns</i>
Level of Education (in years)	13.1±1.2	13.6±2.3	<i>ns</i>
BMI (in kg/m <sup>2</sup> )	23.3±4.3	24.4±5.5	<i>ns</i>
<u>Eating Characteristics</u>			
Disordered Eating Score (EAT-26)	8.9±5.3	7.5±5.9	<i>ns</i>
Sensitivity to Food Cues Score (PFS)	<b>64.0±17.1</b>	<b>41.2±12.8</b>	<b>&lt;.001</b>
Reported being on a special diet (QEWPR)	1 (5.6)	4 (6.3)	<i>ns</i>
Reported Binge-Eating Symptom (QEWPR)	<b>8 (44.4)</b>	<b>0 (0.0)</b>	<b>&lt;.001</b>
Dietary Restraint Score (TFEQ)	7.6±4.2	7.7±4.4	<i>ns</i>
Disinhibition Score (TFEQ)	<b>8.2±3.4</b>	<b>5.0±2.6</b>	<b>&lt;.001</b>
Hunger Score (TFEQ)	<b>8.6±3.2</b>	<b>4.6±3.1</b>	<b>&lt;.001</b>
Fast Food Frequency (times/wk)	<b>2.7±2.1</b>	<b>1.6±1.7</b>	<b>&lt;.05</b>
Restaurant Frequency (times/wk)	5.0±5.7	4.6±4.8	<i>ns</i>
<u>Body Image Characteristics</u>			
Appearance Evaluation (MBSRQ)	3.6±0.8	3.5±0.7	<i>ns</i>
Appearance Orientation (MBSRQ)	3.7±0.5	3.6±0.6	<i>ns</i>
Body Areas Satisfaction (MBSRQ)	3.4±0.7	3.4±0.7	<i>ns</i>
Overweight Preoccupation (MBSRQ)	2.6±0.8	2.5±0.8	<i>ns</i>
Self-Classified Weight (MBSRQ)	3.3±0.7	3.2±0.6	<i>ns</i>
<u>Other Characteristics</u>			
Moderate Exercise (min/wk)	179.2±173.9	188.5±271.8	<i>ns</i>
Vigorous Exercise (min/wk)	113.1±334.3	134.4±420.0	<i>ns</i>
Depression Score (cutoff of 25)	<b>15.8±5.6</b>	<b>12.0±6.2</b>	<b>&lt;.05</b>

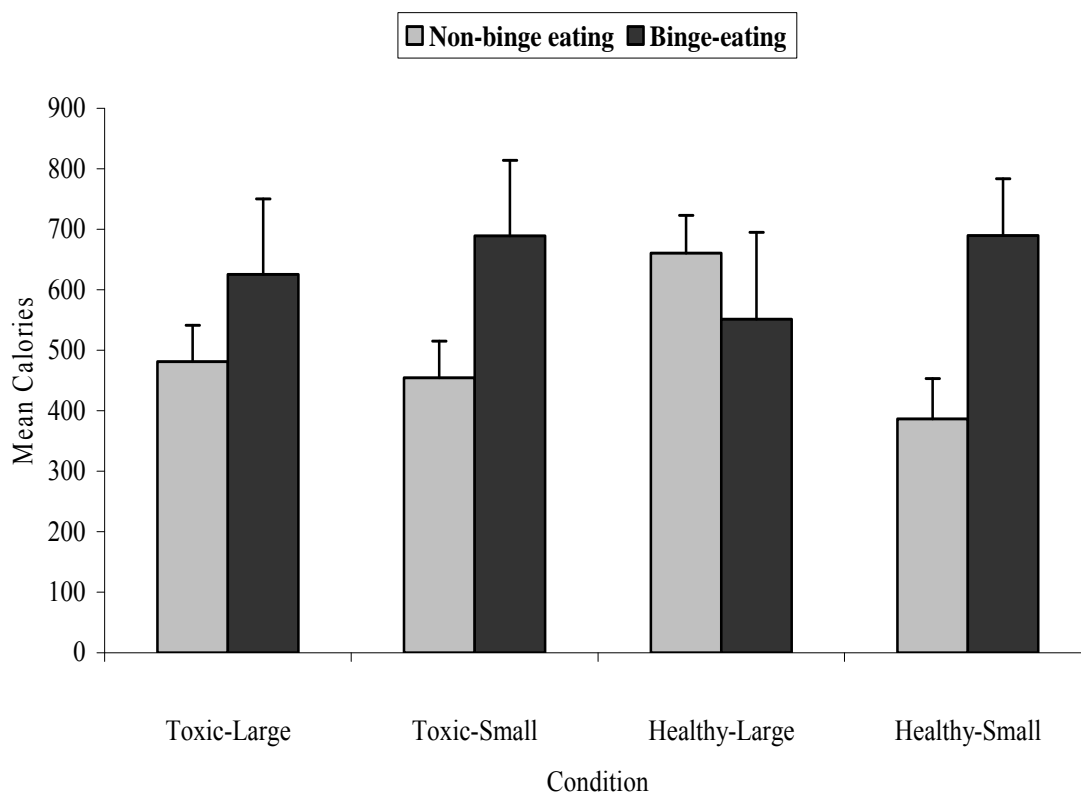
Note. <sup>a</sup>Values are expressed as n (%) or *M*±*SD*.

Those with Binge-Eating Behavior reported being significantly more depressed,  $t(80) = 2.344$ ,  $p < .05$ , and more sensitive to food cues,  $t(80) = 6.171$ ,  $p < .001$ , than those without Binge-Eating Behavior. On the TFEQ, those with Binge-Eating Behavior reported more



dietary disinhibition,  $t(80) = 4.392, p < .001$ , and higher hunger scores,  $t(80) = 4.848, p < .001$ , than those without Binge-Eating Behavior. In addition, those with Binge-Eating Behavior also reported eating more frequently in fast food restaurants,  $t(80) = 2.425, p < .05$ , than those without Binge-Eating Behavior. Results also show significant differences between groups on Binge-Eating Symptom. This chi square analysis is statistically significant as participants skipped the second question if they did not positively endorse the first one, resulting in zero participants endorsing a sense of loss of control in the absence of eating large amounts of food.

Results of the 2x4 ANOVA examining caloric intake in the experimental session demonstrated a significant main effect for Binge-Eating Behavior status,  $F(1,74) = 4.307, p < .05, \eta^2 = .06$ , where those with Binge-Eating Behavior consumed  $652.20 \pm 271.44$  calories, whereas those without Binge-Eating Behavior consumed  $498.32 \pm 252.53$  calories. The results demonstrated no main effect for experimental condition,  $F(3,74) = 0.175, p = .91, \eta^2 = .01$ , and no significant interaction between experimental condition and Binge-Eating Behavior category,  $F(3,74) = 1.585, p = .20, \eta^2 = .06$ . These results are depicted in Figure 20.



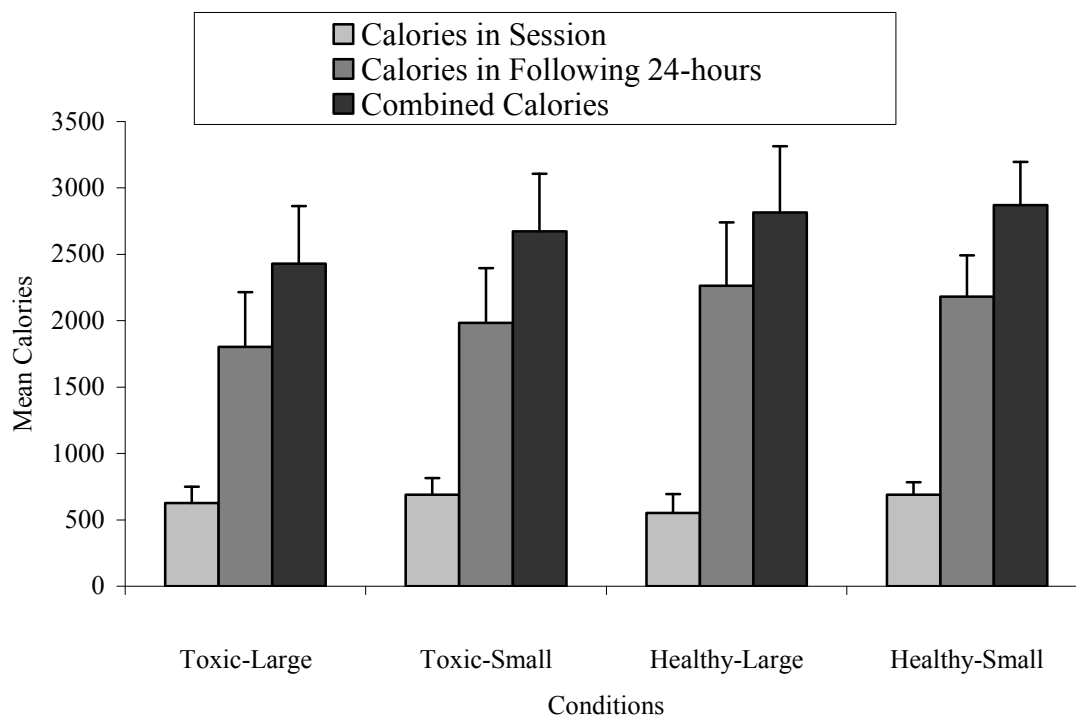
*Figure 20.* Total mean calories (+SE) consumed by participants (n=82) in the experimental condition according to experimental condition and Binge-Eating Behavior status.

The effect of experimental condition and Binge-Eating Behavior status on eating behavior in the 24 hours following the study was also of interest in the present study, necessitating that another 2x4 univariate ANOVA be conducted. These results demonstrated no main effects for either the Binge-Eating Behavior category,  $F(1,72) = 0.072, p=.79, \eta^2 = .00$ , or experimental condition,  $F(3,72) = 0.044, p=.99, \eta^2 = .00$ . In addition, there was no significant interaction between these two variables,  $F(3,72) = 0.656, p=.58, \eta^2 = .03$ .

A 2x4 ANOVA was also conducted using a combined caloric intake in session and in the 24 hours following the study as the dependent variable to examine the impact of regulation. Results indicate no significant main effect for Binge-Eating Behavior category,  $F(1,72) = 0.647, p=.42, \eta^2 = .01$ , or experimental condition,  $F(3,72) = 0.026, p=.99, \eta^2 = .00$ .

In addition, there was not a significant interaction between these two variables,  $F(3,72) = 0.483, p=.70, \eta^2 = .02$ .

Additional univariate ANOVAs were conducted using only the Binge-Eating Behavior participants to clarify the effects of the experimental condition on eating behavior in this population. These participants are slightly different than those presented previously in the exploratory analyses in Hypothesis One and Two, as these participants were required to positively endorse one item on the QEWP-R asking about binge-eating behavior as opposed to those analyzed earlier who positively endorsed two items asking about binge-eating behavior with a sense of loss of control. Results indicated no significant differences between groups,  $F(3,14) = 0.188, p=.90, \eta^2 = .04$ , on eating behavior in session. Results examining eating behavior in the 24 hours following the study demonstrated no significant differences between conditions,  $F(3,14) = 0.283, p=.84, \eta^2 = .06$ . In addition, there were no significant differences in conditions on combined eating behavior when calories consumed in session were added to the calories consumed in the 24 hours following the study,  $F(3,14) = 0.238, p=.87, \eta^2 = .05$ . Mean caloric intake according to condition and time are displayed in Figure 21.



*Figure 21.* Total mean calories (+SE) consumed by Binge-Eating Behavior participants (n=18) according to experimental condition and time.

### Discussion

The present study sought to explore the effects of two elements of today's purported Toxic Environment on women's eating behavior. More specifically, this study sought to simultaneously explore the effect of advertising and packaging on eating behaviors in non-eating-disordered women during an experimental session and the ensuing 24 hours. The current literature examining these variables is limited to correlational and observational studies, which limit causal inference. Therefore, the present study used an experimental design to determine whether there is a causal relationship between today's Toxic Environment and women's eating behavior. Another primary aim of this study was to provide preliminary evidence to support public health policies addressing the obesity epidemic.

### *Study Results*

The results of the present study provide preliminary, but limited, support for the effects of today's purported Toxic Environment on women's eating behavior. While it appears that large package sizes coupled with healthy food advertising may impact normal women's acute eating behavior, these effects do not appear to persist over time. Results provide preliminary evidence for food regulation, but it is unclear if this is primarily driven by biological versus psychological factors. Among restrained eaters, the Healthy-Large condition instigated greater cognitive restraint (i.e., consuming fewer calories than non-restrained eaters) in the 24 hours following the study. Restrained eaters' acute response to Toxic stimuli, however, may take the form of increased consumption when exposed to large package sizes. Therefore, results tentatively suggest that elements of the Toxic Environment may take their toll on restrained eaters, not immediately, but over extended periods, such as the 24-hour follow-up window assessed in this study.

Results also suggest that overweight women may be more responsive to the "Toxic Environment" stimuli used in the present study: Overweight women exposed to Toxic elements consumed more calories than normal weight women and those who were exposed to healthy stimuli. These effects held for both immediate and delayed eating behavior. Interestingly, results suggested that among overweight women, package size may be a more powerful trigger for immediate eating behavior, whereas advertising stimuli may have a greater impact on delayed or prolonged eating behavior.

Finally, as expected, women who engage in binge-eating consumed more calories overall than those without binge-eating patterns. Interestingly, women who engaged in binge-eating seemed to be more responsive to food cues in general, rather than being sensitive to

Toxic versus Healthy food cues. Considering these results, the following discussion points are being made organized according to hypothesis.

The first aim of the study was to examine the effects of advertising and package-size on women's eating behavior in session. This hypothesis was derived from previous research suggesting that these two components of the Toxic Environment are important considerations in understanding the influence of social factors on women's eating behavior. Experimental research has suggested that women consume more food when exposed to larger package sizes as opposed to smaller package sizes (Wansink & Park, 2001; Rolls, Morris, & Roe, 2002). The role of Toxic Environment advertising has not been explored with experimental research but is based on the literature associated with cue reactivity. Many have theorized that advertising is likely to increase food consumption (Wadden, Brownell, & Foster, 2002) and may play a role in normalizing overconsumption (Hoek & Gendall, 2006). The current study is an extension of this research by examining the combined effect of both advertising and package-size on women's eating behavior.

Results of the first aim of the study were inconsistent with the hypothesis that those exposed to the Toxic-Large condition would consume more calories than those in the other conditions. Therefore, the original hypothesis was not supported as those exposed to the Healthy-Large group (i.e., healthy advertising and large package-size) had a trend towards consuming the most calories in session (or acutely). When Binge-Eating Symptom status was entered as a covariate, however, significant group differences on total calories in session emerged. This suggests that exposure to healthy advertising coupled with exposure to food in large packaging may increase immediate eating behavior. At first, this result may seem somewhat perplexing and counterintuitive. Yet it is possible that it could best be explained

by the literature examining dietary disinhibition. Traditionally, disinhibition was defined as losing control over food intake (Stunkard & Messick, 1985) and, more recently, it has been conceptualized as a tendency to overeat in a variety of situations (Westenhoefer, Broeckmann, Munch, & Pudel, 1994). Soetens, Braet, Van Vlierberghe, and Roets (2008) recently completed an experimental study demonstrating that, compared to those with low disinhibition, individuals with high levels of disinhibition consume more of their “favorite snacks” after a period of exposure to these snacks while being forbidden to eat them. In other words, dietary disinhibition and exposure to food cues have been linked to overconsumption of food, but it remains unclear what type of food stimuli exactly causes this disinhibition effect. It is possible that looking at images of healthy foods, such as salads in the present study, and having plenty of food available (i.e. large package sizes) may have led to a disinhibiting effect, which may in turn have resulted in increased acute food consumption. Similar results were found by Strauss, Doyle, and Kreipe (1994), where individuals who are exposed to diet commercials consumed more food than controls. These authors attributed these findings to dietary disinhibition, where the dieting commercials may have served as a feedback function regarding dietary practices. Further correlational analyses of the present study support this interpretation, as there was a strong positive correlation overall between self-reported dietary disinhibition score assessed by the TFEQ and total calories consumed in session ( $p < .01$ ).

