2017

Snack Food Reinforcement During Work and Non-work Hours Among U.S. Office Workers

Sherise Larks
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral dissertation by

Sherise Larks

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Denise Feda, Committee Chairperson, Public Health Faculty
Dr. Scott McDoniel, Committee Member, Public Health Faculty
Dr. Manoj Sharma, University Reviewer, Public Health Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2017

Abstract

Snack Food Reinforcement During Work and

Non-work Hours Among U.S. Office Workers

by

Sherise Larks

MBA/HCM, University of Phoenix, 2006

BS, Xavier University, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

August 2017

Abstract

The current epidemic of overweight and obesity has been partly credited to a growing trend for snacking and sedentary work behaviors. The purpose of this quantitative, cross-sectional survey was to investigate whether the difference between snack food reinforcement during work and non-work hours and work food motives predicted BMI among U. S. office workers. This study was based on the theoretical framework of the individual differences theory, in the context of the behavioral choice theory and reinforcement theory. The independent variables were food reinforcement and food motives; the dependent variable was BMI. Descriptive, correlational, and exploratory analyses were used. The survey was administered to a sample of 100 adult male and female office workers using SurveyMonkey. The results of the study determined that there was a statistically significant difference in food reinforcement during work hours versus non-work hours; however, only change in intensity was a statistically significant predictor for the workers' BMI class scores ($p < .05$). Moreover, during work-hours, office workers were willing to exert more effort (pay more) to obtain these snack foods than during non-work hours. An increase in work intensity was associated with an increase in the odds of being obese, with an odds ratio of 1.050 (95% C.I. [1.016, 1.084]). Food motives were not associated with BMI class scores ($p < .05$). These analyses have provided support for the hypotheses that food reinforcement is greater during work hours among office workers. As a result, they have significant positive social change implications which include relative policy changes within companies, providing healthier snack food choices, increasing prices on high energy-dense foods, and tailoring the workplace environment to meet individual needs.

Snack Food Reinforcement During Work and Non-work Hours Among U.S. Office Workers

by

Sherise Larks

MBA/HCM, University of Phoenix, 2006

BS, Xavier University, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

August 2017

Acknowledgements

The dissertation process has been a long journey, but I am thankful for all of the support throughout the process. I would like to thank my grandmother, sister, brothers, family, and friends who supported this endeavor and kept me motivated to complete the program. Thank you for your understanding, love, and prayers. In addition, a heartfelt thanks to Dr. Denise Feda, Dr. Scott McDaniel, Dr. Manor Sharma, and Timothy McIndoo. Your feedback and support has been instrumental in this process.

A very special thank you to Dr. Feda for her reviews of my endless drafts. If I could, I would give you the chair of the year award. Your support, guidance, patience, and understanding has been greatly appreciated.

Table of Contents

List of Tables

Chapter 1: Introduction to the Study

Introduction

Over the last two decades, the dominating mode of work has become computer based, and this has resulted in many workers spending most of their day sitting (French et al., 2001; Sobal & Wansink, 2007). In light of obesity emerging as one of the most serious public health issues in the nation, obesity research has begun to assess the prevalence rates and the trends of obesity among the U. S. working population (Caban et al., 2005). Currently, 65% of adults are overweight or obese and this percentage is expected to rise by 2020 along with associated diseases such as type 2 diabetes and heart disease (Centers for Disease Control and Prevention [CDC], 2012). Healthcare costs are also expected to rise. Overall United States (U.S.) adult obesity-related medical care costs are estimated to be as high as $147 billion annually (CDC, 2015). The indirect cost of obesity includes loss of productivity cost at $3.9 billion and days of work lost at $39.2 million (Wolf & Colditz, 1998). These huge losses of money may be mitigated by finding explanations for, and solutions to, overweight and obesity in the workplace. This study is expected to provide some insight into this epidemic.

There is a universal agreement that a significant contributor to the obesity epidemic is obesogenic environments that encourage unhealthy eating and discourage physical activity (Devine et al., 2007; Hill et al., 2003; Ogden et al., 2014). Sedentary work, such as office support occupations, is associated with increased prevalence of obesity (Luckhaupt et al., 2014). Foods that are available and consumed during work hours may be one of the largest contributors to excess energy intake (excess food) and weight gain (Maruyama & Morimoto, 1996). In a typical work day, most adults spend 8-

12 hours at work, which is likely to affect their dietary habits (Maruyama & Morimoto, 1996). The workplace can be an influential setting for reaching adults since approximately 66% of the U. S. adult population is employed in various occupations (Courtemanche, 2009). The workplace environment can provide opportunities for dietary and environmental change as well as individual behavior changes.

The current overweight and obesity epidemic is partly credited to a growing trend for snacking, which can facilitate overeating and weight gain in association with quality of food choice, consumption frequency, and eating environments (Bellisle, 2014). Snack foods tend to be high in sugar and fat, which can contribute to weight gain. Food reinforcement is also significant contributor to weight gain and change in body mass index (BMI), and may have a significant effect on those most responsive to food cues (Carr et al., 2014). Prospective data indicated that the reinforcing value of food (i.e., the psychological and sensory properties of food that motivates individuals to eat) predicts weight gain in adults (Carr, Lin, Fletcher, & Epstein, 2014; Epstein, Yokum, Feda & Stice, 2014). In addition, questionnaire measures of eating motivations tend to correlate with weight gain and changes in BMI (Koenders & van Strien, 2011). Therefore, understanding food reinforcement (motivation to eat) and snacking motives (reasons for eating) may help reduce associated energy intake and weight gain (Carr, Lin, Fletcher, & Epstein, 2014; Koenders & van Strien, 2011).

Potential implications for positive social change with this awareness may include relative policy changes within companies, tailoring the worksite environment to meet individual needs, providing healthier food choices, increasing prices on energy-dense foods, and providing non-food alternatives to lunch breaks. Therefore, it is important to

investigate how the food environment at the workplace may influence energy intake and weight-related behaviors.

This study investigated how the food reinforcement of energy-dense (high calorie) snack foods, during work and non-work hours, influenced the energy intake and weight gain that can lead to overweight and obesity among U.S. office workers (professionals, managers, technologists; administrative, financial, and clerical employees). Food motives associated with snack food consumption during work hours was also examined. This study may shed light on the difference in snack food reinforcement during work and non-work hours. Moreover, office workers whose snack food reinforcement differs during work versus non-work hours may find themselves more conscious of when food reinforcement is highest and the motives that drive excess energy intake. In addition, information on the food motives that drive these behaviors may be revealed. The more individuals and organizations know about these environmental food-related behaviors, the more opportunity they may have to take action in mitigating risk for weight gain during work and non-work hours.

In Chapter 1, I discuss the background, problem statement, purpose, research questions, theoretical framework, nature of the study, assumptions, delimitations, limitations, and the significance of the study.

Background

Over the last several decades, obesity across all demographics (ethnicity, race, sex, age, geography region, education level, and socioeconomic status) has increased significantly (CDC, 2015). These significant increases in the incidence and prevalence of overweight and obesity may be due to a growing trend for snacking. Food reinforcement,

in relation to snacking, can facilitate overeating and weight gain, in association with quality of food choice, consumption frequency, and the eating environment (Bellisle, 2014).

Social-environmental influences, such as the home and work environment may be significant risk factors for overweight and obesity (French et al., 2001). Environmental influences on food choice include convenience and the availability of energy-dense snack foods in many settings in which people live and work (French et al., 2001). The global obesity epidemic is blamed on energy-dense diets and energy-dense snacks such as sweets, sweetened beverages, desserts, vending snacks, and fast foods (Currie et al., 2010; Duffey & Popkin, 2011; Escoto et al., 2011; Stubbs & Whybrow, 2004; Swinburn et al., 2004). The key dietary behavior shifts include increased away-from-home consumption with substantial increases in total energy from soft drinks, salty snacks, and pizza (Nielsen, Siega-Riz, & Popkin, 2002).

Food reinforcement is also linked to overweight and obesity. Food reinforcement is a risk factor for weight gain and is related to energy intake in the natural environment (Epstein, Carr, Lin, Fletcher, & Roemmich, 2012; Epstein, Yokum, Feda & Stice, 2014). The relative reinforcing value of food provides an index to measure the motivation to eat (Epstein et al., 2011). Foods, such as snacks, can be a strong stimulus for excess eating and have the ability to motivate a substantial amount of behavior; however, a weaker reinforcer may not motivate as much behavior (Epstein, Leddy, and Tempe, 2007). For example, individuals might spend less effort to gain access to an apple than they would for an energy-dense snack, such as a bag of chocolate chip cookies.

Food choices are influenced by motivating factors such as cost, taste, convenience, accessibility, availability, food cues, emotions (e.g., stress), dietary restraint (restrict food intake), dietary disinhibition (tendency to overeat) and variety (Carr, Fletcher & Epstein, 2014; Cleobury & Tapper, 2014; Darmon & Drewnowski, 2008; French et al., 2010; Sizer & Whitney, 2011).