In addition, dietary cognitive restraint has been associated with dietary disinhibition. An interesting phenomenon is that much of a restrained eater’s behavioral pattern is paradoxical (Westenhoefer et al., 1994). For example, it has been demonstrated that they tend to undereat in normal conditions but overeat in a variety of experimental conditions wherein

cognitive control is difficult, such as in the presence of food stimuli. Nederkoorn and Jansen (2002) discussed this phenomenon in restrained eaters as counterregulation and stated that a common cognitive thought in response to experimental stimuli may be “I’ve already blown my diet – I may as well continue to eat.” It may be that, although most of the participants in the present study were not restrained eaters, they may have engaged in this type of pattern as well, only to a lesser degree. Given that the sample had average dietary restraint score bordering on the suggested cutoff of eating restraint (average value was approximately 8 on the TFEQ Restraint scale with the suggested cutoff of 10) and approximately one quarter of participants did meet this cutoff score (21 participants out of 82), this may be a plausible explanation for the present results. However, further study is required to determine if dietary disinhibition and dietary restraint may have been playing a role.

The role of binge-eating is also important to consider in interpreting the present results. Preliminary analyses demonstrated that individuals meeting criteria for Binge-Eating Symptoms were not equally assigned to all conditions, which has the potential to unduly influence study results. Despite having an eating disorder diagnosis as an initial exclusion criterion, it may also have been important to exclude those with Binge-Eating Symptoms. Results demonstrated that participants meeting criteria for Binge-Eating Symptoms consumed more calories in session than those who did not meet criteria. This finding is consistent with the literature examining food intake in individuals meeting criteria for Binge-Eating Disorder (BED). For example, Sysko, Devlin, Walsh, Zimmerli, and Kissileff (2007) compared obese BED participants to obese control participants and normal weight control participants on caloric intake in session. They found that obese BED individuals consumed more calories in session and required more calories to self-report feelings of satiety and



fullness compared to both control groups. These results may generalize to individuals meeting criteria for Binge-Eating Symptoms as well.

When comparing the effects of the experimental conditions on eating behavior in only those who met criteria for Binge-Eating Symptoms, no significant differences were found, suggesting that either those with Binge-Eating Symptoms may be more resistant to the Toxic Environment cues or the Binge-Eating Symptoms may override the experimental manipulation. However, this may be an intriguing topic for further study as the current study had individuals with Binge-Eating Symptoms in only two conditions (i.e., the Toxic-Large and the Healthy-Small conditions), and it is unknown how they might have responded in the other conditions (i.e., Toxic-Small and Healthy-Large conditions). There is no known literature that explores the impact of the Toxic Environment on those with Binge-Eating Symptoms, but it is an intriguing area for future research. In addition, the present analysis was limited by its sample size and low power to detect statistically significant results. Further research is necessary with larger sample sizes to make a more definitive conclusion. In addition, future research could use a similar design to the present study and only recruit participants who met criteria for Binge-Eating Symptoms to determine if Toxic Environment cues impact eating behavior in this population.

It is important to note that the magnitude of effect found for Hypothesis One was quite small and the observed power to detect differences was limited with the present sample. Therefore, the fact that statistically significant results were found is quite promising, and it provides preliminary evidence for the impact of advertising and packaging on women's eating behavior. Further research clarifying the magnitude of the effect and the potential

variables that may be contributing to it is warranted and may have implications for public health policy if further evidence supports the impact of this purported Toxic Environment.

As noted earlier, the present results failed to support Hypothesis One. That is, there did not appear to have been an acute additive effect of the Toxic Environment elements on women's eating behavior, as has been speculated by some researchers (Horgen & Brownell, 2004). This result was somewhat surprising given that an effect of the Toxic Environment elements was found in the pilot study with fewer people. In addition, the literature associated with the Thin-Ideal also has demonstrated an effect on eating behavior using similar methodology (Harrison, Taylor, & Marske, 2006). It is possible, however, that the advertising stimuli that were used in the present study did not adequately depict the Toxic Environment because they were food images rather than solely advertising images. As described in the materials section, the stimuli were developed by the author and were food images that met certain a priori criteria for inclusion. It is possible that changing the stimuli to include slogans, marketing icons, and people consuming the food products may have more adequately reflected today's Toxic Environment. The key advertising stimuli eliciting eating behavior may not be the food itself, but how the food is marketed and presented to the consumer. Further experimental research should examine alternate methods to depict the advertising component of the purported Toxic Environment.

The second hypothesis aimed to examine the effects of advertising and package-size on women's eating behavior in the 24 hours following the experimental session. This hypothesis was exploratory in nature as there is virtually no research examining the delayed impact of an experimental manipulation on women's eating behavior. In fact, there is little research that has examined food consumption following any type of experimental

manipulation. It was therefore an aim to understand more prolonged effects of the Toxic Environment on women's eating behavior.

There were no statistically significant differences among conditions on women's eating behavior in the 24 hours following the study, and therefore, the stated hypothesis was not supported. These results suggest that exposure to Toxic Environment cues does not have a prolonged effect on women's eating behavior in the ensuing 24 hours after exposure. Yet it is important to note that due to this study's methodology, it is unknown whether participants were exposed to any Toxic Environment stimuli during the 24 hours following the study, which may have impacted food consumption during this period. More carefully controlled studies examining the prolonged effect of the Toxic Environment on women's eating behavior may be of interest as it is possible that individuals exposed to Toxic Environment cues may regulate their intake over time.

In a sense, the results of Hypothesis Two may not be that surprising given the number of factors that prompt eating behavior, as reviewed above, and the fact that participants were only systematically exposed to the Toxic Environment stimuli for one hour. In her review of the literature on the psychology of eating, Logue (2004) discusses many of the biological and environmental factors that initiate and stop eating behavior. For example, food availability is an important variable that contributes to eating behavior (Wansink, 2004). In the current study it is unknown what types of food were available to the participants and if that had an impact on study results. It was originally thought that the toxic advertising stimuli might prompt participants to frequent fast food restaurants following the experimental session. However, it is unknown if participants had the money to purchase food at these establishments or if they had transportation to get to the restaurants should they have had a

desire to get this type of food. Given that many of the participants resided in dormitories and probably had school-sponsored meal plans, environmental constraints may have contributed to their food intake during the follow-up period. Future research may wish to explore this aspect to better understand the possible prolonged effect of the Toxic Environment on women's eating behavior. Better control of other environmental factors during the follow-up phase would have improved the present study, and future research should consider these limitations.

Despite the lack of statistically significant findings for this hypothesis, the present results do generate several hypotheses aimed at better understanding the prolonged effect of the Toxic Environment on women's eating behavior. For example, it could be hypothesized that individuals may regulate their intake over time despite continued exposure to Toxic Environmental cues. Alternatively, it could be hypothesized that individuals will gain clinically significant weight over time when exposed to Toxic Environment cues. The data available do allow for preliminary analyses examining food regulation following exposure to Toxic Environment cues, which was the focus of the exploratory analyses following Hypothesis One and Two.

It was anticipated that participants exposed to the Toxic Environment stimuli would consume more combined calories (i.e., calories consumed in the experimental session and during the 24-hour follow-up period) than those exposed to the other conditions, or in other words, they would not regulate their eating behavior. Results of this exploratory analysis indicate no statistically significant difference in combined calories consumed among the conditions, which suggests that participants may have regulated their food intake following the experimental session. To a certain degree, if individuals consumed more calories in

session, it appears that they consumed fewer calories in the follow-up period, suggesting that they may have been regulating food intake. This was particularly true for participants who were exposed to the Healthy-Large group. This result is consistent with a homeostatic model of eating behavior (Rowland, Li, & Morien, 1996).

It may also be important to consider the effect of disinhibition on these results as well. It was suggested previously that individuals exposed to the Healthy-Large condition may have experienced a disinhibiting effect on eating behavior, resulting in decreased food consumption acutely. However, it is possible that this may have been a short-term effect as this effect is not observed when examining the combined caloric consumption. Therefore, it is possible that individuals may have regulated their food intake during the entire study. How this potential regulation may have occurred remains unclear, but it is possible that psychological factors in conjunction with biological homeostasis could be contributing to this effect. Participants may cognitively be aware that they consumed more calories or – in a sense – overate during the experimental session and then later may have regained cognitive control over their eating, which may explain the possible regulation of their food intake.

From the results of the present study, it is unknown if (and how) regulation occurred, but further research should better operationally define this phenomenon and aim to better understand it through more sophisticated designs than those used in the present study. For example, using a repeated measures design to examine differences in individual eating behavior may be warranted or examining differences in eating behavior compared to a large group norm (i.e., eating 2,000 calories a day).

It is also possible that both biological determinants as well as psychological factors may be contributing to eating regulation. For example, Levitsky (2005) reviewed the

literature on relative contributions to eating regulation and has theorized that in addition to homeostatic regulation, environmental factors such as portion size, food stimuli, and presence of others are important to eating regulation. In addition, Fernandez, Casazza, Divers, and Lopez-Alarcon (2008) recently debated the relative contribution of “nature” and “nurture” on eating behavior and elucidated the need for further research in this area.

Another aim of the present study was to examine the relative contribution of cephalic phase salivation on eating behavior in response to the experimental conditions. Previous research has demonstrated differences in cephalic phase salivation responses in response to food cues in a variety of weight-related populations (Brunstrom, Yates, & Witcomb, 2004; Epstein, Paluch, & Coleman, 1996; Vogeles & Florin, 1997). Therefore, it was hypothesized that this response would have a mediating effect on women’s eating behavior. Results of the present study demonstrated no mediating effect of cephalic phase salivation. In addition, cephalic phase salivation did not moderate the relationship between experimental condition and acute eating behavior. Given that cephalic phase salivation response is often used as a psycho-physiological measure of appetite (Tepper, 1992) and has been associated with reports of hunger (Wooley & Wooley, 1981), the present results could be interpreted that those who were exposed to Toxic stimuli were no more hungry than those exposed to the Healthy stimuli. The lack of statistical findings could be explained in light of the fact that all participants were hungry (i.e. a potential ceiling effect) and that all conditions had food stimuli, where the salivation response was elicited with no distinction between Toxic stimuli and Healthy stimuli. There has been no empirical literature to test the differential impact of advertising on cephalic phase salivation, but future studies may be warranted. It also does not appear that participants’ normal eating patterns contributed to these findings as those who

typically ate and those who typically skipped breakfast were equally distributed across conditions.

It is also important to note that the methodology used to collect cephalic phase salivation data is not standard. A variety of methods have been employed by other studies. Nonetheless, salivation data weights obtained in the present study were similar to the weights obtained in other studies that demonstrated significant effects using the same methodology (Brunstrom, Yates, & Witcomb, 2004). Future research should focus on developing a standard method for collecting cephalic phase salivation. Once measurement has been standardized, the role of cephalic phase salivation responses in women's eating behavior should be explored further.

Another aim of the present study was to examine the effects of the Toxic Environment stimuli on various weight-related populations. Initially, the effect of the Toxic Environment on eating behavior in eating restrained women was explored, hypothesizing that restrained eaters exposed to the Toxic Environment stimuli would consume more calories than non-eating restrained participants. Results demonstrated no significant differences between restrained eaters and non-restrained eaters either in the experimental session or in the 24 hours following the study. Considering that previous results suggested that participants consumed more in the Healthy-Large condition, these analyses were rerun, examining effects when exposed to this condition. Unfortunately, the results also demonstrated no significant differences between restrained eaters and non-restrained eaters in session or in the 24 hours following the study. Interestingly, however, in the Healthy-Large condition, restrained eaters consumed approximately 70 more calories in session than non-restrained eaters and approximately 500 calories less than non-restrained eaters in the 24

hours following the study. While speculative, it is possible that the Healthy-Large stimuli may have had a disinhibiting effect on the restrained eaters, resulting in them marshalling more cognitive control of their eating in the 24 hours following the study. Other researchers using a preload design on examining dietary disinhibition in restrained eaters have demonstrated that food type (i.e., forbidden unhealthy foods versus healthy foods) affects disinhibition where forbidden foods may result in increased consumption in restrained eaters (Knight & Boland, 1989). Results of the present study add to this literature by examining the combined effect of advertising and packaging on eating behavior. Therefore, it is possible that coupling “forbidden” foods with healthy advertising may lead to disinhibition, which is followed by cognitive restraint later in the day. Clearly, though, further research should explore the impact of the Toxic Environment on restrained eaters.

Additional exploratory analyses were conducted on restrained eaters to clarify the effects of the Toxic Environment in this population. Results demonstrated that restrained eaters consumed more calories in the experimental session when exposed to the large package size conditions than the small package size conditions, but there were no effects found for calories consumed in the 24 hours following the study or for combined calories. Previous research has demonstrated that package size does influence food consumption (Rolls, Morris, & Roe, 2002; Wansink & Park, 2001), but this literature has not examined this phenomenon in the eating-restrained population. Therefore, the present results provide preliminary evidence of the effect of package-size on immediate eating behavior in restrained eaters.

An additional aim was to examine the effect of the Toxic Environment on eating behavior in overweight women. Initially, food consumption in session was explored,



demonstrating a significant interaction between weight category and response to the experimental condition. Specifically, overweight women ate significantly less in the Healthy condition than all the other conditions that had elements of the Toxic Environment. Despite this relatively higher consumption by overweight women exposed to Toxic Environment stimuli, overweight women self-reported less sensitivity to food cues as assessed by the Power of Food Scale. These conflicting results suggest that the validity of the PFS may be questionable among overweight women, as their PFS scores did not correspond to actual eating behavior in response to exposure to food cues. It may be that overweight women are not cognitively aware of their sensitivity to food cues, which could explain the discrepancies between their self-reported data and their actual eating behavior.

When examining eating patterns in overweight women during the follow-up portion of the study, results again suggested a significant interaction between weight category and response to experimental condition. Interestingly, during the follow-up, overweight women who were exposed to the Toxic-Small condition consumed more calories than overweight women exposed to the Healthy condition. Similar results were found when combined caloric intake was the dependent variable. While further research examining these effects is needed, these results provide preliminary evidence that overweight women may be more sensitive to Toxic advertising stimuli than normal weight women and may respond to these Toxic cues by consuming more food both acutely and in a delayed fashion.

These results are also consistent with those associated with the Internal – External Hypothesis (Schachter & Rodin, 1974). Similar to the present study suggesting that overweight women are more responsive to external cues, Schachter and Rodin (1974) presented data describing this phenomenon in obese individuals, particularly with respect to

ease of access to food and availability of food. The present results extend this historical work, by incorporating an additional element of today's purported Toxic Environment -- food advertising -- to the ease of access variable. Hence, the present study examined the additive effect of two possible environmental contributors of eating behavior and investigated the differential impact on overweight women versus those who were not overweight.

The present study also sought to better understand the effects of the Toxic Environment on eating behavior in weight-cycling women. However, despite random assignment to conditions, only one weight-cycler was assigned to the Toxic-Small condition. Due to this unbalanced distribution, this line of inquiry could not be pursued. Further research examining the effect of Toxic Environment cues on eating behavior in weight cyclers should be considered.

Another aim was to examine the effects of the Toxic Environment on eating behavior in women who engage in Binge-Eating Behavior (i.e., self-reported eating large amounts of food). Results demonstrated that those who endorsed Binge-Eating Behavior ate significantly more in the experimental session than those who did not endorse this behavior. However, there was no significant effect for experimental condition nor was there an interaction between the independent variables. This suggests that women with Binge-Eating Behavior may be more responsive to food cues in general, but they may not discriminate between Toxic and Healthy cues. This finding is consistent with what previous literature has suggested about those with binge-eating patterns (Jansen, 1998). It appears that this effect is short-lived however, because there was no effect for Binge-Eating Behavior status on calories consumed in the 24 hours following the study. Therefore, it appears that over this

timeframe, binge-eating women may be able to adequately regulate their eating behavior when they are not explicitly exposed to food cues.

These results from those who engage in Binge-Eating Behavior patterns are consistent with that previously reported for those who met criteria for Binge-Eating Symptom (i.e., those who endorse a sense of loss of control over eating). That is, those who engaged in either Binge-Eating Behavior or who met Binge-Eating Symptom criteria appeared to be sensitive to food cues in general, but Toxic and Healthy cues did not appear to have a differential impact on their eating behavior. Again, it is important to note that these results are based on quite small sample sizes and, as such, power limitations may be influencing statistical outcomes. Clearly, however, future research in larger samples will be necessary to better examine the impact of food cues on women with binge-eating patterns.

In addition to these reported results, it is also warranted to discuss the impact that these results may have at the clinical level. Kazdin (1999, p. 332) has described this concept as clinical significance and defined it as “the practical or applied value or importance of the effect of an intervention.” He had originally discussed this concept in regards to psychological treatment outcome, but it can also be applied to a variety of experimental outcomes including social importance of change. In the present study, those exposed to the Healthy-Large condition consumed, on average, approximately 650 calories of “junk-type” food in 30 minutes. This is approximately 160 calories more than those who were exposed to the Healthy-Small condition. If one considers that situations with purported Toxic Environment advertising and packaging conditions may occur to an individual on a daily basis, this would lead to consuming more than 1100 extra calories in a week, which equates to approximately 15 pounds in one year (where 3500 calories equals 1 pound). Fifteen

pounds in a 150-pound woman equates to a 10% increase in body weight, which has been shown to elevate risk for many diseases associated with obesity (Institutes of Medicine, 1995). Clearly, this would be considered clinically significant even in the absence of statistical significance.

Even if this individual was exposed to these conditions only on a weekly basis – which is unlikely given the ubiquitousness of the Toxic Environment – it would still equate to gaining more than two pounds in one year. It is also possible that this subtle weight gain over an extended period of time may be contributing to the increased prevalence of obesity at the society level. Flegal, Carroll, Ogden, and Johnson (2002) have reported obesity rates of 46% in 1980, 56% in 1994, and 65% in 2001. These gradual increases in obesity prevalence rates may be partly due to the ubiquitousness of today's purported Toxic Environment.

Yet, previous research has shown that children, in particular, are exposed to elements of the purported Toxic Environment such as food advertisements on a daily basis. It has been estimated that the average child watches 10,000 television food advertisements in a year. Furthermore, 95% of them are for soft drinks, candy, fast food, sugary cereals, and high-fat/high-sugar snack foods (Dibbs, 1996). Therefore, the average child is typically exposed to Toxic Environment advertising about three times a day through just one medium, which equates to about 80 hours over the course of a year. Data on exposure to Toxic Environment cues from other media are unknown but may also be contributing to the increased obesity prevalence rates. It is possible that a minor number of extra calories (such as 150 extra calories consumed in session) may add up to substantial weight gain over time.

When examining the impact of clinical significance with restrained eaters, the implications may be even more compelling, despite effect sizes that were statistically modest.

Across study participation and the 24 hours thereafter, restrained eaters who were exposed to the Toxic-Large condition consumed approximately 600 more calories than those who were exposed to either the Toxic-Small condition or the Healthy-Large condition. In addition, those exposed to the Toxic-Large condition also consumed approximately 700 more calories than those exposed to the Healthy-Small condition. This suggests that the Toxic Environment stimuli contribute to increased food consumption in restrained eaters. It appears that initially, large package size may contribute to immediate increased food consumption, whereas the effects of the advertising stimuli may have a more prolonged effect, extending into the ensuing 24 hours.

Considering this study design likely replicates only a small fraction of the Toxic exposure that individuals may face on a daily basis, findings may grossly underestimate the impact of larger scale influences on eating behavior. In fact, even if the design fully captured all that might influence behavior in the natural environment, these 700 extra calories consumed per day would clearly be of clinical importance, possibly incrementally impacting weight over time. Furthermore, it is important to note that the analyses examining the eating patterns of restrained eaters were based on a small sample size of 21, making significant findings all the more compelling. Using larger samples, future research should aim to advance our understanding of how and under which conditions elements of the Toxic Environment may impact eating behavior in restrained eaters.

Considering the overall results of the present study, which are not entirely consistent with the stated hypotheses, it is possible that a lack of sufficient power to detect statistically significant differences may be contributing to the present results. However, considering the significant correlational evidence that was provided in the literature for the effects of today's

purported Toxic Environment on eating behavior, it is also possible that there are other intervening variables that may be influencing the causal relationship between Toxic Environmental stimuli and eating behavior. As Wansink (2004) reviewed, there are many different environmental factors that have been shown to contribute to women's eating behavior, such as consumption norms, eating-related characteristics (i.e., eating atmospherics, eating effect, eating with others), and food-related characteristics (i.e., salience of food, variety of food, shape of food containers). Therefore, future research should aim to simultaneously examine all important environmental variables that have been shown to contribute to eating behavior, which could be explored using a multiple regression analysis approach. Furthermore, incorporating biological determinants, such as salivation patterns and appetite hormone levels, into these studies would provide the most comprehensive understanding of women's eating behavior.

### *Limitations*

Despite the many strengths of the present study including its experimental design and strong base in theory, there are several limitations that should be acknowledged. First, the data collected in the screening phase of the study were limited to self-report. This information has the potential to be inaccurate and may have been influenced by social desirability effects. Of most concern may be data obtained from restrained eaters who may not have responded in a totally accurate manner to questions related to disordered eating patterns. Nonetheless, much of the data available in the literature on restrained eaters were obtained using participants' self-report data on the TFEQ, which was used in the present study.

In terms of the experimental portion of the study, it is a concern that the present sample does not generalize to a larger population. The present study used availability sampling where undergraduate college students at one Midwestern university were targeted for recruitment. This sample is not a community sample, and, therefore, generalization to other populations may not be justified. In addition, due to scheduling restraints, there may have been a selection bias towards those who were available to participate in the times being offered by the researchers. For example, some participants were turned away because they could not make the available times for the experimental portion of the study. It is unknown how these participants may have influenced the present results. For instance, these individuals may have alternative schedules where they sleep during the day and are awake at night. In this case, they might be somewhat different than the present sample because they may engage in more nocturnal eating patterns.

A strength of the present study was that BMI was a calculation of a measured height and weight in session rather than being based on a self-reported height and weight. Unfortunately, when height and weight were measured in session, the participants were clothed and wore shoes, which may have artificially increased their height and weight to an unknown degree. This may be related to the finding that study participants tended to be near the overweight range according to their BMI. To be conservative, all the analyses were rerun with BMI as a covariate, but it did not significantly contribute to any analyses.

The present study is also limited by the ability to examine only two aspects of today's Toxic Environment. This choice to examine only two aspects of the Toxic Environment was based on lack of funding and related feasibility considerations. As discussed, however, the purported Toxic Environment encompasses many different variables related to increased

food intake and decreased physical activity. For example, changes in portion sizes at restaurants, the proliferation of buffet restaurants, gas stations with snack foods and ready-made lunches, fast food franchises in hospitals and schools, and school districts signing contracts with soft drink companies are also important to consider (Wadden, Brownell, & Foster, 2002). In addition, the decreased societal emphasis on physical activity is an important aspect that was not examined by the present study. Therefore, it is recommended that future studies aim to be more comprehensive and examine all components of today's Toxic Environment to better inform policy initiatives.

Another limitation of the present study is that, in hindsight, it is unclear if the advertising stimuli used in the present study adequately represented "Toxic" advertising components. There were no suggestions available from the literature as to how to develop laboratory stimuli to adequately represent the pervasiveness of food advertising in our society. Toxic and healthy food images were chosen because it was thought that these images were the primary driving force behind increased eating consumption. However, it is possible that the slogans and iconic advertising symbols themselves are the primary driving force. In addition, it is also possible that the depiction of individuals in the advertising is also an important consideration given the literature on the influence of the thin-ideal media on women's eating behavior (Seddon & Berry, 1996). These studies have demonstrated that exposure to thin-ideal images increase eating behavior in women. Therefore, it may be important to have people embedded in the advertisements, making the individual more readily able to visualize herself consuming the product. It is possible that any combination of the aspects of the advertising may be driving the purported increased food consumption.



Clearly, further research is necessary to better understand what aspects of advertising may have the greatest impact on women's eating behavior.

It is important to consider possible limitations with the package size condition. In order to equate the two experimental conditions except for the variable of interest – packaging size – the small package size condition needed to be equated on weight and calories to the large package size condition. One could argue, however, that then the small package size condition also represented an element of the Toxic Environment where there was an over abundance of food available for consumption to the participant. It is possible that this may have influenced the present results. Further research should be conducted to determine the best methodology to use in these types of circumstances.

The present study also did not control for possible social desirability factors beyond using the guise of studying the effects of hunger on attention. It is possible that participants may have suspected that their food intake may be monitored somehow or that the research assistants may notice how much food was consumed. However, it is unlikely that adding a general social desirability scale to the present study would have made a substantial contribution given the differences between social desirability factors associated with eating and more general social desirability. For example, Hart and Chiovari (1998) found no relationship between social desirability and dieting behavior or obsessive eating rumination, suggesting that there is a distinct difference between these constructs.

Last, a final limiting consideration would be that there was a lack of control of exposure to Toxic Environment stimuli during the follow-up portion of the study. An effort to avoid any social desirability effects on food consumption during the 24 hours following the study necessitated that participants did not know prior to the 24-hour period that food

consumption data would be obtained. Given the ubiquitous nature of the Toxic Environment, it is likely that participants were differentially exposed to these types of cues during the follow-up portion of the study, which may have had an impact on eating behavior.

Unfortunately, data were not collected systematically to examine these effects. In addition, several studies have highlighted the tendency of participants to underestimate their actual food consumption when asked to retrospectively provide this data particularly in dieters (Jonnalagadda et al., 2000). However, this underestimation would be expected to be systematic across participants in all conditions, which should not unduly influence the present results. Lee, Harnack, Jacobs, Steffen, Luepker, and Arnett (2007) have demonstrated that the particular software used in the present study is adequate to meet the aims of the present study as it uses a multiple-pass method to repeatedly prompt recall of food intake. Nonetheless, this is an important consideration when interpreting the current findings.

### *Implications*

Despite the limitations of this study, the findings are intriguing and may have implications for providing preliminary evidence aimed at addressing the obesity epidemic. The present results have implications both at the individual level (i.e., individual treatment) and the population level (i.e., public health policy) in an ecological approach to such a vast problem.

In terms of implications at the level of the individual, the present research has the potential to make an impact in treatment recommendations for many different weight-related populations. For example, the present study found that overweight women may be more sensitive to Toxic Environment cues. Current approaches to obesity treatment do not explicitly address these types of cues, but focus more on food cues in general (Wadden &

Stunkard, 2002). Considering that the effects of the Toxic Environment – both packaging size and advertising – may be influencing eating behavior in overweight women, it may be helpful to address these issues in obesity treatment. As Wansink and Van Ittersum (2007) note, however, it may be easier to alter the individual's environment rather than have the individual attempt to change their thinking about Toxic Environment cues. Clearly, further research is necessary to better understand and to better inform obesity treatment approaches that address aspects of the Toxic Environment.

The present study may also have implications on the individual level in restrained eaters. This specific population appears to be most sensitive to food packaging size, which should be addressed in any treatment approaches. While there are no specified treatments for restrained eating, this behavioral pattern is often imbedded in other disordered eating patterns. When addressing these other disordered eating populations, if it is known that many of the individuals also engage in restrained eating patterns, it may be helpful to understand how food packaging size impacts this specific population. Encouraging environmental changes as noted above at the individual's level may be helpful in avoiding disinhibition and subsequent overeating.

The present results also have implications for better informing treatment approaches for those with Binge-Eating Behaviors and Binge-Eating Symptoms. Findings indicate that those who binge-eat are sensitive to food cues in general and may not discriminate between toxic and health food cues. The recently published treatment manual for Binge-Eating Disorder (Mitchell, Devlin, Zwaan, Crow, & Peterson, 2008) does address cues of binge-eating, but the present study preliminarily suggests that focusing on the food cues most salient to the individual may be helpful in addressing overconsumption. Focusing on

environmental changes in regards to limiting food cues may also be warranted. However, further research with larger samples sizes and adequately controlling for all potentially intervening variables is needed to clarify how to best meet the needs of those who engage in patterns of binge-eating.

Considering the implications of addressing the obesity epidemic at the individual level, it is also important to consider addressing this epidemic at the population level as well despite the limited support offered by results of the present study. Researchers have lamented the failure of obesity treatments at the individual level when purporting the need for population level initiatives (Battle & Brownell, 1996; Brownell, 2002; Henderson & Brownell, 2004; Horgen & Brownell, 2002; Jeffrey, 2002). However, there is no reason to believe that one approach supercedes another approach, and it seems reasonable to consider that addressing the obesity epidemic at both levels might be the most fruitful.

At the population level, the present results may have implications for better informing public health policies aimed at regulating food packaging size if further research supports the impact of this purported Toxic Environment. Many studies have demonstrated the effects of portion sizes on eating behavior (Kral, 2006). Coupling these studies with the present results on the effects of packaging size on women's eating behavior, it is clear that it is imperative to develop strategies to address this aspect of the purported Toxic Environment. Many researchers have made suggestions regarding possible policies. For example, Murphy (2006) suggests that food and beverage industries should develop packaging innovations that address total energy and nutrient density to assist consumers to make more healthful choices. However, Antonuk and Block (2006) experimentally tested the effects of such a change on eating and found it to be most salient for non-dieting individuals. Dieters, on the other hand,

did not experience a decrease in food consumption when exposed to such stimuli. In the present study, it should be noted that all foods and beverages available to participants had nutrition information and suggested serving sizes clearly printed on the labels, with the exception of the small package M&M's. Therefore, having the nutrition information available to individuals is simply not enough to change eating behaviors. Based on these preliminary results, other initiatives are needed.