The increasing prevalence of overweight and obesity among the U. S. population has led researchers to investigate possible associations between not only weight gain and snacking, but its relation to food motives, food reinforcement, and environmental factors. There is extensive literature on barriers to healthy eating, but there is limited research on the difference in food reinforcement and motivation to consume energy-dense snack foods during work and non-work hours and its relation to the weight gain. This additional research may provide a better understanding of food reinforcement relative to snack foods, excess energy intake, increased BMI, and the incidence and prevalence of overweight and obesity. By understanding there are significant differences in food reinforcement by environment; the door is opened to further modifying work environments to promote health for all employees.

Problem Statement

Today, overweight and obesity are grave concerns because they increase the risk of hypertension, diabetes, cancers, heart disease, and many other conditions (CDC, 2015). The prevalence of obesity has more than doubled since 1960, increasing from 13.4% to 35.7% in U.S. adults age 20 and older (Ogden et al., 2014). In light of statistics showing that nearly 66% of the nation is now overweight or obese; many studies suggest that a portion of this percentage can be explained by the consumption of high energy-

dense foods during the work day (Devine et al., 2012; Ogden et al., 2014; Shimotsu et al., 2007).

The workplace food environment may play a significant role in the growing problem of overweight and obesity, but with additional research and preventive measures, the workplace may also be a key resource for improving the health of employees in making sustainable, healthier food choices (Park et al., 2010). Many of the nation's workers spend more than half their waking hours at work, which is where they consume half their daily calories. Moreover, food reinforcement, food motives, and consumption of energy-dense snack foods during work hours may be a significant contributing factor to the nation's overweight and obesity epidemic (Park et al., 2010: Wanjek, 2005). Environmental factors, as well as snack food reinforcement and food motives, may also be important to consider in the development of obesity programs in the workplace (Park et al., 2010; Wanjek, 2005).

Over the past two decades, U.S. adults have steadily increased the number of daily snack foods from 18–24% (Piernas & Popkin, 2010). Snack foods tend to be high in sugar and fat, which can contribute to weight gain (Bes-Rastrollo et al., 2010). Therefore, understanding food reinforcement and motives for snacking in different environments may help reduce associated weight gain

Food reinforcement, such as the motivation to eat energy-dense snacks, is associated with energy intake and obesity (Piernas & Popkin, 2010). Understanding why people make certain food choices is important for developing interventions to prevent obesity (Renner et al., 2012). Food choices are influenced by food motives such as convenience, price, mood, health, familiarity, sensory appeal, weight control, natural

content, and ethical concerns (Drewnowski & Daron, 2008; Steptoe, Pollard, & Wardle, 1995).

Food motives drive food reinforcement (Drewnowski & Darmon, 2008). Food reinforcement is an empirical indicator of food choice and motivation to eat snack foods (Carr, Lin, Fletcher, & Epstein, 2014; Epstein et al., 2010; Epstein et al., 2012). The motivation to consume energy-dense snacks during the work day may differ from motivation to consume these obesogenic foods during non-work hours. There is a gap in knowledge in this aspect, and this remains to be tested. There is extensive literature on barriers to healthy eating, but there is a gap in knowledge concerning the difference in food reinforcement, and motivation to consume energy-dense snack foods, during work hours and non-work hours. A better understanding of snack food reinforcement and the motives that drive these food choices may provide insight into the increasing prevalence of overweight and obesity.

Purpose of the Study

The purpose of this quantitative study was to examine whether the difference between snack food reinforcement during work and non-work hours predicted BMI among U.S. office workers. In addition, food motives associated with energy-dense snack food consumption were examined to assess their impact on the relationship between food reinforcement and BMI. In this cross-sectional study, the independent variables were food reinforcement and food motives. The dependent variable was BMI. Understanding food reinforcement and motives for energy-dense snacking in different environments may help reduce associated weight gain (Carr, Lin, Fletcher, & Epstein, 2014; Koenders & van Strien, 2011).

Research Questions

The study was guided by the following four research questions with a cross-sectional survey to measure the variables:

RQ1: Is there an association between food reinforcement and BMI among office workers?

$H_0$1: There is no association between food reinforcement and BMI among office workers.

H_A1: There is an association between food reinforcement and BMI among office workers.

RQ2: Is there a relationship between work hour food motives and BMI among office workers?

$H_0$2: There is no relationship between work hour food motives during work hours and BMI among office workers.

H_A2: There is a relationship between work hour food motives and BMI among office workers.

RQ3: Is there a difference in food reinforcement during work hours vs. non-work hours among office workers?

$H_0$3: There is no difference in food reinforcement during work hours vs. non-work hours among office workers.

H_A3: There is a difference in food reinforcement during work hours vs. non-work hours among office workers.

RQ4: Is there an association between food reinforcement and food motives during work hours among office workers?

$H_0$4: There is no association between food reinforcement and food motives during work hours among office workers.

H_A4: There is an association between food reinforcement and food motives during work hours among office workers.

Theoretical Framework

Factors such as food environments, food motives, food reinforcement, life styles, and SES are significant factors that may contribute to energy imbalance, increased BMI, and weight gain. There may be individual differences in who substitutes healthier foods for energy-dense foods and snacks, or who substitutes alternative activities for energy-dense foods or snacks (Epstein et al., 2007). These choices may be associated with individual differences based on SES status, mood, eating history, snack food accessibility, lack of food options available in that environment, food motives or just the reinforcing value of the energy-dense snack foods available (Carr, Fletcher, & Epstein, 2014; French et al. 2003). This study was based on the theoretical framework of the individual differences theory, in the context of the behavioral choice theory and reinforcement theory.

Reinforcement is described as an active behavior that functions within the environment to generate consequences (Skinner, 1948). Ecological and economic circumstances include wide access to energy-dense snacks foods and lack of beneficial alternatives to eating, which strengthens food reinforcement, while promoting unhealthy food choices (Lin et al., 2013). As a consequence, this greater food reinforcement can lead to positive energy balance that leads to weight gain.

Choice theory developed by Glasser, is intended to explain human behavior based

on internal motivation (1998). According to the theory, most behavior is chosen and is driven by our genes to satisfy six basic needs: survival, love, belonging, power, freedom, and fun. Epstein et al. (2007) discussed choice theory more specifically as it relates to obesity. According to Epstein et al. (2007), behavioral choice theory states that choice of food is determined by the absolute reinforcing value of food (only one option available) and the accessibility of other foods (alternatives). While food motives may drive food reinforcement and behavioral choice, individual differences in eating behaviors determine how strongly individuals respond to environmental food cues or accessibility and availability of energy-dense snacks during work and non-work hours (McAdams & Olsen, 2010; Terracciano et al., 2009). With a better understanding of each theory, it may be possible to determine how the environment during work and non-work hours affects the food reinforcement and food motives that drive motivation to consume the energy-dense snacks that promote weight gain. These theories may provide insight into the relationship among the variables studied and their association with overweight and obesity. These theories will be discussed in detail in Chapter 2.

Nature of the Study

This quantitative study used a cross-sectional survey of office workers to assess (a) the role of food reinforcement of energy-dense snack foods during work and non-work hours, and (b) the role food reinforcement plays in the energy intake and weight gain that may lead to overweight and obesity. The most appropriate methodology to investigate the research questions was a cross-sectional survey design. A more detailed justification of this methodology will be offered in chapter 3. This design allowed for the comparison of the population in two different environments, work and non-work hours, at

a single point in time (Lavrakas, 2008). This design also allowed for the comparison of different variables (age, gender, income, education, geographic locations, and ethnicity) at the same time (Lavrakas, 2008).

The study examined whether the difference between food reinforcement during work and non-work hours predicted BMI among U.S. office workers. In addition, food motives associated with energy-dense snack food consumption were examined to assess whether they affected the relationship between food reinforcement and BMI. The participants were obtained through self-selection, convenience sampling among those in the target population that completed the survey online via SurveyMonkey. Descriptive, correlational, and exploratory analysis were used to assess the survey data.

Assumptions

In this study, it was assumed that the participants answered accurately, truthfully, and to the best of their ability. It was assumed that they answered to the best of their knowledge based on personal experiences related to food motives and food reinforcement. It was also assumed that all participants met the criteria requested for the study: Full-time, US adult office worker, age 18 years or older, not pregnant, understands/reads fluent English, BMI > 18 kg/m2 (not underweight) with a normal diet (no restrictions on food or eating). These assumptions were necessary as it relates to the validity of data and study results.

Scope and Delimitations

The focus of this quantitative, cross-sectional study was to assess the difference between snack food reinforcement during work and non-work hours among U.S office workers and its relationship to BMI. Food motives associated with energy-dense snack

food consumption were also examined to assess whether they affected the relationship between food reinforcement and BMI. This study was only done among U.S. office workers. By limiting the participants of this study to only U.S. office workers, the results of the study may not be generalizable to other occupations or office workers outside the U.S. This population was chosen because of recent literature linking sedentary work to the increasing prevalence of overweight and obesity in the U.S. This study was based on the theoretical framework of the individual differences theory, in the context of the behavioral choice theory, and reinforcement theory. Only these three theories were examined because they were most relevant to the research. With a better understanding of these theories it may be possible to determine how work and non-work hour food environments affect the food reinforcement and food motives that drive motivation to consume the energy-dense snacks that promote weight gain.