Another potential policy could address the packaging and portion sizes offered at fast-food restaurants (Harnack & French, 2003). The present results suggest that limiting the portion sizes and packaging sizes available may reduce caloric intake. Further research should examine this possibility. Yet Wansink and Van Ittersum (2007) note that there might be significant backlash from the public in regard to attempts at decreasing portion sizes because larger portions have become the “consumption norm.” They also advocate that education alone about proper portion sizes is not enough, and changing the environment is necessary to address the obesity issue. It is suggested that buying individually packaged foods and creating smaller package sizes within larger packages may be helpful (Wansink & Van Ittersum, 2007). Recently, many companies have introduced “100-calorie” packs of various snack foods. To this author's knowledge, no research has been conducted to experimentally test if this type of packaging has an impact on eating behavior. Future research should explore the utility of this approach towards addressing the obesity epidemic. Developing a better understanding of how packaging size and portion size impact eating behavior will provide more informed public health policies.

As alluded to in the literature review, public health policy aimed at regulating the advertising of food has been suggested by many (Story, Kaphingst, Robinson-O'Brien, &

Glanz, 2008). However, the present study did not find much support for these types of initiatives. These findings may be tempered by limitations in methodology, and, therefore, addressing these limitations may still be a fruitful area of research. For example, it is possible that the advertising stimuli used in the present study did not truly capture what was intended, as slim models and iconic food symbols were largely absent from the Toxic portfolios. Therefore, future research should carefully consider what aspects of advertising seem to contribute to eating behavior and develop appropriate experimental stimuli to test these theories. Refinement of the methodology may lead to research that better informs public health policies aimed at regulating food advertising.

In sum, the data presented here are preliminary, and results are somewhat tenuous regarding the impact of purported Toxic Environment variables on eating behavior. However, if further research continues to support the influence of Toxic Environment cues on increased food consumption, the present results may provide preliminary support for public health policy initiatives that regulate packaging size of food. It appears that this is an important environmental factor of women's eating behavior that should be more carefully considered and managed at the societal and individual levels. Initiatives aimed at addressing purported Toxic Environment cues may be able to impact the escalating obesity epidemic. However, it is clear that in order to make any changes in public health policy, multiple factors, such as political and economic factors, need to work in conjunction with the scientific evidence. In addition to population level initiatives, the present findings also support interventions aimed at the individual level in reference to specific weight-related populations. The present results suggest a differential response in varying populations. Better understanding these effects through further research is also warranted.

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## Appendices

Appendix A: Demographic/Background Questionnaire

Appendix B: Assessment of Hyperactivity and Assessment (AHA)

Appendix C: Power of Food Scale (PFS)

Appendix D: Center for Epidemiologic Studies – Depression Scale (CES-D)

Appendix E: Questionnaire on Eating and Weight Patterns – Revised (QEWP-R)

Appendix F: Eating Attitudes Test (EAT-26)

Appendix G: Three Factor Eating Questionnaire (TFEQ)

Appendix H: Multidimensional Body Self-Relations Questionnaire – Appearance Scale  
(MBSRQ-AS)

Appendix I: Physical Activity Assessment Tool (PAAT)

Appendix J: Away-from-Home Eating Habits

Appendix K: Class Announcement and Sign-Up Sheet for Screening

Appendix L: Recruitment Email to Screening Participants

Appendix M: Informed Consent for Research Screening

Appendix N: Request to Notify Professor for Possible Extra Credit

Appendix O: Offer to Participate in Main Study

Appendix P: Quantities of Food by Condition

Appendix Q: Recruitment Email for Experimental Participants

Appendix R: Experimental Procedures Script

Appendix S: Informed Consent for Participation in Research

Appendix T: Experimental Data Sheet

Appendix U: Table of Participants by Condition

Appendix V: Dot Location Sheet

Appendix W: Stimuli for Follow-Up

Appendix X: Dietary Recall Interview Script

Appendix Y: Timeline of Experimental Procedures

Appendix Z: Human Subjects Review Approval

Appendix AA: Caloric Intake Algorithms

Appendix A  
Demographic/Background Questionnaire

Please indicate your responses to the questions by checking the appropriate answer.

Gender: \_\_\_\_\_ Female \_\_\_\_\_ Male \_\_\_\_\_ Transgender

Age (in years): \_\_\_\_\_

Ethnic background (check all that apply)

_____ 01 – White or Caucasian (Not Hispanic)	_____ 05 – Alaskan Native
_____ 02 – Black or African-American (Not Hispanic)	_____ 06 – Asian
_____ 03 – Hispanic or Latino	_____ 07 – Pacific Islander
_____ 04 – American Indian	_____ 08 – Middle Eastern

Do you consider yourself to be of any other race or ethnic group?

Yes     No    If so, what is it? \_\_\_\_\_

Marital status

_____ 1 - Married	_____ 5 - Divorced
_____ 2 - Remarried	_____ 6 - Never Married
_____ 3 - Widowed	_____ 7 - Living with same sex partner
_____ 4 - Separated	_____ 8 - Living with opposite sex partner

Education

How many years of education have you completed? (Completing High School or its equivalent = 12 years) \_\_\_\_\_ years of education

Employment Status

_____ 1 – Full Time (>35hrs/wk)	_____ 5 – Unemployed, Full Time Student
_____ 2 – Part Time (regular hours)	_____ 6 – Unemployed, Part Time Student
_____ 3 – Part Time (irregular hours)	_____ 7 – Retired/Disability
_____ 4 – Military Service	

Annual Household Income (if you are a dependent of your parents, please include their income)

_____ 1 – ≥ \$150,000	_____ 5 – \$25,000-49,000
_____ 2 – \$100,000-149,000	_____ 6 – \$10,000-24,000
_____ 3 – \$75,000-99,000	_____ 7 – ≤\$9,000
_____ 4 – \$50,000-74,000	_____ 8 – Don't know, or prefer not to say

Economic Status of Household (if you are a dependent of your parents, please include their income)

_____ 1 – Barely enough to get by	_____ 4 – Plenty of “extras”
_____ 2 – Enough to get by, but no more	_____ 5 – Plenty of “luxuries”
_____ 3 – Solidly middle class	_____ 6 – Don't know/prefer not to say

Are you on a special diet that has been prescribed to you by a physician? No \_\_\_\_\_  
Yes \_\_\_\_\_, If yes, what kind of special diet are you on? \_\_\_\_\_

Do you have any food allergies? No \_\_\_\_ Yes \_\_\_\_  
If yes, what food allergies to you have? \_\_\_\_\_

Have you ever been diagnosed with the following conditions?

Diabetes (Type I, or Type II) No \_\_\_\_ Yes \_\_\_\_  
Hypertension (high blood pressure) No \_\_\_\_ Yes \_\_\_\_  
Hypercholesterolemia (high cholesterol) No \_\_\_\_ Yes \_\_\_\_  
Heart Disease No \_\_\_\_ Yes \_\_\_\_  
Anorexia Nervosa No \_\_\_\_ Yes \_\_\_\_  
Bulimia Nervosa No \_\_\_\_ Yes \_\_\_\_  
Any other type of eating disorder No \_\_\_\_ Yes \_\_\_\_  
Attention Deficit Hyperactivity Disorder (ADHD) No \_\_\_\_ Yes \_\_\_\_  
Attention Deficit Disorder without hyperactivity (ADD) No \_\_\_\_ Yes \_\_\_\_  
Insomnia No \_\_\_\_ Yes \_\_\_\_  
Hypersomnia No \_\_\_\_ Yes \_\_\_\_

Are you taking any medications that cause weight gain as a side effect? No \_\_\_\_\_  
Yes \_\_\_\_\_

If so, what medications do you take? \_\_\_\_\_

Have you gained weight in the past because of any medication side effects? No \_\_\_\_\_  
Yes \_\_\_\_\_

If so, what medications? \_\_\_\_\_

Have you smoked at least 100 cigarettes in your entire life? No \_\_\_\_ Yes \_\_\_\_

Have you smoked at least part of a cigarette in the last 7 days? No \_\_\_\_ Yes \_\_\_\_

If yes, currently, during a typical 7-day period, how many cigarettes do you smoke per day?  
\_\_\_\_\_ cigarettes/day, on average

Are you currently pregnant? \_\_\_\_\_ Yes \_\_\_\_\_ No

Please indicate how many days it has been since the start of your last menstrual period  
\_\_\_\_\_

Are you currently taking birth control pills? No \_\_\_\_\_ Yes \_\_\_\_\_

If so, what kind are you taking? \_\_\_\_\_

If taking birth control pills, do these pills reduce the frequency of your periods (i.e.,  
you only have a period once every several months)? No \_\_\_\_\_ Yes \_\_\_\_\_

During the week, how much sleep to get per night, on average? \_\_\_\_\_ hours/night

On the weekend, how much sleep to get per night, on average? \_\_\_\_\_ hours/night

Do you generally eat breakfast during the week? \_\_\_\_\_ No \_\_\_\_\_ Yes

Please rate the following foods according to your taste preference on a scale of 1 to 5, with 1 meaning that you strongly like the food listed and 5 meaning you strongly dislike the food listed.

1. Doritos

Strongly like	Like	Neutral	Dislike	Strongly Dislike
1	2	3	4	5

2. M&M's

Strongly like	Like	Neutral	Dislike	Strongly Dislike
1	2	3	4	5

3. Oreo Cookies

Strongly like	Like	Neutral	Dislike	Strongly Dislike
1	2	3	4	5

4. Pretzels

Strongly like	Like	Neutral	Dislike	Strongly Dislike
1	2	3	4	5

5. Coca-Cola

Strongly like	Like	Neutral	Dislike	Strongly Dislike
1	2	3	4	5

6. Sprite

Strongly like	Like	Neutral	Dislike	Strongly Dislike
1	2	3	4	5

Appendix B  
AHA

Below, you will read descriptions of certain behaviors. Answer each question for both how you were as a CHILD (age 12 and younger), as best you can remember, and as you have been in the past 6 months.

Section I	As a child (age 12 and younger)		As an adult (last 6 months)	
	yes	no	yes	no
1a. Did you have difficulty focusing on details?	yes	no	yes	no
1b. Did you frequently make mistakes at school, work, or at home?	yes	no	yes	no
2a. Did you have trouble paying attention?	yes	no	yes	no
2b. Did you usually have trouble keeping your mind on school or work projects?	yes	no	yes	no
2c. Did you find that tasks requiring sustained attention were boring?	yes	no	yes	no
3. Did others complain that you weren't listening?	yes	no	yes	no
4a. Did you have trouble finishing things such as homework or chores?	yes	no	yes	no
Was this because you just didn't want to or just didn't feel like doing them?	yes	no	yes	no
4b. Did you have trouble following instructions?	yes	no	yes	no
Was this because you didn't understand the instructions?	yes	no	yes	no
5a. Did you have trouble organizing tasks or activities?	yes	no	yes	no
5b. Did you start many projects but finish few?	yes	no	yes	no
5c. Were your play or work areas messy?	yes	no	yes	no
6. Did you avoid or dislike tasks that required sustained mental effort? (e.g. homework, paperwork, writing, reading)	yes	no	yes	no
7. Did you often lose things such as toys, books, keys, tools, papers, etc.?	yes	no	yes	no
8a. Could almost anything get your mind off of what you were doing in school, at work, or in a game?	yes	no	yes	no
8b. When there were noises or people moving around in the room, did you have trouble sticking to what you were doing?	yes	no	yes	no
9. Did you often forget things like birthdays, anniversaries, bills, or appointments?	yes	no	yes	no

Section II	As a child (age 12 and younger)		As an adult (last 6 months)	
	yes	no	yes	no
1a. Were you always moving in your chair, fidgeting, or having a hard time sitting still?	yes	no	yes	no
1b. Did you have trouble sitting through a movie, lecture, or church?	yes	no	yes	no
2. Did you have trouble staying in your seat at school, work, or during dinner?	yes	no	yes	no
3a. Did you run around, climb, or pace excessively?	yes	no	yes	no
3b. Did you experience a feeling of restlessness, particularly when required to remain still or focus attention?	yes	no	yes	no
4. Was it hard for you to play or engage in leisure activities quietly?	yes	no	yes	no
5. Did you often feel “on the go” or act as if you were “driven by a motor?”	yes	no	yes	no
6. Did you talk a lot, or all the time, or more than others, that is, talk excessively?	yes	no	yes	no
7. Did you blurt out answers to questions before someone finished asking?	yes	no	yes	no
8a. Was it hard for you to wait your turn when you were in traffic, shopping, banking, attending a concert, or playing a game?	yes	no	yes	no
8b. Did you have a strong urge to push ahead if you were in line?	yes	no	yes	no
9. Did you often talk when others were talking without waiting until they were finished (for example, butting into a conversation or games)?	yes	no	yes	no

10. Please rate how much of the behaviors listed in Section I and II above caused problems for you in the following areas, when you were a child (before age 12).

AT SCHOOL (e.g. being punished repeatedly, getting low grades, problems keeping up with schoolwork, skipping school, having your parents called in to discuss your behavior, etc.).

No problem at all Severe problems  
 1    2    3    4    5    6    7    8    9    10

AT HOME (e.g. such as being punished a lot, or being yelled at a lot, feeling bad about myself because I couldn't do what was expected of me).

No problem at all Severe problems  
 1    2    3    4    5    6    7    8    9    10



SOCIAL PROBLEMS (e.g. problems getting along with people, finding or keeping friends).

No problem at all  
1      2      3      4      5      6      7      8      9      Severe problems  
10

11. Please rate how much of the behaviors listed in Section I and II above caused problems for you in the following areas, in the past six months.

AT WORK (e.g. trouble keeping a job, poor work reviews, becoming easily overwhelmed, not being able to keep up with your work, not getting promotions).

No problem at all  
1      2      3      4      5      6      7      8      9      Severe problems  
10

AT HOME (e.g. home disorganized and messy, problems with family relationships, financial problems).

No problem at all  
1      2      3      4      5      6      7      8      9      Severe problems  
10

SOCIAL PROBLEMS (e.g. problems getting along with people, finding or keeping friends).

No problem at all  
1      2      3      4      5      6      7      8      9      Severe problems  
10

Appendix C  
PFS

Please indicate the extent to which you agree that the following items describe you. Use the following 1-5 scale for your responses.

- 1=don't agree at all
- 2=agree a little
- 3=agree somewhat
- 4=agree
- 5=strongly agree

1. I find myself thinking about food even when I'm not physically hungry.
2. When I'm in a situation where delicious foods are present but I have to wait to eat them, it is very difficult for me to wait.
3. I get more pleasure from eating than I do from almost anything else.
4. I feel that food is to me like liquor is to an alcoholic.
5. If I see or smell a food I like, I get a powerful urge to have some.
6. When I'm around a fattening food I love, it's hard to stop myself from at least tasting it.
7. I often think about what foods I might eat later in the day.
8. It's scary to think of the power that food has over me.
9. When I taste a favorite food, I feel intense pleasure.
10. When I know a delicious food is available, I can't help myself from thinking about having some.
11. I love the taste of certain foods so much that I can't avoid eating them even if they're bad for me.
12. When I see delicious foods in advertisements or commercials, it makes me want to eat.
13. I feel like food controls me rather than the other way around.
14. Just before I taste a favorite food, I feel intense anticipation.
15. When I eat delicious food, I focus a lot on how good it tastes.
16. Sometimes, when I'm doing everyday activities, I get an urge to eat "out of the blue" (for no apparent reason).
17. I think I enjoy eating a lot more than most other people.
18. Hearing someone describe a great meal makes me really want to have something to eat.
19. It seems like I have food on my mind a lot.
20. It's very important to me that the foods I eat are as delicious as possible.
21. Before I eat a favorite food, my mouth tends to flood with saliva.