Limitations

This study was subject to a few limitations.

- One limitation was that the analysis included cross-sectional data with a small sample size and the results were not generalizable to the target population.
- The cross-sectional design excluded the manipulation and control that is typical of experimental studies; and thus allowed for threats to external validity (Frankfort-Nachmias & Nachmias, 2008). The study also suffered from serious methodological issues in relation to internal validity. With this design, causal relationship could not be established because there could have been other explanations. With cross-sectional/correlational designs, these

factors can be controlled statistically with regression analysis (Frankfort-Nachmias & Nachmias, 2008). In this study, regression analysis was used to control for these factors.

- Since a convenience sample was used, the sample was not representative of the entire population. These factors limited the inferences that could be made and lowered the external validity of the study. The data permitted only inferences of association between food reinforcement, food motives, and weight gain; no inferences could be made about causality. These limitations were addressed by doing the following: (a) To ensure the study was representative of the whole population, the online request was open to eligible participants from all U. S. regions; (b) The sample size was 100, instead of the required 65, to reduce the likelihood that the results would be due to chance alone; and (c) the inclusion and exclusion criteria were established in the beginning to ensure eligible participants were correctly identified.
- Another limitation includes self-selection bias in which only participants with an inherent bias could volunteer for the study (Khazaal, 2014). Since the study was not qualitative nor did it have open-ended questions, bias in this respect may not significantly affect the results.
- The study included self-reporting. This could lead to bias in relation to social desirability and embarrassment in reporting weight, food motives, and the reinforcing value of snack food. Self-reporting with individual misjudgments, bias, height/weight sensitivity, or food motives sensitivity could lead to an underestimation of the role food reinforcement of energy-dense snack foods

play in the energy intake and weight gain that may lead to overweight and obesity. This limitation was addressed by clearly stating that the study was anonymous.

- All possible motives for eating were not provided in the questionnaire. The survey included those motives assessed in the FCQ, which measured only price, mood, convenience, weight concern, familiarity, sensory appeal, health, natural content, and ethical concern. This could cause underestimation of motives for eating energy-dense snacks. For future research, I will recommend a study that includes additional motives.
- I added ten additional questions that measured age, sex, food environments, regional location, eating behaviors, self-reported height and weight (BMI), weight status, and occupational status (full-time office worker). The survey questions I compiled were taken from various validated surveys; they will be discussed in more detail in Chapter 3. The additional questions added were more exploratory. If these variables impact the outcome, I will suggest that additional research studies are warranted to develop a survey measure to examine these specific variables.

Significance of the Study

One of the major immediate and long-term health issues in modern society is the problem of overweight and obesity. Food reinforcement, food motives, and the food environment are contributors to the overweight and obesity epidemic (Bes-Rastrollo et al., 2010; Escoto et al. 2010; Koenders & van Strien, 2011; Sobal & Wansink, 2007;

Swinburn et al., 2004; Temple et al., 2011). Food choices and food reinforcement are shaped by food motives and the complex world in which people live and work. With a better understanding of individual differences with respect to food reinforcement and behavioral choice, it may be possible to determine how the environment during work and non-work hours affects the food reinforcement and food motives that drive motivation to consume the energy-dense snacks that promote weight gain. The information provided by this study has the potential to advance knowledge in the discipline and organizational policy. Understanding if differences exist in food reinforcement during work and non-work hours may lead to essential need-based evidence to alter work and non-work hour food environments

This study was expected to contribute to research on knowledge of how food motives and food reinforcement of snack foods, during work and non-work hours, influence energy intake and BMI. The findings could help inform the target population and help with individual and organizational mitigation of risk associated with obesogenic food environments. This insight into the work environment has not been explored and may provide valuable information on who may benefit from interventions in the workplace.

The implications for positive social change included relative policy changes within organizations, tailoring the worksite environment to meet individual needs, providing healthier food choices, increasing prices on energy-dense foods, and providing non-food alternatives at breaks. Non-food alternatives to lunch breaks could include the incorporation of a non-food break room, where workers could exercise on exercise equipment (weights, treadmills etc.) or just read, watch television, play games, and

socialize. Another non-food alternative would be a group walk, where those having the same break could take walks around the building or parking lot. Since the reinforcing value of snacks depends on available alternatives, strategies to increase the reinforcing value of healthy snacks and non-food alternatives, or reducing access to highly reinforcing foods that drive motivation to eat, may reduce energy-dense snack consumption (Epstein, Yokum, Feda, & Stice, 2014; Giesen et al., 2010; Temple, et al., 2009). However, future research is needed to assess whether these initiatives would work with workers with high food reinforcement.

Potential contributions of the study can advance policy within organizations. Workplace interventions that offer healthful eating options in vending machines and cafeterias have the potential to greatly benefit organizations, employees and their families (Quintiliani, Poulsen, & Sorensen, G., 2010). Increasing prices on energy dense foods or reducing prices on healthier food items may also be an option. However, future research is needed to assess whether these initiatives would work with workers with high food reinforcement.

Food is readily available throughout the day during work hours (vending, cafeterias and surrounding food outlets) and non-work hours (home food environment, restaurant dining, fast food restaurants, convenience, and grocery stores). Identifying when food reinforcement is highest, and the motives behind it, may be essential in efforts to influence dietary change.

Understanding whether there are differences in food reinforcement during work and non-work hours may lead to essential need-based evidence to change the food environments at work and outside of work. Understanding why people make certain food

choices is important for creating interventions to prevent obesity (Renner et al., 2012). The findings, along with a better understanding of this phenomenon, could yield preventive measures taken by these workers and worksites, which could decrease medical care expenditures, disability, disease, and number of deaths (World Health Organization [WHO], 2016). This study was expected to create awareness of the risk of overweight and obesity associated with food reinforcement, food choice motives, and the worksite food environment.

Summary

The increasing prevalence of overweight and obesity among the U. S. population has led researchers to investigate possible associations between not only weight gain and snacking, but its relation to food motives, food reinforcement, and environmental factors. The current epidemic of overweight and obesity has been partly credited to a growing trend for snacking and sedentary work behaviors. The purpose of this quantitative, cross-sectional survey was to investigate whether the difference between food reinforcement during work and non-work hours predict BMI among U. S. office workers. Food motives associated with energy-dense snack food consumption were also examined to assess whether they affected the relationship between food reinforcement and BMI. The independent variables were food reinforcement and food motives; the dependent variable was BMI. This study was based on the theoretical framework of the individual differences theory, in the context of the behavioral choice theory and reinforcement theory. Potential implications for positive social change include relative policy changes within companies, tailoring the worksite environment to meet individual needs, providing healthier snack food choices, and increasing prices on energy-dense foods.

In Chapter 1, the background, problem statement, purpose, research questions, theoretical framework, nature of the study, assumptions, delimitations, limitations, and the significance of the study was discussed. The research discussed in this chapter supports this study and potential implications for positive social change. In addition, Chapter 1 introduces the literature review (chapter 2) of relevant studies on food reinforcement and food motives, in relation to BMI and consumption of energy-dense snack foods, during work and non-work hours. Chapter 3 will provide further elaboration on the methodology and research design for this study. The results and discussion will be presented in Chapters 4 and 5 respectively.

Chapter 2: Literature Review

Introduction

The prevalence of obesity has more than doubled since 1960, increasing from 13.4% to 35.7% in U.S. adults age 20 and older (Ogden et al., 2014). In light of statistics showing that nearly 66% of the nation is now overweight or obese; many studies suggest that a significant portion of the nation's weight gain can be explained by the consumption of high energy-dense foods during the work day (Devine et al., 2007; Ogden et al., 2014; Shimotsu et al., 2007). The purpose of this quantitative study was to understand the difference between snack food reinforcement and associated food motives and their relation to BMI and weight gain during work hours and non-work hours among U. S. office workers.

The focus of the literature review is to summarize the findings from relevant, prior research to provide knowledge on the relationship between the variables involved in the study. This chapter addressed the independent variables of food reinforcement and food motives, and the dependent variable BMI. Relevant studies that embodied the major themes and methods of this study were used and areas needing further research were discussed. Factors such as energy-dense snacking as it relates to food reinforcement food motives, food environment during work and non-work hours, and overweight and obesity were discussed.

In this chapter I reviewed the current literature on how food reinforcement and food motives of energy-dense snack foods influenced weight gain and BMI during work hours and non-work hours. This information sought to shed light on the obesity epidemic in relation to the independent variable, the dependent variable, and the confounding

factors. Reinforcement theory, behavioral choice theory, and the individual differences theory are discussed to provide insight into the relationship between these variables and their association with overweight and obesity.

Literature Search Strategy

To investigate the possible link between food reinforcement and food motives, and their relation to BMI and weight gain during work hours and non-work hours, I used the following databases for the period 2011–2016: Sage, ProQuest (family health database and public health database), Academic Search Premier, PubMed, and MEDLINE. However, if an out-of-range article was significant, and no other relevant literature was available, it was considered for the literature review. Search strategies were developed from the variables used and research questions. The following key terms were used in the searches: *snacking, food reinforcement, food motives, BMI, weight gain, work environment, food environment,* and *overweight, obesity*. Of the over 200 titles examined, over 150 journal articles and peer-reviewed literature, were used in this review.

Theoretical Foundation

Factors such as food environments, food motives, food reinforcement, life styles, and SES are significant factors that may contribute to energy imbalance, increased BMI, and weight gain. There may be individual differences in who substitutes healthier foods for energy-dense foods and snacks, or who substitutes alternative activities for energy-dense foods or snacks (Epstein et al., 2007). These choices may be associated with individual differences based on SES status, mood, eating history, snack food accessibility, lack of food options available in that environment, food motives or just the

reinforcing value of the energy-dense snack foods available (Carr, Fletcher & Epstein, 2014; French et al., 2003).

While food motives may drive food reinforcement and behavioral choice, individual differences determine how strongly individuals respond to environmental food cues or accessibility and availability of energy-dense snacks during work hours and non-work hours. With a better understanding of individual difference in the context of food reinforcement and behavioral choice, we may be able to determine how the environment during work and non-work hours affects the food reinforcement and food motives that promote weight gain. These theories may provide insight into the relationship among the factors studied and their association with overweight and obesity.

Reinforcement, Operant and Classical Conditioning

Much of the theory concerning general reinforcement began in 1948 with behavioral psychologists such as B. F. Skinner, J. B Watson and Edward Thorndike and their use of animal experiments. Skinner is famous for his research on reinforcement and his belief that positive reinforcement is superior to punishment in molding behavior (Skinner, 1938). Skinner postulated that positive reinforcement can cause lasting long-term behavior modification, but punishment changes behavior only short term, with many detrimental side-effects. Skinner described reinforcement as creating "situations that a person likes or removing a situation that he doesn't like, and punishment as removing a situation a person likes or setting up one he doesn’t like; therefore, the distinction is based mainly on the pleasant or aversive nature of the stimulus" (Skinner, 1948).

Skinner's research also extended the concept of reinforcement to operant conditioning. In this paradigm, he advised that the experimenter cannot elicit the

desirable response, but must wait for the response to occur naturally before a potential reinforcer is delivered. It is a method of learning that arises through punishments and rewards. Skinner defined the term reinforcement as an active behavior that functions within the environment to generate consequences. Operant conditioning is described as actions followed by reinforcement, which tends to strengthen that action, and the likelihood of reoccurrence. With this conditioning, there is a relationship between the behavior and its consequence. For example, when a dog is ordered to sit, and he obeys, he receives a treat as his reward; however, if the dog receives an electric shock when he disobeys, he learns to sit when he is ordered.

On the other hand, in the paradigm of classical conditioning, the experimenter elicits the desired response, by presenting a reflex eliciting stimulus (uncontrolled stimulus), which is then paired with a neutral stimulus (Brown, 2004). Ivan Petkovic Pavlov was known for his work, in 1901, with classical conditioning. He is famous for the concept of conditioned reflex, with his research in examining the salivation of dogs. He observed in his classical conditioning experiment that when the bell was rung, signaling the occurrence of food, in consecutive sequences, the dogs would initially salivate when the food was presented; thus observing that the dogs would begin to associate the bell ringing, with the presentation of the food, and salivate upon presentation of the stimulus (Brown, 2004). In his observation it was found that eventually, the bell alone became the conditioned stimulus, evoking the salivating response.

In terms of graphically observing the stimulus and elicited response, as seen in Skinner and Pavlov's research, demand curves can be used. Demand curves are used to

show the relationship between responding, response requirements and breakpoints (stop responding) to provide an idea of the degree/level of change in responding as a function of the proportional change in behavioral requirements to obtain the food (Epstein, Leddy, and Temple, 2007). One of the most relevant features of the demand curve is the change in the shift from increasing responses for food, to decreasing responses for food. These changes may occur for each individual for different reasons. B.F Skinner proposed that individual differences among individuals or groups stem from that fact that they come from different environments in which their learning behavior has been molded and reinforced in different ways (Skinner, 1948). This can be in terms of SES, childhood experiences, current eating environments, beliefs, emotion, etc. The observed differences seen among shifts in increasing and decreasing responses may be due to individual differences in food reinforcement and the food motives that drive the choice behaviors elicited in different environments (work hours and non-work hours).

A considerable proportion of energy-dense snacks foods are consumed during sedentary time such as with sedentary occupations (Barr-Anderson et al., 2009; Capot et al., 2011; Sisson et al., 2009). Ecological and economic circumstances experienced by many SES individuals, which include wide access to energy-dense snacks foods and lack of beneficial alternatives to eating, strengthens food reinforcement while promoting, unhealthy food choices (Lin et al., 2013). As a consequence, this greater food reinforcement can lead to positive energy balance that leads to weight gain.

Behavioral Choice Theory

Choice theory, developed by Dr. William Glasser, is the explanation of human behavior based on internal motivation (1998). The theory advises that most behavior is

chosen and driven by six genetically driven genes (food, shelter, security, breathing, clothing and personal safety) and four fundamental psychological needs (love, freedom, power and fun). Epstein et al. (2007), in his research, discussed the choice theory more specifically as it relates to obesity. According to Epstein et al., 2007, the behavioral choice theory conceptualizes that choice of food is determined by the absolute reinforcing value of food (i.e., the psychological and sensory properties of food that motivates individuals to eat) and the accessibility of other foods.

Food reinforcement and the behavioral choice theory are relevant to understanding excess energy intake and obesity, providing a framework for assessing factors that can influence eating aside from factors that may regulate energy homeostasis (Epstein, Leddy, & Temple, 2007). This theoretical approach may help organize research, treatment and prevention strategies based on the assessment of food reinforcement behaviors. The many choices that impact consumption habits and weight gain are viewed as alternatives, in which one choice may be more luring or reinforcing than the other. The main paradigm of studying choice is to present access to two or more options and vary the schedules of reinforcement (amount of work) needed to obtain each (Epstein, Leddy & Temple, 2007). This helps in determining the relative reinforcing value of the other choices.

Choice paradigms are based on the alternative(s) available, in that if the alternative has little reinforcing value, then there might not be a difference in the absolute and reinforcing value; however, if the alternative is very reinforcing, then the absolute versus reinforcing value might be a little different (Epstein, Leddy, and Temple, 2007). Take for instance the evaluation of the absolute reinforcing value of a peach, or the

relative reinforcing value of a peach versus carrots. Since, for many people, carrots are not a very reinforcing alternative, the absolute and relative reinforcing value may be similar. Now, if you have a chocolate candy bar as an alternative to the peach than the relative reinforcing value of the peach, versus the chocolate candy bar, may be lower in comparison with the absolute reinforcing value of the peach being studied alone. Many people tend to find energy-dense foods more reinforcing; however, studies have shown that increasing purchasing of both energy-dense foods through subsidies and taxes, along with decreasing accessibility of these items, can promote healthier food choices (Epstein et al., 2010; Lin et al., 2013). In assessing the absolute reinforcing value of energy-dense snack foods, individual differences may play a large role in choice behaviors.

Individual Differences

Food choices and food reinforcement are shaped by food motives and the complex world in which people live, in terms of the food environment, as well as one's physical and social surroundings. Over that last 20 years, research on food environments has looked at how settings such as homes, neighborhoods, worksites, and schools, influence which foods are available and whether those settings provide opportunities for healthier diets. Understanding how the food environment influences weight, can help policymakers find ways to change the environment and, in turn, reduce the prevalence of obesity (Larson & Story, 2009). Although environmental and social changes are behind the recent obesogenic epidemic, several individual difference variables may contribute to the problem (Hiza et al., 2012; Konttinen et al., 2013; Lin et al., 2013). While food motives may drive food reinforcement and behavioral choice, individual differences

determine how strongly individuals respond to environmental food cues or accessibility and availability of energy-dense snacks during work hours and non-work hours.

As discussed with food reinforcement, there are differences in the direction or level of response to the stimulus provided, which is also associated with personality traits. In terms of values, beliefs, preferences, and health-related behaviors, there are significant individual differences that exist among people. Kulpe's (1895) theory of individual differences suggests that behavior is related to imaged sensation or vivid imagery. Contemporary psychologists have debated this notion and have redefined this imagery as an objective internal representation that is used in information processing not the subjective experience itself (Kosslyn, Thompson, Kim, Rauch, and Alpert 1996). Personality traits measure individual differences in enduring patterns of behavior, emotion, and cognition in terms of the summation of an individual's attitudinal, emotional, and behavioral responses (McAdams & Olsen, 2010; Terracciano et al., 2009). These personality traits and associated behavioral responses may differ for each individual in work and non-work hour food environments.