Appendix D  
CES-D

INSTRUCTIONS FOR QUESTIONS: Below is a list of ways you might have felt or behaved. Write the number that best describes how often you have felt this way during the past week.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of the time (3-4 days)

Most or all of the time (5-7 days)

DURING THE PAST WEEK:

- \_\_\_\_\_ 1. I was bothered by things that usually don't bother me.
- \_\_\_\_\_ 2. I did not feel like eating; my appetite was poor.
- \_\_\_\_\_ 3. I felt that I could not shake off the blues even with help from my family or friends.
- \_\_\_\_\_ 4. I felt that I was just as good as other people.
- \_\_\_\_\_ 5. I had trouble keeping my mind on what I was doing.
- \_\_\_\_\_ 6. I felt depressed.
- \_\_\_\_\_ 7. I felt that everything I did was an effort.
- \_\_\_\_\_ 8. I felt hopeful about the future.
- \_\_\_\_\_ 9. I thought my life had been a failure.
- \_\_\_\_\_ 10. I felt fearful.
- \_\_\_\_\_ 11. My sleep was restless.
- \_\_\_\_\_ 12. I was happy.
- \_\_\_\_\_ 13. I talked less than usual.
- \_\_\_\_\_ 14. I felt lonely.
- \_\_\_\_\_ 15. People were unfriendly.
- \_\_\_\_\_ 16. I enjoyed life.
- \_\_\_\_\_ 17. I had crying spells.
- \_\_\_\_\_ 18. I felt sad.
- \_\_\_\_\_ 19. I felt that people disliked me.
- \_\_\_\_\_ 20. I could not get "going."

Appendix E  
QEWP-R

1. How tall are you? \_\_\_\_\_ feet \_\_\_\_\_ inches
2. How much do you weigh now? \_\_\_\_\_ pounds
3. What has been your highest weight ever (when NOT pregnant)? \_\_\_\_\_
4. Have you ever been overweight by at least 10 pounds as a child or 15 pounds as an adult (when NOT pregnant)?  Yes  No  
IF YES: How old were you when you were first overweight (at least 10 pounds as a child or 15 pounds as an adult)? If you are not sure, what would be your best guess?  
\_\_\_\_\_ years
5. How many times (approximately) have you lost 20 pounds or more (when you weren't sick) and then gained it back?  
 Never  Once or twice  Three or four times  Five times or more
6. During the past six months, did you often eat within any 2 hour period what most people would regard as an unusually large amount of food?  Yes  No

IF NO: → SKIP TO QUESTION 11

7. During the times when you ate this way, did you often feel you couldn't stop eating or couldn't control what or how much you were eating?  Yes  No

IF NO: → SKIP TO QUESTION 11

8. During the past six months, how often, on average, did you have times when you ate this way – that is, large amounts of food plus the feeling that your eating was out of control? (There may have been some weeks when it was not present – just average those in.)  
 Less than one day a week  One day a week  Two or three days a week  
 Four or five days a week  Nearly every day
9. Did you usually have any of the following experiences during those occasions?
  - a. Eating much more rapidly than usual?.....  Yes  No
  - b. Eating until you felt uncomfortably full?.....  Yes  No
  - c. Eating large amounts of food when you  
didn't feel physically hungry?..... Yes  No
  - d. Eating alone because you were embarrassed  
by how much you were eating?..... Yes  No
  - e. Feeling disgusted with yourself, depressed,  
or very guilty after overeating?..... Yes  No

10. Think about a typical time when you ate this way – that is, large amounts of food plus the feeling that your eating was out of control.
- a. What time of day did the episode start?
- Morning (8am- 12 Noon)
  - Early afternoon (12 Noon – 4pm)
  - Late afternoon (4pm – 7pm)
  - Evening (7pm-10pm)
  - Night (After 10pm)
- b. Approximately how long did this episode of eating last, from the time you started to eat until when you stopped and didn't eat again for at least two hours?
- \_\_\_\_\_ hours \_\_\_\_\_ minutes
- c. As best you can remember, please list everything you might have eaten or drank during that episode. If you ate for more than two hours, describe the food eaten and liquids drunk during the two hours when you ate the most. Please be specific – include brand names where possible, and amounts as best you can estimate (for example, 7 ounces Ruffles potato chips; 1 cup Breyer's chocolate ice cream with 2 teaspoons hot fudge; 2 8-ounce glasses of Coca-cola; 1 ½ ham and cheese sandwiches with mustard).
- d. At the time this episode started, how long had it been since you had previously finished eating a meal or snack?
- \_\_\_\_\_ hours \_\_\_\_\_ minutes
- 11. In general, during the past six months, how upset were you by overeating (eating more than you think is best for you)?
- Not at all     Slightly     Moderately     Greatly     Extremely
12. In general, during the past six months, how upset were you by the feeling that you couldn't stop eating or control what or how much you were eating?
- Not at all     Slightly     Moderately     Greatly     Extremely
13. During the past six months, how important to you has your weight or shape been in how you feel about or evaluate yourself as a person – as compared to other aspects of your life, such as how you do at work/school, as a parent, or how you get along with people?
- Weight and shape were not very important
  - Weight and shape played a part in how you felt about yourself
  - Weight and shape were among the main things that affected how you felt about yourself
  - Weight and shape were the most important things that affected how you felt about yourself

14. During the past three months, did you ever make yourself vomit to avoid gaining weight after binge eating?..... Yes  No

IF YES: How often, on average, was that?

- Less than once a week  Once a week  Two or three times a week  
 Four or five times a week  More than five times a week

15. During the past three months, did you ever take more than twice the recommended dose of laxatives to avoid gaining weight after binge eating?..... Yes  No

IF YES: How often, on average, was that?

- Less than once a week  Once a week  Two or three times a week  
 Four or five times a week  More than five times a week

16. During the past three months, did you ever take more than twice the recommended dose of diuretics (water pills) to avoid gaining weight after binge eating?  Yes  No

IF YES: How often, on average, was that?

- Less than once a week  Once a week  Two or three times a week  
 Four or five times a week  More than five times a week

17. During the past three months, did you ever fast – not eat anything at all for at least 24 hours – to avoid gaining weight after binge eating?..... Yes  No

IF YES: How often, on average, was that?

- Less than once a week  Once a week  Two or three times a week  
 Four or five times a week  More than five times a week

18. During the past three months, did you ever exercise for more than an hour specifically to avoid gaining weight after binge eating?..... Yes  No

IF YES: How often, on average, was that?

- Less than once a week  Once a week  Two or three times a week  
 Four or five times a week  More than five times a week

19. During the past three months, did you ever take more than twice the recommended dose of a diet pill to avoid gaining weight after binge eating?..... Yes  No

IF YES: How often, on average, was that?

- Less than once a week  Once a week  Two or three times a week  
 Four or five times a week  More than five times a week

20. During the past six months, did you go to any meetings of an organized weight control program? (like Weight Watchers, Optifast, Nutrisystem, Curves) or a self-help group (like TOPS, Overeaters Anonymous, etc.)?..... Yes  No

IF YES: Name of program: \_\_\_\_\_

21. Since you have been an adult – 18 years old – how much of the time have you been on a diet, been trying to follow a diet, or in some way been limiting how much you were eating to lose weight or to keep from regaining weight you had lost? Would you say...

- None or hardly any of the time
- About a quarter of the time
- About half the time
- About three-quarters of the time
- Nearly all of the time

22. **SKIP THIS QUESTION IF YOU NEVER LOST AT LEAST 10 POUNDS BY DIETING.** How old were you the first time you lost at least 10 pounds by dieting or in some way limiting the amount you ate? If you are not sure, what is your best guess? \_\_\_\_\_ years old

23. **SKIP THIS QUESTION IF YOU NEVER HAD EPISODES OF EATING UNUSUALLY LARGE AMOUNTS OF FOOD ALONG WITH A SENSE OF LOSS OF CONTROL.** How old were you when you first had times when you ate large amounts of food and felt that your eating was out of control? If you are not sure, what is your best guess? \_\_\_\_\_ years old.

24. Which category best describes your parents as they appeared to you when you were a teenager:

a. Your Father

- Extremely underweight
- Underweight
- Normal weight
- Overweight
- Extremely overweight
- Not applicable

b. Your Mother

- Extremely underweight
- Underweight
- Normal weight
- Overweight
- Extremely overweight
- Not applicable

25. Which category best describes your grandparents as they appeared to you when they were approximately 40-years-old?

a. Your Paternal Grandfather (your father's side)

- Extremely underweight
- Underweight
- Normal weight
- Overweight
- Extremely overweight
- Not applicable

b. Your Paternal Grandmother (your father's side)

- Extremely underweight
- Underweight
- Normal weight
- Overweight
- Extremely overweight
- Not applicable

c. Your Maternal Grandfather (your mother's side)

- Extremely underweight
- Underweight
- Normal weight
- Overweight
- Extremely overweight
- Not applicable

d. Your Maternal Grandmother (your mother's side)

- Extremely underweight
- Underweight
- Normal weight
- Overweight
- Extremely overweight
- Not applicable



Appendix F  
EAT-26

Please check one response for each of the following statements according to following scale  
1=Always, 2=Usually, 3=Often, 4=Sometimes, 5=Rarely, 6=Never

1. I am terrified about being overweight.
2. I avoid eating when I am hungry.
3. I find myself preoccupied with food.
4. I have gone on eating binges where I feel that I may not be able to stop.
5. I cut my food into small pieces.
6. I am aware of the calorie content of foods that I eat.
7. I particularly avoid food with high carbohydrate content (i.e., bread, rice, potatoes, etc.).
8. I feel that others would prefer if I ate more.
9. I vomit after I have eaten.
10. I feel extremely guilty after eating.
11. I am preoccupied with a desire to be thinner.
12. I think about burning up calories when I exercise.
13. Other people think I am too thin.
14. I am preoccupied with the thought of having fat on my body.
15. I take longer than others to eat my meals.
16. I avoid foods with sugar in them.
17. I eat diet foods.
18. I feel that food controls my life.
19. I display self-control around food.
20. I feel that others pressure me to eat.
21. I give too much time and thought to food.
22. I feel uncomfortable after eating sweets.
23. I engage in dieting behavior.
24. I like my stomach to be empty.
25. I have the impulse to vomit after meals.
26. I enjoy trying new rich foods.

Please check one response for each of the following statements according to following scale  
1=Never, 2=Less than 1 time a month, 3=1 to 3 times a month, 4=once a week, 5=2 to 6 times a week, 6=once a day, 7=more than once a day

In the past 3 months, how often have you...

1. gone on eating binges? (eating a large amount of food while feeling out of control)
2. made yourself sick (vomited) to control your weight?
3. used laxatives to control your weight or shape?
4. exercised to lose or to control your weight?

Appendix G  
TFEQ

Part I: Read each of the following statements carefully. If you agree with the statement, or feel that it is true as applied to you, answer T (true). If you disagree with the statement, or feel that it is false as applied to you, answer F (false). Be certain to answer every question.

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 weigh 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: Each question in this section is followed by a number of answer options. After reading each question carefully, choose the one option which applies to you.

37. How often are you dieting in a conscious effort to control your weight? .....  
 (1)rarely       (2)sometimes       (3)usually       (4)always
38. Would a weight fluctuation of 5lbs affect the way you live your life? .....  
 (1)not at all       (2)slightly       (3)moderately       (4)very much
39. How often do you feel hungry? ..... (1)only at mealtimes        
 (2)sometimes between meals       (3)often between meals       (4)almost always
40. Do your feelings of guilt about overeating help you to control your food intake?  
 ..... (1)never       (2)rarely       (3)often       (4)always
41. How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours? ..... (1)easy       (2)slightly difficult  
 (3)moderately difficult       (4)very difficult
42. How conscious are you of what you are eating? ..... (1)not at all       (2)slightly  
 (3)moderately       (4)extremely
43. How frequently do you avoid 'stocking up' on tempting foods? ..... (1)almost never       (2)seldom       (3)usually       (4)almost always
44. How likely are you to shop for low calorie foods? ..... (1)unlikely  
 (2)slightly unlikely       (3)moderately likely       (4)very likely
45. Do you eat sensibly in front of others and splurge alone? ..... (1)never  
 (2)rarely       (3)often       (4)always
46. How likely are you to consciously eat slowly in order to cut down on how much you eat? ..... (1)unlikely       (2)slightly likely       (3)moderately likely       (4)very likely
47. How frequently do you skip dessert because you are no longer hungry? .....  
 (1)almost never       (2)seldom       (3)at least once a week       (4)almost every day
48. How likely are you to consciously eat less than you want? ..... (1)unlikely        
 (2)slightly likely       (3)moderately likely       (4)very likely
49. Do you go on eating binges though you are not hungry? ..... (1)never        
 (2)rarely       (3)sometimes       (4)at least once a week
50. On a scale of 0 to 5, where 0 means no restraint in eating (eating whatever you want, whenever you want it) and 5 means total restraint (constantly limiting food intake and never 'giving in'), what number would you give yourself? ..... (0)eat whatever you want, whenever you want it       (1)usually eat whatever you want, whenever you want it       (2)often eat whatever you want, whenever you want it       (3)often limit food intake, but often 'give in'       (4)usually limit food intake, rarely 'give in'       (5)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)not like me       (2)little like me       (3)pretty good description of me  
 (4)describes me perfectly

Appendix H  
MBSRQ-AS

Below you will see a series of statements about how people might think, feel, or behave. Please indicate the extent to which each statement pertains to you personally. To preserve confidentiality, please do not write your name on any of the materials. Read each statement carefully and decide how much it pertains to you personally. Using a scale like the one below, indicate your answer by entering it to the left of the number of the statement.

EXAMPLE

\_\_\_\_\_ I am usually in a good mood.

In the blank space, enter a 1 if you definitely disagree with the statement;  
Enter a 2 if you mostly disagree;  
Enter a 3 if you neither agree nor disagree;  
Enter a 4 if you mostly agree;  
Or enter a 5 if you definitely agree with the statement.

There are no right or wrong answers. Just give the answer that is most accurate for you. Remember, your responses are confidential, so please be completely honest and answer all the items.

1	2	3	4	5
Definitely Disagree	Mostly Disagree	Neither Agree Nor Disagree	Mostly Agree	Definitely Agree

- |       |  |
|-------|--|
| _____ | C1. Before going out in public, I always notice how I look.        |
| _____ | C2. I am careful to buy clothes that will make me look my best.    |
| _____ | C3. My body is sexually appealing.                                 |
| _____ | C4. I constantly worry about being or becoming fat.                |
| _____ | C5. I like my looks just the way they are.                         |
| _____ | C6. I check my appearance in a mirror whenever I can.              |
| _____ | C7. Before going out, I usually spend a lot of time getting ready. |
| _____ | C8. I am very conscious of even small changes in my weight.        |
| _____ | C9. Most people would consider me good-looking.                    |
| _____ | C10. It is important that I always look good.                      |
| _____ | C11. I use very few grooming products.                             |
| _____ | C12. I like the way I look without my clothes on.                  |
| _____ | C13. I am self-conscious if my grooming isn't right.               |
| _____ | C14. I usually wear whatever is handy without caring how it looks. |
| _____ | C15. I like the way clothes fit me.                                |
| _____ | C16. I don't care what people think about my appearance.           |
| _____ | C17. I take special care with my hair grooming.                    |
| _____ | C18. I dislike my physique.  |
| _____ | C19. I am physically unattractive.                                 |
| _____ | C20. I never think about my appearance.                            |

\_\_\_\_\_ C21. I am always trying to improve my physical appearance.  
 \_\_\_\_\_ C22. I am on a weight-loss diet.