The built environment during work and non-work hours consist of a range of social and physical elements that make up the structure of that environment, and may influence overweight and obesity. Food choices in these environments are made in the context of alternatives. Environmental influences on food choice include convenience and availability of energy-dense foods in many settings in which people live, work and socialize (French et al., 2010). What we choose to consume plays a significant role in determining risk for weight gain. It is essential to identify if there are individual

differences in food reinforcement because individuals may be motivated to consume energy-dense foods for different reasons.

For example, if your co-workers Tanya, Bob, and Lisa took a break to go to the vending machine, each individual may vary in their choice selection. Upon their return, Tanya comes back to her desk with a granola bar, Bob with two bags of Doritos and Lisa comes back with nothing. In theory, in terms of individual differences, Bob may have chosen the bags of Doritos because of food motives such as price, convenience, taste, dietary disinhibition, or childhood familiarity. Tanya may have chosen the granola bar because of healthy eating habits, taste, natural content or other health conscious motives relevant to calorie intake. Lisa may have chosen nothing due to dietary restraint, health motives, lack of variety during work hours, ability to delay gratification until non-work hours or price (reached her breakpoint in higher vending machine snack prices).

Additional research is warranted to investigate if energy-dense snack foods with associated food motives are more reinforcing during work hours or non-work hours. Could an individual's environment during work hours and non-work hours influence food motives and food reinforcement of these energy-dense snack foods, taking into consideration an individual's behavioral choice and individual differences? There may be individual differences in who substitutes healthier foods for energy-dense foods and snacks, or who substitutes alternative activities for energy-dense foods or snacks (Epstein et al., 2007). These choices may be associated with individual differences based on SES status, price breakpoints, food motives, eating history, snack food accessibility, lack of food options available in that environment, or just the reinforcing value of the energy-dense snack foods available.

For the present study, the efficacy of the single reinforcer, energy-dense snack foods, by using its absolute reinforcing value, will be evaluated by using progressive ratio schedules of reinforcement. In progressive ratio schedules, schedule requirements are progressively increased after gaining access to a reinforcer. For example, a study participant, being asked, "How much are you willing to pay for this cookie?" with the amount increasing each time. $1? $2? $3? etc. This will determine the reinforcing value of the snack food. The reinforcing efficacy is considered the breakpoint or point in which participants stop responding (Epstein, Leddy, and Temple, 2007). Simply put, what's the most you would pay for this snack? In this example, participants with higher breakpoints would find the snack more reinforcing than participants with lower breakpoints.

Snacking and Energy Intake

Currently, 65% of adults are overweight or obese and this number is expected to trend upward by 2020 along with associated diseases such as type 2 diabetes and healthcare cost (CDC, 2012). One of the changes that has contributed to this incline is that compared to 20 years ago Americans now work an average of 47 hours a week, which is 164 hours more per year (American Health Association [AHA], 2014). The work that is being performed today is much less demanding from an energy perspective. American workers are now burning 120-150 calories less per day than they did in the early 1960s when jobs such as hoeing the fields and factory work required more physical activity (Gardner, 2011).

While 150 calories doesn't sound overwhelming, after accumulating, it can significantly affect attempts at weight loss. In consideration of 3500 calories equaling

1lb, this can be a gain of an additional 15-16 lbs. per year (Cutler, 2003). This decrease in energy expenditure has contributed to the increase in mean body weights for both men and women (Gardner, 2011). Obesity risk in relation to food reinforcement, food environments, and lack of physical activity has been extensively researched; however, snacking and energy intake are also widely recognized as important contributors to excess weight gain and overweight and obesity prevalence (Carr, Lin, Fletcher, & Epstein, 2014; Duffey & Popkin, 2011; French et al. 2003).

The present overweight and obesity epidemic is accredited to a growing trend for snacking which may facilitate overeating and weight gain in association with quality of food choice, consumption frequency, and environment of eating (Bellisle, 2014). There is no scientific agreement among scholars to define snacking; however, in the Chaplin and Smith (2006) study, participants defined snacking as drinks and foods consumed between main meals. The Booth Hypothesis states that multiple eating or grazing events between main meals (generally breakfast, lunch, dinner), and the growing trend of snacking, rather than the typical three meals a day, was an important factor that contributed to the etiology of obesity (Booth, 1988).

One reason snack consumption leads to overconsumption is their energy density. Energy-dense snacks are typically thought to include foods such as cookies, chips, pastries, cakes, pies, pizza, sodas, etc. Popular snacks such as chips, pastries, and cookies typically have high sugar and fat content and consequently energy density (Sizer & Whitney, 2011). Snacking is done to satisfy pre-meal time hunger, but careless snacking can lead to energy consumption greater than the recommended daily energy requirements while providing little or no nutritional value (Sizer & Whitney, 2011). The

recommended daily calorie intake for occupational/leisure time sedentary men is about 2400 kcal and for women about 2000 kcal., leaving a range of 300-800 kcal for snacks between main meals (Sizer & Whitney, 2011). The consequence of overdoing this daily allowance is weight gain. According to Cutler (2003), since 3500 calories is about one pound, depending on individual metabolisms and caloric expenditures; an increase in calorie consumption of 3500 calories, or a reduction in caloric expenditure in that amount, can increase or decrease weight by one pound.

In many workplaces, only vending machines are available to grab a convenient food item while working. Vending machines as well as neighborhood convenience stores consist of many luring energy-dense snack items, which include: muffins (averaging 500 calories), assorted trail mix (averaging 580 calories), granola bars with yogurt (averaging 480 calories), snack pies (averaging 480 calories), pastries (averaging 450-500 calories), candy bars (averaging 280 calories), potato chips (averaging 200-320 calories) and sodas averaging 250 calories (Keane, 2008; Self-Nutrition Data, 2014). Frequent snacking is a pattern that can more likely take an individual over their daily calorie budget and can result in excess weight, especially in cases where energy-dense snacks are consumed, or servings are too large. This frequent snacking can cause the average American adult to take in an average 400-450 calories in excess a day (Sebastian, Wilkinson & Goldman, 2011; Yoquinto, 2011). Depending on an individual's energy expenditure activities and metabolism, this can be a gain anywhere between 3.4-3.9 lbs. a month, and between 40-47 lbs. a year based on the calculation that 1 lb. is approximately 3500 calories (Pelletier et al., 2004; Sebastian, Wilkinson & Goldman, 2011). The excess calories consumed from energy-dense snacks imply a tendency for a higher contribution of energy intake.

On average, for adults, calories consumed at snacking occasions make up 24% of total daily calories consumed; however, for 1 in 6 adults, food and beverage snacks consumed provide 40% of their daily calories (Sebastian, Wilkinson & Goldman, 2011). Snacks contribute to 20-25% of daily energy intake (Summerbell et al., 1995; Webb, 2013). Between 1977-2008, the mean frequency of snacking increased from 1.0 to 2.2 snacks a day (Sebastian, Wilkinson & Goldman, 2011). In light of the statistics mentioned, additional research on food reinforcement and food motives, as it relates to snacking during work hours and non-work hours, may be beneficial to understanding weight gain risk factors and increasing BMI's.

Forslund et al. (2005) conducted a cross-sectional Swedish study that investigated snacking frequency in association with food choices and energy intake, taking physical activity into account, among obese men and women vs. reference men and women. The reference men and women were participants from a prior study called the Swedish Obese Subjects Study (SOS) which included obese individuals who lost weight by surgical means (gastric banding, vertical banded gastroplasty, and gastric by-pass). It was found that the obese group consumed snacks more often than the reference group ($P < 0.001$) and women more often than men ($P < 0.001$). Energy intake increased with snacking frequency, irrespective of PA. There was a statically significant trend difference found for chocolate/candies, cookies/cakes, and desserts in association with snacking frequency and energy intake, where energy intake increased more by snacking occasion in obese participants than in the reference participants. The findings of this study indicated a link between energy intake, frequent snacking, and obesity. The lack of consistency in others studies concerning snacking and BMI may be due to different definitions for

meal/snacking intake occasions (Drummond et al., 1998; Kant et al., 1995; Ruidavets et al., 2002 & Gatenby et al., 1995). The authors suggested that energy–dense food choices, as well frequent snacking, may facilitate increased energy intake.

Bes-Rastrollo et al. (2010) supported the hypothesis that snacking is a significant factor in the prevalence of obesity. Their study assessed the relationship between weight gain and snacking in a middle-aged, free-living population. This was a longitudinal prospective study with a Spanish dynamic cohort consisting of 10,162 university graduates (mean age 39 years) who were followed for an average of 4.6 years. It was found that self-reported, between-meal snacking was significantly associated with increased risk for substantial weight gain ($\geq$ 3 kg/year; $p < 0.001$; $\geq$ 5 kg/year, $p < 0.001$; $\geq$ 10% baseline weight, $p < 0.001$), after adjusting for confounders. It was observed that among participants with a BMI lower than 30 kg/m2 (n = 9709), there were 258 new cases of obesity. Usual snackers had an adjusted 69% higher risk of being obese during follow-up (Hazard Ratio: 1.69; 95% Confidence Interval: 1.30–2.20). The study concluded that between-meal, self-reported snacking was a potential risk factor for obesity.

The global obesity epidemic is associated with energy-dense diets and energy-dense foods such as snacks, sweetened beverages, and desserts (Swinburn et al., 2004; Stubbs & Whybrow, 2004). In terms of energy intake, a diet low in fiber and high in carbohydrates and fats, and consumption of sugar-containing soft drinks are identified as risk behaviors that relate most to weight gain (CDC, 2015). An increasing frequency of snacks consumed is being observed in meal pattern studies, due to its ability to alter diet with its energy density and low nutrient content and additional research is warranted.

The increasing prevalence of overweight and obesity among the U. S. population has recently led researchers to investigate not only possible associations between snacking and weight gain, but associations with food reinforcement as risk factors as well.

Food Reinforcement

Food reinforcement, or the reinforcing value of food, is frequently used to describe the motivation to eat and is measured by how hard someone is willing to work to gain access to food (Epstein et al., 2011). Food reinforcement is a risk factor for weight gain and is related to energy intake in the natural environment (Epstein, Carr, Lin, Fletcher, & Roemmich, 2012; Epstein, Yokum, Feda & Stice, 2014). Prospectively, food reinforcement is associated with BMI and weight gain in adults and predicts weight change in children, both a consequence of regular and repeated eating of energy-dense foods (Saelens & Epstein, 1996; Temple et al., 2009; Temple et al., 2011). Therefore, additional research concerning food reinforcement during work and non-work hours may be beneficial to the understanding of when snack food reinforcement is highest to help mitigate risk of weight gain. Understanding if there is a difference between food reinforcement of energy-dense snacks during work and non-work hours, and the level of influence, may be beneficial in future interventions.

As previously mentioned, the reinforcing value of food provides an index of the motivation to eat. To test this in the laboratory, the reinforcing value, or reinforcer efficacy can be defined as the amount of responses made to gain access to food (Epstein, Dearing & Roba, 2010). Two of the most common approaches for assessing the efficacy of a reinforcer include absolute and relative reinforcing value. The absolute reinforcing value (one option available) or relative reinforcing value (multiple options available),

measures food reinforcement (Epstein, Leddy, & Temple, 2007). For example, if an individual knew of only one cell phone service provider in the area, and were unaware of the services and features available with other cell phone service providers in the area, they would remain content with that service. They would not be able to compare the service features and therefore, would have only an absolute experience, not a relative one.

Schedules of reinforcement are important factors of operant conditioning which is learning through consequences or rewards. Schedules of reinforcement determine how often an organism is reinforced for that particular behavior with the reinforcement having an impact on the pattern of responding by the organism (Fester & Skinner, 1997). How often, and when a behavior is reinforced, can have a significant impact on the rate and strength of the response (Jarmolowicz & Hudnall, 2014). There may be cases when the behavior might be reinforced every time it occurs or sometimes not at all. There are many schedules of reinforcement; however, they are beyond the scope of this study.

Many food reinforcement studies use different schedules of reinforcement to determine the reinforcing value of a particular food or alternative and its relation to energy intake and weight gain (Giesen et al., 2010; Carr, Lin, Fletcher, & Epstein, 2014; Epstein et al., 2011). Giesen et al. (2010) used a concurrent schedules task to investigate their hypothesis that the relative reinforcing value of high-calorie snacks was greater for those overweight and obese than those of normal weight. The authors argued that since obesity is the consequence of consuming more energy than expended, the prevalence of obesity can be described as excess calorie intake. The researchers noted that reinforcement tasks are measured by the point in which an individual stops working for food, determining the food's reinforcing value. The study examined whether

overweight/obese study participants worked harder for high-calorie snacks, in comparison to normal weight participants. It was found that normal-weight control participants had a lower demand for snacks than overweight/obese participants (estimate = 0.135, P = 0.021). The study supported the study's hypothesis. The authors suggested that lowering the reinforcing value of energy-dense snack foods could be done by increasing the cost linked to these snacks.

Epstein et al. (2011) conducted a similar study, with a similar theory, that the relative reinforcing value of food (RRV food) is associated with energy intake and obesity. In this study, the authors investigated the association of food reinforcement and macronutrients in ad libitum snack eating task. The participants were made up of 273 adult obese and non-obese men and women, with various BMI's, to assess the reinforcing value of reading, food, hedonics/liking, and energy intake in an ad libitum taste test, and usual energy intake from repeated daily dietary recalls. The break point at which subjects stop responding to the food or non-food alternatives was calculated for each alternative. The Three-Factor Eating Questionnaire, the Binge Eating Questionnaire, and the Questionnaire on Eating and Weight Patterns were also administered to the participants. After controlling for age, income, sex, education, minority status and other macronutrients intakes (aside from carbohydrates and sugars), the relationship between total energy predictors and energy associated with macronutrient intake, were assessed using multiple regression. With the use of pearson product-moment correlations, it was found that RRV food was related to energy intake in the laboratory ($r = 0.30$, $P < 0.001$) and to energy intake from repeated 24-h recalls ($r = 0.28$, $P < 0.001$). The results revealed that BMI, usual energy intake, and laboratory-measured energy intake, was

positively related to the relative proportion of responding for food compared with reading; therefore, snack food reinforcement did influence energy intake and BMI.

Epstein et al. (2012) similarly suggested that the relative reinforcing value of food is associated with overweight status and energy consumed. The researchers conducted a parallel study hypothesizing that food reinforcement is associated with BMI through usual energy intake. The sample included 250 adults with varying BMI levels and weight. The subjects visited the laboratory for two sessions that included a food reinforcement task scheduled 2-3 weeks apart, and an ad libitum snack eating task. The 2005 Block Food Frequency Questionnaire was administered after the first session. The ad libitum task included a taste test where the subjects were provided 210-305 kcal (42-60 g) servings of six palatable, energy-dense snacks, which included: Kit Kat (42 g); Wavy Lay's Potato Chips (57 g); plain M&M's (60 g); Butterfinger (57 g); Twix (48 g); and Cooler Ranch Doritos at 56 grams (Epstein et al., 2012).

The results revealed that usual energy intake mediated the relationship between the relative reinforcing value of food and BMI controlling for confounders including the relative reinforcing value of reading. The mediational relationship found suggested that increasing or decreasing food reinforcement may influence body weight by changing food consumption. The researchers advised that additional research is warranted to devise methods of modifying the relative reinforcing value of food to determine if altering food reinforcement could result in differences in body weight. The study supported that hypothesis that energy intake mediates the relationship between BMI and food reinforcement.

According to Epstein, Yokum, Feda & Stice (2014), food reinforcement, in association with snack foods, and parental obesity are risk factors for weight gain. Their study supported other studies that have investigated and found food reinforcement as a risk factor for weight gain (Carr, Lin, Fletcher, & Epstein, 2014; Epstein et al., 2012; Giesen et al., 2010). As suggested with this study, the authors noted with consensus of relevant behavioral economic literature, that increasing cost to energy-dense foods or reducing access, leads to a decrease in purchasing, which in turn modifies the food environment to limit access by environmental or stimulus control (Epstein et al., 2012; Epstein et al., 2012; Epstein, Yokum, Feda & Stice, 2014).

Food reinforcement has been associated with higher energy intake in various studies because individuals who find certain types of food more reinforcing tend to have greater energy intakes, especially for obese individuals, compared to their leaner peers (Epstein et al., 2007; Epstein et al., 2011; Saelens & Epstein, 1996). Obesity has been linked to food cravings high in sugar and fat, such as energy-dense snack foods (Drewnowski, 2004; Epstein, 2007). Prospective data indicate that the reinforcing value of food predicts weight gain in adults (Carr, Lin, Fletcher, & Epstein, 2014; Epstein, Yokum, Feda & Stice, 2014). A determinant of energy intake is the reinforcing value of food in which food reinforcement mediates the relationship between body weight and food reinforcement (Epstein et al., 2007; Epstein et al., 2011; Epstein et al., 2012). While food reinforcement is an important determinant of snack food consumption, it may also interact with environmental factors to influence energy intake (Epstein et al., 2007). Food environments during work and non-work hours may be a significant factor to consider in obesity research. These may be factors that influence snack food

reinforcement during work and non-work hours, and the possible weight gain that may lead to overweight and obesity, among office workers. Understanding if differences exist in food reinforcement during work and non-work hours may lead to essential need-based evidence to alter work and non-work hour food environments.

Food Environments

As with food reinforcement**,** environmental influences have been widely recognized as significant contributors to excess weight gain, and overweight and obesity prevalence. Environmental factors, such as foods available during non-work hours and work hours, may be factors that influence food reinforcement. Sensitivity to environmental food cues may cause more attention to food, which has been shown to be linked to energy intake and weight gain prospectively (Yokum & Stice, 2011). Built environments, at many scales, influence the type and amount of food consumed, providing a subtle and often unconscious influence on food choices, food intake, obesity, and health (Sobal & Wansink, 2007).