For the remainder of the items use the response scale given with the item and enter your answer in the space beside the item.

\_\_\_\_\_ C23. I have tried to lose weight by fasting or going on crash diets.  
 Never       Rarely       Sometimes       Often       Very Often

\_\_\_\_\_ C24. I think I am:  
 Very Underweight       Somewhat Underweight       Normal Weight  
 Somewhat Overweight       Very Overweight

\_\_\_\_\_ C25. From looking at me, most other people would think I am:  
 Very Underweight       Somewhat Underweight       Normal Weight  
 Somewhat Overweight       Very Overweight

C26-C34. Use this 1 to 5 scale to indicate how dissatisfied or satisfied you are with each of the following areas or aspects of your body:

1	2	3	4	5
Very	Mostly	Neither	Mostly	Definitely
Dissatisfied	Dissatisfied	Satisfied Nor Dissatisfied	Satisfied	Dissatisfied

\_\_\_\_\_ C26. Face (facial features, complexion)  
 \_\_\_\_\_ C27. Hair (color, thickness, texture)  
 \_\_\_\_\_ C28. Lower torso (buttocks, hips, thighs, legs)  
 \_\_\_\_\_ C29. Mid torso (waist, stomach)  
 \_\_\_\_\_ C30. Upper torso (chest or breasts, shoulders, arms)  
 \_\_\_\_\_ C31. Muscle tone  
 \_\_\_\_\_ C32. Weight  
 \_\_\_\_\_ C33. Height  
 \_\_\_\_\_ C34. Overall appearance

Duplication and use of the MBSRQ-AS only by permission of  
 Thomas F. Cash, Ph.D., Department of Psychology,  
 Old Dominion University, Norfolk, VA 23529

Appendix I  
PAAT

This next section will be asking you questions about your MODERATE and VIGOROUS physical activity level during the last 7 days. Descriptions of MODERATE and VIGOROUS physical activity and examples of each are listed in the boxes below.

Thinking about the last 7 days, answer the questions below each box.

MODERATE: Like Walking fast (3-4mph)		
Walking fast (3-4mph)	Walking downstairs	Aerobics, Low impact
Bicycling (less than 12mph;<150W)	Bowling	Calisthenics, light
Carpentry	Dancing	Fishing, standing
Gardening: Planting, raking, weeding	Frisbee	Golf
Housework: Mopping, sweeping, vacuuming	Gymnastics	Horseback riding
Lifting, turning, carrying: less than 50 lbs	Mowing lawn, power mower	Ping pong
Playing with children: Walking, kneeling, lifting	Rowing, sailing	Skateboarding
Tai Chi Qi Gong	Volleyball	Yoga, vigorous stretching
Water Aerobics	Washing, working on car	Weight lifting

During the last 7 days, on how many days did you do MODERATE physical activity for at least 10 minutes at a time without stopping?

\_\_\_\_\_ Days

On those days, how much of the time did you spend on average doing MODERATE physical activities?

\_\_\_\_\_ Minutes/Day

VIGOROUS: Like Jogging or Running		
Jogging, running	Walking upstairs	Aerobics, high impact
Carrying loads, more than 50 lbs	Basketball	Calisthenics, vigorous
Bicycling, fast (more than 12mph; >150W)	Judo, karate, kick boxing	Jumping rope
Roller skating, rollerblading	Stair climbing, stairmaster	Soccer
Ski machine (Nordic Track)	Swimming laps	Tennis, racketball

During the last 7 days, on how many days did you do VIGOROUS physical activity for at least 10 minutes at a time without stopping?

\_\_\_\_\_ Days

On those days, how much of the time did you spend on average doing VIGOROUS physical activities?

\_\_\_\_\_ Minutes/Day

Compared to your physical activity over the last three months, was the last seven days' activity:

\_\_\_\_\_ More than usual

\_\_\_\_\_ Less than usual

\_\_\_\_\_ About the same

Appendix J  
Away from Home Eating Habits

How often do you eat breakfast, lunch, or dinner in a place such as McDonald's, Burger King, Wendy's, Arby's, Pizza Hut, or Kentucky Fried Chicken? \_\_\_\_\_

How many times per month do you eat breakfast, lunch, or dinner in a restaurant or cafeteria?

\_\_\_\_\_



Appendix K  
Class Announcement and Sign-Up Sheet for Screening

Study on Attention and Hunger

- I am here today to offer you an opportunity to participate in a research study examining the effects of hunger on attention.
- This screening portion of the study is a web-based survey that asks you questions about your personal and family background, attention level, eating-related patterns, current activity level, weight history, body image, emotional well-being, and smoking history.
- The screening portion of the study should only take about 30 minutes to complete at your discretion. This screening portion of the study will also may give you the opportunity to participate in the experimental portion of the study if you meet the inclusion/exclusion criteria. I cannot tell you those criteria, but it is anticipated that many students your age will be eligible.
- Participation is completely voluntary. You do not have to participate if you do not want to. Your personal responses are also confidential. Your instructor will not know your personal responses to study.
- Compensation for the screening portion of the study includes extra credit in your psychology course if your instructor provides it. Compensation for the experimental study also includes extra credit if your instructor provides it as well as \$25 cash. There are no known risks to participate.
- It is hopeful that the information provided will be used to better understand the effect of attention on hunger allowing us to make causal inferences about these two variables.
- In order to participate, you will need to put your name, EMU ID Number, and current email address on this sheet that I am passing around (please be sure to print clearly). A researcher will email the URL and procedures for participation shortly. Once you get to the link, you will be asked to follow the prompts to the survey.
- To receive extra credit, it is very important that you provide the information requested on the screen, at the end of the survey, where you will be asked to tell us your EMU ID number and which course instructor we should inform about your participation. Remember, your course instructor will not be informed of any information you provide, aside from the simple fact that you did the survey.
- To participate in the experimental study, you will need to complete the screen where it asks for your permission to contact you to participate. If selected based on inclusion/exclusion criteria, you will be asked to come to a lab for about an hour and a half to complete the experimental portion of the study and also be called the next day for about a half-hour telephone follow-up.

Thanks for participating!



Appendix L  
Recruitment Email to Screening Participants

Dear Student,

Recently, you provided your email address in response to a classroom announcement about a research opportunity. Participating in this study, entitled Attention and Hunger, involves simply completing an online survey that should take no more than 30 minutes.

If you agree to participate, you will be asked a variety of questions including your eating preferences, medical concerns, physical activity level, weight history, body image, personal and family background, and emotional well-being.

To participate, simply [Click here](#) or paste this URL into a browser to access the survey: [http://www.surveymonkey.com/s.aspx?sm=2bGxIKJ1uFVEl6yXg\\_2bGSd5w\\_3d\\_3d](http://www.surveymonkey.com/s.aspx?sm=2bGxIKJ1uFVEl6yXg_2bGSd5w_3d_3d). On this page, you will be directed to read an informed consent to participate in research. Simply click the “next” button at the bottom of the page to begin if you wish to participate. You can elect not to continue participation at any time by simply closing the browser window.

If your instructor has told you he/she will give extra credit for participation, it is very important that you provide the information requested on the page entitled Request to Notify Professor for Possible Extra Credit, where you will be asked to tell us who you are and which course instructor we should inform about your participation. Note that your course instructor will not be informed of any information you provide, aside from the simple fact that you did the survey. Of course, you are welcome to do the survey anonymously, by not providing this information at the end, if you do not want extra credit. It is important to note that participation does not guarantee that extra credit is awarded as this determination is at your individual instructor’s discretion, not the researchers.

In addition, the final page is an invitation to participate in the experimental phase of the study where you would be compensated \$25 for participation. Please complete that page as well if you are interested.

Thanks for participating!

Amy Collings, MS  
Doctoral Candidate  
Clinical Psychology  
Eastern Michigan University  
611 W. Cross Street  
Ypsilanti, MI 48197  
(734) 487-4987

## Appendix M

**INFORMED CONSENT FOR RESEARCH SCREENING**

## Effect of Hunger on Attention

Amy S. Collings, M.S., Doctoral Fellow – Principal Investigator

Karen K. Saules, Ph.D., Professor of Psychology – Co-investigator

1. **Purpose of Study and How Long It Will Last:** The purpose of this screening is to determine whether you are eligible to participate in an experimental study on attention and hunger based on set inclusion and exclusion criteria. We cannot tell you in advance what the eligibility criteria are, but it is anticipated that many students and community members will be eligible. In addition, it is hopeful that the screening portion of this study will provide a better understanding of the relationships among attention, hunger, eating, body image, physical activity, and overall health. This screening will be completed online and should only take approximately twenty to thirty minutes to complete.
2. **Participation Withdrawal or Refusal to Participate:** Participation in this study is completely voluntary; you may choose to quit the research project at any time without any penalty. If you do decide to participate, you can change your mind at any time and withdraw from the study without negative consequences. Because this is a web-based study, in order to withdraw, you can simply close the browser window at any time during the study.
3. **Description of Study Procedures:** For this study, you will be asked to fill out an online survey that will take approximately 20-30 minutes to complete. Questions on this survey will ask you about your eating habits, your physical activity level, your weight history, some of your medical history, your mood, as well as demographic and background information such as your age, weight, marital status, and employment. Once you have completed the survey, your participation in the screening is complete and you will be asked if you agree to be contacted for participation in the main phase of the study. You are not obligated to participate in the main phase of the study, but can elect to do so if interested.
4. **Confidentiality of Information Obtained:** All responses and personally identifiable information will be kept confidential within the confines of SurveyMonkey's privacy policy (see [http://www.surveymonkey.com/Monkey\\_Privacy.aspx](http://www.surveymonkey.com/Monkey_Privacy.aspx) for further information). Your personal responses will only be released to the principal investigator, who will download all the responses off the internet at the end of the study and delete the information off of SurveyMonkey.com. At this point, any identifying information will be separated from your survey responses and you will be given an identification number to use throughout the study to protect your confidentiality. However, to ensure that you are using the same number throughout the study, the principal investigator will keep a log of personally identifiable information and identification numbers. Only the principal investigator will have access to this log and will store it in a secure locked cabinet separate from your individual responses. Once all data has been collected, this log will be destroyed. Information from this study may be reported or published in aggregated form, but your anonymity will be maintained in any publications or presentations.

5. **Expected Risks of the Study:** There are no known or anticipated risks for participating in the study. Nevertheless, you may experience some mild emotional discomfort when completing the study, but it is not expected to last longer than it takes you to complete the study. If, however, you experience emotional reactions that are difficult for you to manage, you can contact the principal investigator for referral information
6. **Expected Benefits of the Study:** Your participation in this study will help us to better understand the relationship between hunger and attention and identify potential participants for the main phase of the study.
7. **Compensation for Participation:** Your participation in this study will allow you to learn a bit about how psychologists conduct research. If you are an EMU psychology student and your instructor offers extra credit for research participation, you may be eligible to obtain it for participation in this study. If you provide the researchers the name of your instructor, we will verify that you completed the study and your instructor will determine if and how much extra credit you may receive. Please note that participation in this study does not guarantee that you will receive extra credit as that is determined by your instructor, not the researchers. There is no monetary compensation for your participation.
8. **Use of Research Results:** Findings from this study may be published in psychological journals and may also be presented at professional conferences. In addition, the data being collected will be used in the Principal Investigator's dissertation, and, as such, may appear in that published document. As a participant, you are entitled to meet with the Principal Investigator to obtain the results of the study and for any other questions or concerns.
9. **Future Questions:** If, at any time, you have questions about study procedures or your participation in the study, please contact the principal investigator, Ms. Amy Collings (Phone: 734-487-4987; Email: [collings\\_amy@yahoo.com](mailto:collings_amy@yahoo.com)) or her Co-Investigator, Dr. Karen Saules (Phone: 734-487-4987; Email: [ksaules@emich.edu](mailto:ksaules@emich.edu)).
10. **Human Subjects Review Board:** This research protocol and informed consent document have been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee for use from 9/12/07 to 9/12/08. If you have questions about the approval process, please contact Dr. Deb de Laski-Smith (734.486.0042, Interim Dean of the Graduate School and Administrative Co-chair of UHSCR, [human.subjects@emich.edu](mailto:human.subjects@emich.edu)).

CONSENT TO PARTICIPATE: I understand my rights as a research participant and I voluntarily consent to participate in this study and follow its requirements. I additionally understand the purpose, intent, and necessity of the present study. I am able to print out a copy of this consent form for my future reference if I desire.

If you have read all of the above and would like to take part in this study, click the "next" button below. By doing so, you are giving informed consent for us to use your responses in this study.

If you do not wish to take part in this study, please close this browser window now.

Appendix N  
Request to Notify Professor for Possible Extra Credit

This information is completely optional and intended for only those who are interested in obtaining extra credit for their participation.

If you are interested in obtaining extra credit for your participation in this online study, please complete the following and the researchers will inform your instructor of your participation before the end of the semester in which you completed this study. Note: This does not necessarily guarantee you will receive extra credit as extra credit criteria are determined by your instructor not the researchers.

Name \_\_\_\_\_  
EMU Identification Number (i.e., E00123456) \_\_\_\_\_  
Name of Class for which you would like extra credit (i.e., PSY101) \_\_\_\_\_  
Your psychology professor's name \_\_\_\_\_

If you do not provide the above information, the researchers will have no way of verifying your participation and therefore informing your instructors of research participation.

Appendix O  
Offer to Participate in the Main Study

Thank you for participating in the screening portion of this study. We are now extending an offer to participate in the main study, where you would receive \$25 cash for participating. You may also be eligible for extra credit in your psychology class per your instructor's guidelines.

Would you like to participate in the main study? \_\_\_\_\_ Yes      \_\_\_\_\_ No

If yes, please provide your name \_\_\_\_\_

EMU Identification Number \_\_\_\_\_

And your electronic mail address \_\_\_\_\_

And a telephone number where you can be reached \_\_\_\_\_

The following questions will assist the researchers in scheduling a time to come in for the main portion of the study as we want you to arrive for the session hungry (defined as not eating for five hours).

What time do you usually get up on Tuesday mornings? \_

\_\_\_\_\_ before 4am      \_\_\_\_\_ between 4 and 5:45am      \_\_\_\_\_ between 6 and 7:45am  
\_\_\_\_\_ between 8 and 9:45am      \_\_\_\_\_ between 10 and 11:45am      \_\_\_\_\_ between 12  
and 1:45pm      \_\_\_\_\_ after 2pm

What time do you usually get up on Wednesday mornings?

\_\_\_\_\_ before 4am      \_\_\_\_\_ between 4 and 5:45am      \_\_\_\_\_ between 6 and 7:45am  
\_\_\_\_\_ between 8 and 9:45am      \_\_\_\_\_ between 10 and 11:45am      \_\_\_\_\_ between 12  
and 1:45pm      \_\_\_\_\_ after 2pm

What time do you usually get up on Thursday mornings?

\_\_\_\_\_ before 4am      \_\_\_\_\_ between 4 and 5:45am      \_\_\_\_\_ between 6 and 7:45am  
\_\_\_\_\_ between 8 and 9:45am      \_\_\_\_\_ between 10 and 11:45am      \_\_\_\_\_ between 12  
and 1:45pm      \_\_\_\_\_ after 2pm

What time do you usually eat your first meal of the day on Tuesdays?

\_\_\_\_\_ before 4am      \_\_\_\_\_ between 4 and 5:45am      \_\_\_\_\_ between 6 and 7:45am  
\_\_\_\_\_ between 8 and 9:45am      \_\_\_\_\_ between 10 and 11:45am      \_\_\_\_\_ between 12  
and 1:45pm      \_\_\_\_\_ after 2pm

What time do you usually eat your first meal of the day on Wednesdays?