Food is readily available throughout the day during work hours (vending, cafeterias and surrounding food outlets) and non-work hours (home food environment, restaurant dining, and fast food restaurants, convenience stores, and grocery stores). Environments can influence food choice; however, individual behavior to make healthier food choices can happen in only supportive environments with affordable and accessible health food choices (Story et al., 2002; U. S. Dep. Health Human Services, 2001). Individual-level factors related to eating behaviors and food choice include self-efficacy, motivations, outcome behavior capability, and outcome expectations while environmental

context linked to eating behaviors include physical environments, social environments and macro-level environments (Story et al., 2002).

French, Story & Jeffrey (2001) described these three environments noting that (a) the physical environment includes settings where people produce or eat food such as the worksite, home, supermarkets and restaurants; (b) the social environment which includes interactions with peers, friends, family, home environment, and others in the community that may affect choice of foods through influences such as social norms, social support, and modeling; and (c) macro-level environmental factors that serve a more indirect role, but influential role in food choice through factors such as social norms, distribution systems, food marketing, economic price structure and agriculture policies. Food choice may play an important role in determining risk for weight gain; however, these food choices are influenced by the environments in which one works, resides, and socializes. Understanding if there is a difference between food reinforcement during work and non-work hours, and the level of influence, may be beneficial for future interventions.

Food Environment During Work Hours

Working a full-time nine-to-five may be a way to sustain oneself financially, but associated factors may influence attempts in sustaining a healthy weight. Food choices related to energy-dense snack foods are influenced by societal, individual, and environmental factors (Sobal & Wansink, 2007). For many people, most of the working day is spent in front of a computer screen. Over the last two decades, the dominating mode of work has become universally computer based, and this has resulted in many workers spending most of their day sitting (French et al., 2001; Sobal & Wansink, 2007).

For office workers (professionals, managers, technologists, administrative, financial and clerical employees), computer based, sedentary work is now more common, opposed to that of blue collar workers (transport or equipment operators, mining, forestry, farming, fishing, processing, manufacturing or utilities) whose work involves more physical activity (Bennie et al., 2014). Sedentary work such as office support occupations are associated with increased prevalence of obesity (Luckhaupt et al., 2014). Office work involves little physical activity, and as a result, the amount of calories from food intake is greater than the calories the body burns off (Sobal & Wansink, 2007). The body stores this extra energy as fat, resulting in weight gain that can lead to overweight and obesity (Sobal & Wansink, 2007). Sedentary employment and lack of physical activity have received much attention as the main contributors to the obesity epidemic over the last few decades (French et al., 2001). The food environment during the work day has also recently received focus (French et al., 2001). While this factor has not received as much focus as sedentariness at work and lack of exercise, consumption of energy-dense snack foods during the work day may have equal influence in terms of its influence on dietary habits and food motives.

In obesogenic environments, such as workplaces, energy-dense foods are abundantly available. The cafeterias serve mostly energy-dense foods, work events are catered with energy-dense food and snacks, and vending machines are conveniently stocked with sugar and fat laden snacks and foods (Devine et al., 2007). There is a universal agreement that a significant contributor to the obesity epidemic is obesogenic environments that encourage unhealthy eating and discourages physical activity (Devine et al., 2007; Hill et al., 2003; Ogden et al., 2014).

The built environment during work and non-work hours consist of a range of social and physical elements that make up the structure of that environment, and may influence overweight and obesity. The workplace can be an influential setting for reaching adults since approximately 66% of the U. S. adult population are employed (Courtemanche, 2009). The workplace environment can provide opportunities for physical and social worksite environmental change as well as individual behavior changes. Dietary intake can be influenced by environmental strategies such as availability of healthy food options, increasing variety, reducing the price of healthy foods in vending machines and cafeterias, and nutrition education (Block et al., 2004; French et al., 2001; French et al., 2010). Workplace initiatives to promote healthy food purchases should implement pricing and availability strategies to change dietary intake (French et al., 2010). This could be done by reducing pricing of healthier food choices which is a public health strategy that should be implemented through industry collaborations and policy initiatives (French et al., 2010). A strategy such as this one is warranted in light of the price competitive array and availability of energy-dense snacks, worksite vending machines tend to offer. Understanding how the food environment influences weight, can help policymakers find ways to change the environment and, in turn, reduce the prevalence of obesity (Larson & Story, 2009).

In light of obesity emerging as one of the most serious public health issues in the nation, some researchers have begun to assess the prevalence rates and trend of obesity among the U. S. working population. Caban et al. (2005) assessed these factors in their study, *"Obesity in US Workers: The National Health Interview Survey, 1986 to 2002."* The researchers collected annual data from the National Health Interview Survey (1986

to 1995 and 1997 to 2002) of self-reported height and weight among U. S. workers, age 18 and older. Overall, gender-specific, race and occupation rates of obesity (defined as a BMI of greater than 30.0 kg/m2) were computed with data pooled from both study time frames (n > 600,000).

Occupation-specific annual prevalence rates were also calculated and their time frames were assessed. It was found that obesity rates significantly increased over time among employed individuals, regardless of gender and race. Overall, it was found that women workers, within all occupational groups, in all races studied, had higher obesity rates than male workers, with black female workers having the highest rates. The authors suggested that work-related factors, such as job stress, extended work hours, job, and position may promote weight gain.

Luckhaupt et al. (2014), conducted a similar study to explore associations between occupational factors and obesity among U.S. workers. The 2010 Health Interview Survey was used to obtain data to calculate weighted prevalence ratios and rates for obesity in relation to work organization characteristics (work week length, job insecurity, work shift, work arrangement), industry and occupation, and work-related psychosocial stressors (job insecurity, hostile work environment, and work-family imbalance). The collection of the 2010 data was analyzed in 2012-2013, among all U.S. workers, with 27.7% meeting the BMI criterion (BMI ≥30.0 kg/m2) for obesity. Data was available for 15,121 U.S. working adults representing 135 million people ages 18-29. The data analyzed was based on 57.6% of the 27,157 sample adults.

After adjusting for confounders, a significant association with an increased prevalence ratio (PR) of obesity was found among workers with over 40-hour week

schedules. It was found that protective service (PS) workers had the highest prevalence of obesity (40.7%, SE = 3.2). After adjusting for covariates, PRs for architecture and engineering (AE), protective services (PS), community and social service (SC), and office and administrative support (OAS) occupations were also associated with increased prevalence of obesity. The authors suggested that workplace interventions should focus on reducing obesity by taking organizational factors along with diet and physical activity into consideration. The study highlighted the theory that office workers are at a greater risk for weight gain than many other occupations.

The Shaikh et al. (2015) study revealed comparable findings in their investigation of occupational variations in obesity. The highest prevalence of obesity was found with community and social services workers (39.0%, 95% CI: 31.4–46.5%) with morbid obesity being highest (6.2%, 95% CI:2.2–10.3%) in workers with mathematical, office, and computer-related occupations. The study suggested that sedentary type work, such as with office jobs, can pose challenges for consistent healthy weight management behaviors. More research is needed to examine the relationship between work hours, weight gain, and weight-related behaviors among single occupational groups with higher obesity prevalence (Escoto et al., 2010, Devine et al., 2007).

Relevant worksite characteristics include easy access to large portion size energy-dense foods, social times in terms of place and time for eating, and sedentariness (Devine et al., 2012). Foods available and consumed during work hours may be one of the largest contributors to excess energy intake and weight gain. In a typical work day, most adults spend 8-12 hours at work, which is likely to affect their dietary habits (Maruyama & Morimoto, 1996). Therefore it is important to investigate how the workplace food

environment may influence energy intake and weight-related behaviors. The food environment during work hours, as well as non-work hours, can greatly influence food choice, energy intake, and weight-related behaviors.

Food Environment During Non-work Hours

Food is readily available from various sources during non-work hours. These sources include food available at home, restaurants, fast food restaurants and diners, convenience stores, and grocery stores. Food choices related to energy-dense snack foods are influenced by environmental factors (Sobal & Wansink, 2007). While individuals may have little control over the availability and accessibility of energy-dense snack foods during work hours, during non-work hours, autonomous adults can have complete control over both.

Home environment. Foods purchased for the home can influence the type and amount of food one consumes. According to Kegler et al. (2014), since 68% of calories for U. S. adults come from home food sources, the home may play a significant role in molding behaviors that affect BMI in both children and adults. The quality of foods available in the home is greatly influenced by the use of non-home food sources for family meals, grocery shopping behavior, and food preparation methods (Kegler et al., 2014). In addition, foods available and consumed in the home are usually purchased from community grocers, retail stores, convenience store gas stations and fast food restaurants (Currie et al., 2010; Guthrie, Lin & Frazao, 2002; Moreland et al., 2002; Richardson et al., 2012). As opposed to the work hour food environment, during non-work hours, individuals can create structured eating environments that can support, encourage, and promote healthy eating for themselves and their families.