\_\_\_\_\_ before 4am      \_\_\_\_\_ between 4 and 5:45am      \_\_\_\_\_ between 6 and 7:45am  
\_\_\_\_\_ between 8 and 9:45am      \_\_\_\_\_ between 10 and 11:45am      \_\_\_\_\_ between 12  
and 1:45pm      \_\_\_\_\_ after 2pm

What time do you usually eat your first meal of the day on Thursdays?

\_\_\_\_\_ before 4am      \_\_\_\_\_ between 4 and 5:45am      \_\_\_\_\_ between 6 and 7:45am  
\_\_\_\_\_ between 8 and 9:45am      \_\_\_\_\_ between 10 and 11:45am      \_\_\_\_\_ between 12  
and 1:45pm      \_\_\_\_\_ after 2pm

The main study will be operating in two locations in the Ann Arbor/Ypsilanti area. Please provide us with your preference of location from the two following choices:

\_\_\_\_\_ Eastern Michigan University Psychology Clinic, 611 W. Cross Street, Ypsilanti, MI 48197 (this is on the southeast side of EMU's main campus, next to the Tower Inn).

\_\_\_\_\_ University of Michigan Nicotine Research Lab, 2025 Traverwood #B, Ann Arbor, MI 48105 (this is just off of Plymouth and Huron Parkway).

A researcher will be contacting you shortly to schedule a time to participate in the main study if you meet the inclusion/exclusion criteria. Again, thank you for your participation!



Appendix P  
Quantities of Food by Condition

	Single Serving Packaging	Large Serving Packaging
Doritos	12 – 1 oz packages	1 – 12.5 oz package
Pretzels	10 – 1.5 oz packages	1 – 16 oz package
M&M's	34 – 18 oz packages	1 – 21.3 oz package
Oreo's	9 – 2 oz packages	1 – 18 oz package
Coke	6 – 12 oz cans	1 – 2 liter
Sprite	6 – 12 oz cans	1 – 2 liter

Appendix Q  
Recruitment Email for Experimental Participants

Dear Potential Participant:

You have been selected to participate in the experimental portion of Attention and Hunger Research Study based on your responses to the online screening. I am now contacting you to see when you would be available to come to the EMU Psychology Clinic to complete this portion of the study. You should plan to allow approximately one and one-half hours for completion of the experimental portion, plus another half-hour the following day for a telephone follow-up call. Both the experimental session and the telephone follow-up need to be completed for you to receive your \$25 compensation. The following is a list of times that are available to complete the study.

Tuesday: 10am and 11:15am

Wednesday: 10am, 11:30am, and 1pm

Thursday: 10am

Keep in mind that you need to complete the study approximately two-to-five hours after you awake and you need to be hungry when you come into the lab (which means that you cannot have eaten anything in the five hours before coming to the lab). In addition, in order to receive the compensation, you will need to bring photo identification (like a driver's license) and proof of employment eligibility (like your social security card). This is common practice in research studies that award over \$10 in compensation. Please be assured that your information will be kept confidential and protected.

Please email me back with your availability to come in for the experimental session based on the available times listed above. Thank you for participation and I hope to hear from you soon!

*Amy Collings, MS  
Doctoral Candidate  
Clinical Psychology  
Eastern Michigan University  
611 W. Cross Street  
Ypsilanti, MI 48197  
(734) 487-4987*

## Appendix R Experimental Procedures Script

### Introducing the Participant to the Study

*Thank you for participating in this study. Please turn off any cell phone, pagers, or any other electronic devices as we want you to be able to concentrate on completing the study. Also, please place your bags over here and do not go to them during this study in order to minimize distractions.*

*Here is an informed consent for you to review and sign. If you have any questions regarding the study, please do not hesitate to ask me. Basically, this study entails you participating in an experimental session, which we will do today and should last approximately one hour to an hour and a half. Then you will be contacted by telephone tomorrow to provide some follow-up information, which should only last about 20-30 minutes. There are no known risks to participating, but you have the right to withdraw from the study at anytime without penalty.*

*In order to be eligible to receive the compensation for this study, you will need to complete this I-9 form and allow me to copy your proof of identity (like your driver's license) and your proof of employment eligibility (like your social security card). Please be assured that this information will be kept confidential.*

*Also, we need your contact information in order to send you your compensation after you complete the follow-up portion. In addition, if you are interested in possibly obtaining extra credit in your classes, you will need to fill out this extra credit form to take to your professor. This simply verifies your participation; it does not guarantee you will receive extra credit as that is at your instructor's discretion. Please complete these sheets now.*

*We also need to know when you would be available to contact via telephone to complete the follow-up telephone interview. This needs to be more than 24 hours from now, but less than 48 hours. So, what is most convenient for you? Also, please let me verify a phone number where I can contact you.*

### Instructions for Obtaining the Cephalic Phase Salivation Response

*Now, I need to collect some of your saliva to measure your hunger level. I will give you this bag with a dental swab in it and will ask you to put it under your tongue and leave it there for exactly 30 seconds. Once you get it in place, let me know and I will time you. Then you will remove the swab and replace it in the bag. I have gloves available if you would like to use them. Any questions?*

### Obtaining History and Inclusion/Exclusion Criteria

*Now, I need to ask you a few background questions that may have changed since you completed the screening. (now follow the questions on the experimental data sheet).*

### Instructions for Attention Task

*Next, I am going to ask you to look for numbered red dots in this portfolio and record the page number you found them on and a brief description of where you found the dot. There are 40 dots and you will have at total of 30 total minutes to find them. This is plenty of time, so take your time to find them all and accurately record the description of where you found the dot. I will let you know when time is up."*

### Instructions for Obtaining Salivation Response – Second Time

*I now need to collect your saliva again using the same procedure as before. Please take this swab and place it under your tongue. I will ask you to take it out in 30 seconds and place it back in the bag.*

### Instructions for Presentation of Food

*Thank you for working on this task so far. I am now going to ask you to continue working with this portfolio, but with this colored pen. (Give the participant the other colored pen). Also, I would like you to eat as much of this food as you want. It is important that you eat until you are no longer hungry. Feel free to eat whatever you would like on this tray. I will return in 15 minutes with another attention task. Remember to continue working with portfolio as you are eating.*

### Instructions for Second Portfolio

*Thank you for working on this so far. Now I am going to switch portfolios with you and ask you to continue working on locating the dots. Again there are 40 dots and you will have a total of 30 minutes to find them. This is plenty of time, so take your time to find them all and accurately record the description of where you found the dot. Also, please continue to eat until you are full.*

### Instructions for Obtaining Salivation Response – Third Time

*I now need to collect your saliva for a final time using the same procedure as before. Please take this swab and place it under your tongue. I will ask you to take it out in 30 seconds and place it back in the bag.*

### Instructions for Taking Food Away

*Thank you for working on this task so far. I am now going to take the food. Please continue working with the portfolio, but with this colored pen. (Give the participant the other colored pen). I will return in 15 minutes to collect all the materials from you.*

### Instructions for Weighing

*Thank you for participating thus far – we are now finished with the portfolios. Now, I am going to ask you to come with me into another room to obtain your weight and height information.” If the participant is hesitant to get weighed, say “This is crucial information for the study. Let me reassure you that this information is kept separate from any identifying information.*

### Finishing for the Day

*Thank you for your participation thus far – you are almost finished for today. Before you go, I need give you this envelope with information in it that you will need to use during the phone follow-up. Please do not open this envelope until a researcher contacts you. Again, thanks so much for participating – we greatly appreciate it!”*

## Appendix S

## INFORMED CONSENT FOR PARTICIPATION IN RESEARCH

## Effect of Hunger on Attention: Main Study

Amy S. Collings, M.S., Doctoral Fellow – Principal Investigator

Karen K. Saules, Ph.D., Professor of Psychology – Co-investigator

1. **Purpose of Study and How Long It Will Last:** The purpose of this research study is to gain a better understanding of how hunger affects attention and concentration. Total participation time will be approximately two to three hours, divided among one experimental session, a telephone follow-up session, and a brief meeting to provide feedback about the study and to award the compensation for participation. Participants must meet inclusion/exclusion criteria before admission to the study based on responses to a web-based survey. More specifically, participants must be between the ages of 18 and 30, not be pregnant, not be on any special diet for medical reasons (i.e., diabetes or other chronic illnesses), not have food allergies to snack foods, not be significantly depressed, and not have a clinical eating disorder. In addition, participants must not have eaten any food for five hours prior to the commencement of the experimental session.
2. **Participation Withdrawal or Refusal to Participate:** Participation in this study is completely voluntary; you may choose to quit the research project at any time without any penalty. If you do decide to participate, you can change your mind at any time and withdraw from the study without negative consequences. However, you will only be eligible for the compensation and the extra credit if you complete all phases of the study.
3. **Description of Study Procedures:** A research assistant will explain the study to you, answer any questions you may have, and witness your signature to this consent form. A duplicate copy of this informed consent will be provided, which includes follow-up contact information, if necessary. Initially, you will be asked to place a clean dental swab in your mouth and hold it there for two minutes. At this time, the researcher will weigh the swab for a measure of your hunger level. This procedure will be repeated two more times during the course of the experimental session. Next, you will be asked to complete a short attention task (i.e., findings dots in a magazine) while hungry, then eat the available food until you are satiated, and then complete a similar attention task. Next, your height and weight will be obtained. The following day, a researcher will contact you by telephone to complete a brief follow-up questionnaire with you regarding the study. Finally, after all data has been collected by all participants, you will be asked to come to the laboratory for a final session where the researchers will explain the results of the study and award you your \$20 incentive for participation. It is estimated that you will be at the laboratory for one to one and one half hours for the experimental session, and a half-hour for the results session. In addition, the telephone interview is estimated to take approximately a half-hour, for a total participation time of two to three hours. Throughout the study, the researchers ask that you DO NOT put your name on any of the study materials, so that your anonymity can be preserved.
4. **Confidentiality of Information Obtained:** All responses and personally identifiable information will be kept confidential by being stored in separate locked secure cabinets. You will be given an identification number to use throughout the study to protect your confidentiality. However, to ensure that you are using the same number throughout the study, the principal investigator will keep a log of personally identifiable information and identification numbers. Only the principal investigator will have access to this log and will store it in a secure locked cabinet separate from your individual responses. Once all data has been collected, this log will be destroyed. Information from this study may be reported or published in aggregated form, but your anonymity will be maintained in any publications or presentations.

5. **Expected Risks of the Study:** There are no known or anticipated risks for participating in the study. Nevertheless, you may experience some mild emotional discomfort when completing the study, but it is not expected to last longer than it takes you to complete the study. If, however, you experience emotional reactions that are difficult for you to manage, you can contact the principal investigator for referral information
6. **Expected Benefits of the Study:** Your participation in this study will hopefully give the researchers a better understanding of the relationship between attention and hunger.
7. **Compensation for Participation:** Your compensation for completing all phases of the study includes receiving \$25 and having available free food to eat during the study according to study procedures. Food is provided by the researchers so that you will be able to eat until you are satiated. In addition, you will have the benefit of learning a bit about how psychologists conduct research. If you are an EMU psychology student and your instructor offers extra credit for research participation, you may be eligible to obtain it for participation in this study. If you provide the researchers the name of your instructor, we will verify that you completed the study and your instructor will determine if and how much extra credit you may receive. Please note that participation in this study does not guarantee that you will receive extra credit as that is determined by your instructor, not the researchers.
8. **Use of Research Results:** Findings from this study may be published in psychological journals and may also be presented at professional conferences. In addition, the data being collected are for the Principal Investigator's dissertation, and, as such, may appear in that published document. As a participant, you are entitled to meet with the Principal Investigator to obtain the results of the study at any time and for any other questions or concerns.
9. **Future Questions:** If, at any time, you have questions about study procedures or your participation in the study, please contact the principal investigator, Ms. Amy Collings (Phone: 734-487-4987; Email: [collings\\_amy@yahoo.com](mailto:collings_amy@yahoo.com)) or her Co-Investigator, Dr. Karen Saules (Phone: 734-487-4987; Email: [ksaules@emich.edu](mailto:ksaules@emich.edu)).
10. **Human Subjects Review Board:** This research protocol and informed consent document have been reviewed and approved by the Eastern Michigan University Human Subjects Review Committee for use from 9/12/07 to 9/12/08. If you have questions about the approval process, please contact Dr. Deb de Laski-Smith (734.486.0042, Interim Dean of the Graduate School and Administrative Co-chair of UHSCR, [human.subjects@emich.edu](mailto:human.subjects@emich.edu)).

CONSENT TO PARTICIPATE: I understand my rights as a research participant and I voluntarily consent to participate in this study and follow its requirements. I additionally understand the purpose, intent, and necessity of the present study. I will receive a copy of this consent form for my future reference.

\_\_\_\_\_  
Participant Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant Name (Print)

\_\_\_\_\_  
EMU Student EID Number (to facilitate processing of extra-credit, if applicable)

\_\_\_\_\_  
Witness Signature

\_\_\_\_\_  
Date

Appendix T  
Experimental Data Sheet

Participant ID number: \_\_\_\_\_ Condition: \_\_\_\_\_

Date of Experimental Session: \_\_\_\_\_ Time of Experimental Session: \_\_\_\_\_

Baseline Cephalic Salivation \_\_\_\_\_ g

Are you currently pregnant?            Yes            No

Have you had any changes in your medical condition since you completed the screening?  
    Yes            No            If yes: What changes?

\_\_\_\_\_

Have you had any medication changes since you completed the screening?  
    Yes            No            If yes: What changes?

\_\_\_\_\_

Do you smoke daily?            Yes            No

What is your age? \_\_\_\_\_

---

*If the participant answers yes to any of these questions or is younger than 18, older than 30, tell them that they do not meet the inclusion/exclusion criteria and are not eligible to participate. Do not continue with the remainder of the study. Note: if medical changes/medication changes do not generally affect eating behavior, you may continue with the study. However, if they have developed diabetes, for example, do not continue.*

---

When did you get up this morning? (Time) \_\_\_\_\_ (needs to be approximately 2-5 hours after rising – reschedule if widely outside this range).

When was the last time you ate (Date) \_\_\_\_\_ (Time) \_\_\_\_\_  
 (ensure has not eaten in the last 5 hours – reschedule with them if they have – it's okay if they had 2 cups of coffee/2 cans of soda in previous five hours, but not during the last 2 hours)

What did you eat?

\_\_\_\_\_

\_\_\_\_\_

*Have participant complete the attention task*

Cephalic Salivation after exposure to stimuli: \_\_\_\_\_ g

Cephalic Salivation after food exposure: \_\_\_\_\_ g

Record food weight measurements:

1. Synder's Sourdough Pretzels
  - a. **Weight:** Before \_\_\_\_\_ grams; After \_\_\_\_\_ grams
2. M&Ms
  - a. **Weight:** Before \_\_\_\_\_ grams; After \_\_\_\_\_ grams
3. Nacho Cheese Doritos
  - a. **Weight:** Before \_\_\_\_\_ grams; After \_\_\_\_\_ grams
4. Oreos Cookies
  - a. **Weight:** Before \_\_\_\_\_ grams; After \_\_\_\_\_ grams
5. Regular Coca-Cola
  - a. **Weight:** Before \_\_\_\_\_ grams; After \_\_\_\_\_ grams
6. Regular Sprite
  - a. **Weight:** Before \_\_\_\_\_ grams; After \_\_\_\_\_ grams

Participant's Height: \_\_\_\_\_ inches

Participant's Weight: \_\_\_\_\_ pounds

Availability for follow-up tomorrow: (must be at least 24 hours from when they leave the session)      Date: \_\_\_\_\_      Time: \_\_\_\_\_

*Verify telephone number* (record on participant contact form)

Time Completed: \_\_\_\_\_



Appendix U  
Table of Participants by Condition

	Toxic Advertisement	Healthy Advertisement
Large Packaging	Toxic-Large Group Participants: 4, 7, 10, 16, 17, 22, 27, 30, 36, 39, 41, 46, 51, 56, 59, 61, 65, 70, 75, 80, 82	Healthy-Large Group Participants: 2, 5, 9, 14, 19, 23, 28, 31, 33, 40, 42, 47, 52, 53, 58, 62, 68, 71, 73, 77
Single-serve Packaging	Toxic-Small Group Participants: 3, 8, 11, 15, 18, 24, 26, 32, 34, 38, 43, 48, 50, 54, 57, 63, 67, 72, 74, 78, 43	Healthy-Small Group Participants: 1, 6, 12, 13, 20, 21, 25, 29, 35, 37, 44, 45, 49, 55, 60, 64, 66, 69, 76, 79, 81

Appendix V  
Dot Location Sheet

Participant #	Portfolio #	Color Min 1-15	Color Min 16-30
Dot No.	Page No.	Description of Nearby Content	
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3			
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## Appendix W Stimuli for Follow-Up

Developed by NC SNAC  
March 2003

# What's in a Serving Size?

Finding it hard to picture a serving size? Everyday examples can help you compare your portion size with the standard Food Guide Pyramid serving size. **Note: hands and finger sizes vary from person to person!** These are GUIDES only.

### The Bread, Cereal, Rice, and Pasta Group

- 1 pancake..... is a compact disc (CD)
- $\frac{1}{2}$  cooked cup rice, pasta..... is a cupcake wrapper full or a rounded handful
- 1 piece of cornbread..... is a bar of soap
- 1 slice of bread..... is an audiocassette tape
- 1 cup of cereal..... is a fist or a tennis ball
- 1 roll..... is a bar of soap

### The Vegetable Group

- 1 cup green salad..... is a fist or a tennis ball
- 1 baked potato..... is a fist or a tennis ball
- $\frac{1}{2}$  cup tomato juice..... is a small Styrofoam cup
- $\frac{1}{2}$  cup cooked broccoli..... is a scoop of ice cream or a light bulb
- $\frac{1}{2}$  cup serving..... is 6 asparagus spears/7 or 8 baby carrots/1 ear of corn

### The Fruit Group

- $\frac{1}{2}$  cup of grapes (15 grapes)..... is a light bulb
- $\frac{1}{2}$  cup of fresh fruit..... is 7 cotton balls
- 1 medium size fruit..... is a fist or a tennis ball
- 1 cup of cut-up fruit..... is a fist or a tennis ball
- $\frac{1}{4}$  cup raisins..... is a large egg or a golf ball

### The Milk, Yogurt, and Cheese Group

- $1\frac{1}{2}$  ounces cheese..... is a 9-volt battery or your index and middle fingers
- 1 ounce of cheese..... is a pair of dice or your thumb
- 1 cup of ice cream..... is a large scoop the size of a tennis ball

### The Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group

- 2 tablespoons peanut butter..... is a Ping-Pong ball
- 3 ounces cooked meat, fish, poultry..... is a palm, a deck of cards or a cassette tape
- 3 ounces grilled/baked fish..... is a checkbook
- 3 ounces cooked chicken..... is a chicken leg and thigh or a breast
- 1 cup cooked dried beans..... is a fist or a tennis ball
- 1 ounce of nuts..... is one handful

### Fats, Oils and Sweets

- 1 teaspoon butter, margarine..... is the size of a stamp the thickness of your finger
- 2 tablespoons salad dressing..... is a Ping-Pong ball
- 1 ounce of chocolate..... is one package of dental floss
- 1 ounce of small candies..... is one handful
- 1 ounce of chips or pretzels..... is two handfuls
- $\frac{1}{2}$  cup of potato chips, crackers or popcorn..... is one handful

# EATING SMART AT HOME

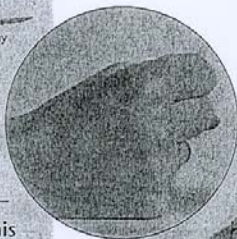


## Smart-size Your Portions

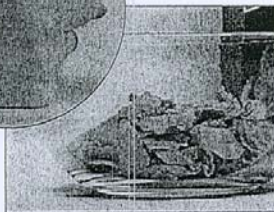
A portion is what you serve yourself or what a restaurant gives you—you can also think of this as a “helping.”

The reality is that a portion is sometimes larger than it should be.

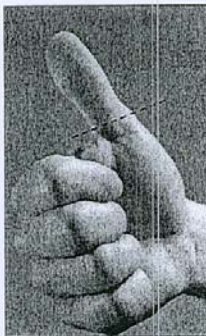
Use your hand as a guide to estimate a smart size portion.



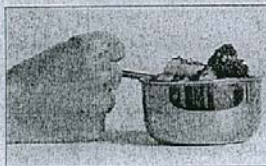
Your fist is about the size of one cup or one ounce of cereal.



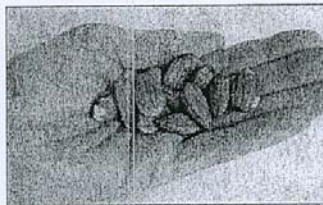
The palm of your hand is about the same size as 3 ounces of meat, fish, or chicken.



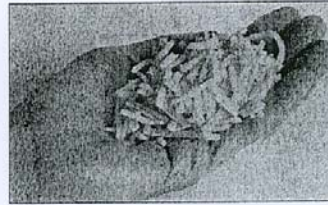
Your thumb is about the same size as 1 ounce of cheese.



Because hand sizes vary, compare your fist size to an actual measuring cup.



A small handful of nuts is about 1 ounce. For chips and pretzels, 2 handfuls equals about 1 ounce.



A handful of shredded cheese is about one ounce.



## Appendix X Dietary Recall Interview Script

### Preparation:

Open NDSR Program (Start → Programs → NDSR 2007 → NDSR). Highlight Project (Amy Dissertation) and open new record. Enter participant id number and date. Have both portion size materials ready and out. Call the participant.

### Introduction:

***“Hi, is \_\_\_\_\_ there? Hi, \_\_\_\_\_, this is \_\_\_\_\_ from the Attention and Hunger Study. How are you doing today? Thanks so much for participating in the study and now I am calling to do the final follow-up portion of the study. The first thing I would like you to do is to get out the envelope that the research assistant gave to you as you left yesterday. Please verify what number is on your envelope (make sure it corresponds to the number you assigned). Today we are going to be recording what you have had to eat in the 24-hours following the study and where you ate at. In the envelope that we gave you yesterday, you will find two sheets of paper that will help you to estimate serving sizes. Please take a few moments to look over these sheets and familiarize yourself with the information. (Give the participant at least one minute to review). Okay are you ready to begin?”***

### Quick List:

Follow the prompts in the computer program starting with ***“After you left the experiment, what was the first time you had something to eat or drink?”*** This section is designed to get a quick list of all the foods that the participant ate in the 24 hours following when she left the study (i.e., if the participant left at 11:30am, you would count the 24 hours following from 11:30am to the following day at 11:30am).

### Reviewing:

Follow the prompts ***“Now let’s review what we have so far. At \_\_\_\_\_ (list time), you had \_\_\_\_\_ (read all foods). Can you think of anything else you had at that time? Did you have a beverage with that meal? Did you have any snacks between meals or did you sample food as you prepared for the meal.”*** Add missed meals wherever they need to be added.

### Detailing:

Follow the prompts ***“Now we will fill in your list with more detail. Did you add anything to \_\_\_\_\_ (first item on list)? How much did you eat/drink (get unit –cup, oz, etc. and quantity). What brand was it? What type was it? What flavor was it?”***

### Final Review:

Follow the prompts ***“Now we will review the record. Tell me if I missed anything. At \_\_\_\_\_ (time), you had \_\_\_\_\_ (amount) of \_\_\_\_\_ (type of food). Is this correct? At the end of the meal, ask: “Did you have anything else at that time?”***

Trailer Items:

Ask the participant the following prompt: ***“Was this amount of food usual for you, considerably more than usual for you, or considerably less than usual for you?”*** Also assess the reliability of the recall: reliable, unable to recall one or more meals, unreliable for other reasons.

Concluding:

***“Well that completes the follow-up information. The principal investigator will be sending you \$25 compensation in the mail as well as the sheet of paper documenting your participation, which you may use to obtain extra credit if your instructor is offering it in your class. You should get this within one week, so please call us if you do not receive it by that time. I just want to verify your mailing address. Is \_\_\_\_\_ correct? Great! Well, that concludes your participation in this study. We greatly appreciate the effort that you put forth to complete this study. One final thing is that we ask that you do not talk about your participation with any other potential participant as we are continuing to collect data on potentially many of your classmates. We hope you will honor this request. Do you have any questions? Again, thank you for your participation.”***



Appendix Y  
Timeline of Experimental Procedure

Time (in min)	Materials	Procedure
0-5	Informed Consent Sheet I-9 Forms Experimental Script Pen	Greeting Obtain Informed Consent with signature Answer Questions Record Id Number on Informed Consent Obtain time and phone number to call for follow-up.
6-8	Experimental Data Sheet Pen Small ziplock bag with cotton roll corresponding to participant number Large ziplock bag Stopwatch	Introduce salivation data collection procedure (want to ensure you are hungry). Have participant place one roll under their tongue – leave in place with mouth closed for thirty seconds. They will need to curl it slightly to fit under the tongue. Also have participant swallow prior to putting it in and no talking during the 30 seconds. Have participant remove roll and replace in the original ziplock bag. Ensure it is closed tightly! Put small ziplock bag into larger ziplock bag and ensure that is tightly closed.
9-10	Experimental Data Sheet Pen	Ask inclusion/exclusion criteria questions Ask last time ate and what questions
11		Introduce “attention” task
12-27	Portfolio One Data Recording Sheet Different colored pens	Participant will work on task alone without the researcher present (door shut). During this time, the researcher can weigh the food that will be presented later to the participant.
28-29	Experimental Data Sheet Pen Small ziplock bag with cotton roll corresponding to participant number Large ziplock bag Stopwatch	Collect second salivation trial data using same procedure (saying we need another measure of hunger to be sure). Have participant place one roll under their tongue – leave in place with mouth closed for thirty seconds. They will need to curl it slightly to fit under the tongue. Also have participant swallow prior to putting it in and no talking during the 30 seconds. Have participant remove roll and replace in the original ziplock bag. Ensure it is closed tightly! Put small ziplock bag into larger ziplock bag and ensure that is tightly closed.

30	Food according to condition	Introduce the food to the participant and encourage her to continue working on the “attention” task. Large packaging condition – make sure the bags/bottles are open and available to the participant Small packaging condition – open one bag/can
31-46	Different colored pen	Change color of ink pen used by participant to record location responses. Participant will continue to work on task alone with food present (door shut).
47	Portfolio Two Second Location Sheet	Switch portfolios with participant telling them to begin working on this one.
48-63	Different colored pen	Change color of ink pen used by participant to record location responses. Participant will continue working on task alone with food present (door shut).
64-65	Experimental Data Sheet Pen Small ziplock bag with cotton roll corresponding to participant number Large ziplock bag Stopwatch	Collect third salivation trial data using same procedure (saying we need another measure of hunger to be sure). Have participant place one roll under their tongue – leave in place with mouth closed for thirty seconds. They will need to curl it slightly to fit under the tongue. Also have participant swallow prior to putting it in and no talking during the 30 seconds. Have participant remove roll and replace in the original ziplock bag. Ensure it is closed tightly! Put small ziplock bag into larger ziplock bag and ensure that is tightly closed.
66	Experimental Data Sheet Pen Food Scale	Remove food from room. Instruct participant to continue working on task Weigh food and record on data sheet
67-82	Different colored pen	Change color of ink pen used by participant to record location responses. Participant will continue working on task alone with food present (door shut).
83-84	Balance Scale Experimental Data Sheet Pen	Researcher will thank participant thus far. Researcher will take the participant to another room and obtain her height and weight, recording it on the data sheet.



85-86	Phone Number Log Sheet Experimental Data Sheet Pen Follow-up stimuli envelopes	Give participant the follow-up stimuli envelopes and instruct not to open until they are contacted tomorrow. Thank participant for volunteering so far.
After		Please check the room and wastebasket (if accidentally left in room) to ensure that the participant did not throw away any wrappers or food. If they did, you will need to retrieve them and weigh them with the rest of the leftovers.

Appendix Z  
Human Subjects Review Approval

**E**ASTERN MICHIGAN UNIVERSITY

*Education First*

November 20, 2007

Amy Collings  
College of Psychology

Dear Amy Collings:

The Human Subjects Institutional Review Board (IRB) of Eastern Michigan University has granted approval to your modified proposal, "An Experimental Analysis of the Impact of Advertising and Food Packaging on Women's Eating Behavior: Implications for Public Health Policy Addressing the Obesity Epidemic."

After careful review of your completed application, the IRB determined that the rights and welfare of the individual subjects involved in this research are carefully guarded. Additionally, the methods used to obtain informed consent are appropriate, and the individuals participating in your study are not at risk.

You are reminded of your obligation to advise the IRB of any change in the protocol that might alter your research in any manner that differs from that upon which this approval is based. Approval of this project applies for one year from the date of this letter. If your data collection continues beyond the one-year period, you must apply for a renewal.

On behalf of the Human Subjects Committee, I wish you success in conducting your research.

Sincerely,

Deb de Laski-Smith, Ph.D.  
Interim Dean  
Graduate School  
Administrative Co-Chair  
University Human Subjects Review Committee

Note: If project continues beyond the length of **one** year, please submit a continuation request form by **11/21/08**.

Reference # 071110M

University Human Subjects Review Committee · Eastern Michigan University · Starkweather Hall  
Ypsilanti, Michigan 48197  
Phone: 734.487.0042 Fax: 734.487.0050  
E-mail: [human.subjects@emich.edu](mailto:human.subjects@emich.edu)  
[www.ord.emich.edu/](http://www.ord.emich.edu/)

Appendix AA  
Caloric Intake Algorithms

Pretzel weight = Pretzel (preweight) – Pretzel (postweight)

M&M weight = M&M (preweight) – M&M (postweight)

Doritos weight = Doritos (preweight) – Doritos (postweight)

Oreos weight = Oreos (preweight) – Oreos (postweight)

Coke weight = Coke (preweight) – Coke (postweight)

Sprite weight = Sprite (preweight) – Sprite (postweight)

Pretzel Calories = Pretzel weight \* (110 calories / 30 grams)

M&M Calories = M&M weight \* (210 calories / 42 grams)

Doritos Calories = Doritos weight \* (150 calories / 28 grams)

Oreos Calories = Oreos weight \* (160 calories / 34 grams)

Coke Calories = Coke weight \* (100 calories / 267 grams)

Sprite Calories = Sprite weight \* (100 calories / 267 grams)

Total Calories = Pretzel Calories + Doritos Calories + M&M Calories + Oreos Calories +  
Coke Calories + Sprite Calories