Eating meals at home has been linked to lower BMI's in some studies (Sen, 2006; Taverns et al., 2005). In other studies, individuals have reported barriers to eating heathy foods and cooking healthy meals at home. These barriers include: (1) healthy foods are more expensive; and (2) it takes longer to prepare healthy meals than to buy convenience or fast foods (Darmon & Drewnowski, 2008; Larson & Story, 2009). Kegler et al. (2014) noted that unhealthy foods in the home are associated with percent calorie intake from fat. The authors suggested that the home environment may contribute to obesity through the availability and accessibility of energy-dense snacks and beverages.

According to Emery et al. (2015), many studies have investigated how features of the home environment (e.g., exercise equipment, televisions) may be associated with obesity, but no prior study has investigated objective features of the home environment (e.g., location of food) in combination with behavioral (e.g., food purchases), psychological (e.g., self-efficacy) and social factors among obese adults. Emery et al. (2015) conducted a study that examined factors associated with obesity status from measures of eating behavior, food purchasing behavior, psychosocial functioning, and the home environment. These factors are important because they affect the type of foods purchased and consumed, which in turn, can influence the energy intake that promotes weight gain and increases BMI (Eertmans et al., 2005). The study found no group difference in household size or income; however, obese adults reported more reliance on fast food, greater food insecurity, and more long-term food storage capacity in refrigerators. In addition, obese individuals reported lower ability to control eating and more depressive symptoms. In addition, obesity status was associated with more food

available in the home (odds ratio [OR] 1.04, P = 0.036) and energy-dense food consumption (OR 0.94, P = 0.048).

Eating occasions in terms of where energy-dense foods are most consumed (work hours or non-work hours) is also an important factor to consider in overweight and obesity incidence and prevalence research. Liu, Han & Cohen (2014) investigated the association between eating occasions and places of consumption among adults. In five U.S cities, data on dietary behaviors of 226 adults was collected from food diaries, for 7 days. Places of consumption and eating occasions were recorded with eating occasions defined as a snack, meal, non-fruit dessert, and beverage consumption. Approximately 33% of eating occasions occurred in non-designated eating places (other than the usual). The results indicated that snacking was more likely to occur at work than at home, while sugar-sweetened beverage consumption was more likely at food service locations than at home. The authors suggested that since different types of eating occasions were associated with places of consumption, characteristics of eating environments are important in addressing individual eating behaviors.

Neighborhood and retail stores. Food purchased for the home and consumed during non-work hours are usually purchased from neighborhood retail stores such as grocers, supermarkets, and convenience stores (Larson, Story, & Nelson, 2009). Neighborhood variances in healthy food accessibility (e.g., fresh fruit, vegetables, produce) may have a significant impact on health disparities in the United States. Food stores and their proximity has become a concern in association with socio-demographic factors. Unhealthy dietary patterns and obesity established risk factors for chronic

disease have been associated with neighborhood minority composition, low area population density and neighborhood deprivation (Larson, Story, & Nelson, 2009).

The presence of small and large grocery stores and their proximity is also associated with eating patterns among neighborhood residents. For example, it was revealed in the Laraia et al. (2004) study that pregnant women who resided over four miles away from a supermarket were significantly more likely to have poorer diet quality, even after controlling for confounders such as availability of smaller grocery stores, socio-economic status and convenience stores. Powell et al. (2009) had a parallel theory in relation to adolescent BMI and the food environment. In their study, it was revealed that lower BMI was associated with increased access to supermarkets, and higher BMI being associated with greater access to convenience stores. A higher density of small grocery stores and convenience stores are associated with higher BMI, opposed to neighborhoods with a higher density of chain supermarkets (Larson, Story & Nelson, 2009; Richardson et al., 2012).

The relationship between BMI and energy intake with grocery stores, convenient stores, and supermarkets may also be associated with the gradual increase in food and snack portion sizes. Processed food size portions have more than doubled for many items since the 1970's, partially due to consumer demands for greater value (Morland et al., 2002). Prepackaged foods bought from convenience, grocery stores and vending are being marketed in larger sizes (French, Story & Jeffrey, 2001; Young & Nestle, 2002). One example is that Coca-Cola was marketed in 6.5-oz serving bottles (1950's) to 12-oz cans (1970's) to 20-oz bottles (2000), which is a 250% increase from 1950 (French et al., 2003). Energy-dense snack food portions have also increased with potato chips and

candy bars previously packaged in 1-ounce servings, now being in 2-3 oz. single serving packages, and Muffins and bagels previously being 2-3 oz., now packaged in 4-7 oz. servings (Young and Nestle, 2002). Fast food restaurants have similarly increased portion sizes with their supersize products of fries (198 g; 610 kcal) and 42 oz. sodas (McDonald's Corporation, 2015).

Fast food restaurants. While foods prepared at home are obtained from grocery stores, retail stores, convenience stores and supermarkets; foods consumed during non-work hours are also bought from fast foods restaurants, diners and fine dining restaurants. These foods are typically ready-to-eat, where the consumer has less control over nutritional content and portion size (Lin, et al., 1999). Fast foods can also be considered snacks (Dumagan & Hackett (1995). Energy-dense foods and snacks tend to be tastier, inexpensive and easily available and accessible. Food expenditures, which include fast food and other restaurants, increased to 415 billion in 2002 from 263 billion in 1992 (Morland et al., 2002). According to French et al. (2003), in 1995 foods away from home (e.g., vending, work, school, restaurants, fast food restaurants, and other places) captured 40% of total food spending.

Americans have begun to purchase foods from restaurants and fast food restaurant more, consuming more than 32% of their calories (Guthrie, Lin & Frazao, 2002). Fast food restaurants have recently received great attention as a target for obesity prevention due to their contribution to promoting fast food consumption. It is well supported that fast food places have increased portion sizes of food and beverages over the last two decades (Duffey & Popkin, 2011; Livingstone & Pourshahidi, 2014; Young & Nestle, 2002). Fast food and restaurant food consumption is frequently related to weight gain,

higher caloric intake and obesity (Bowman et al., 2004; Guthrie, Lin & Frazao, 2002). While fast food meals are high in calories and fat, restaurant food can be high in calorie, fat, sodium and cholesterol as well (Guthrie, Lin & Frazao, 2002). In a fast food world of "Biggie Size" and "Supersize," fast food restaurants offer large portion, high-calorie meals, and sugary beverages. The luring commercials, dollar menus, and two for $5 deals can seem very tempting in consideration of convenience, low cost and daily time constraints at work and at home. Foods and snacks consumed from fast food restaurants during work hours and non-work hours may be one of the largest contributors to excess energy intake and weight gain.

Over that last 20 years, research on food environments has looked at how settings such as worksites, homes and communities, influence which foods are available, pricing and whether those settings provide opportunities for healthier diets. Understanding how the food environment influences weight gain, can help policymakers find ways to change the environment and in turn, reduce the prevalence of obesity. Food choices and food reinforcement are shaped by food motives and the complex world in which people live, in terms of the food environment, as well as one's physical and social surroundings. By understanding there are significant differences in food reinforcement by environment; the door is opened to further modifying work environments to promote health for all employees. Additional research is also warranted for the food motives that drive food reinforcement, and the energy-dense snacks consumed during work and non-work hours.

Food Motives

Identifying food choice motives are essential in efforts to influence dietary change. While food reinforcement describes motivation to eat and is measured by how

hard someone is willing to work to gain access to food, food motives describe the motives that drive these actions (Carr, 2014; Renner et al., 2012). Understanding why people make certain food choices is important for the creation of interventions to prevent the development of obesity (Renner et al., 2012). It is assumed that food motives mediate the effect of traits on food consumption and may also have different effects on food consumption (Eertmans et al., 2005). People may consume energy-dense snacks foods for many different reasons. Food choices are influenced by motivating factors such as cost, taste, convenience, variety, accessibility, availability, food cues, emotions (e.g., stress), impulsivity, dietary restraint and dietary disinhibition (Carr, Fletcher and Epstein, 2014; Cleobury & Tapper, 2014; Darmon & Drewnowski, 2008; French et al., 2010; Sizer & Whitney, 2011). Consumption of snack foods has increased significantly in recent years. Snack foods tend to be high in sugar and fat, which can contribute to weight gain; therefore, understanding motives for snacking may help reduce associated energy intake and weight gain.

According to Koenders & van Strien (2011), questionnaire measures of emotional eating tend to correlate with weight gain and BMI. Research indicates that eating is not always initiated by hunger, but can be initiated by other motives such as emotional eating in response to negative emotions (e.g., stress at work or home) and external eating in response to food cues (Cleobury & Tapper, 2014). Unhealthy snacking patterns include: (a) emotional eating which is described as individuals using food to cope with emotional triggers such as stress, love, frustration, mild depression, boredom, habit, excitement, and procrastination; (b) food availability in relation to places, such as work or school, where only processed energy-dense foods with low essential nutrients may be the only foods

available; and (c) eating for convenience, which is when individuals choose to snack on readily available energy-dense foods (Sizer and Whitney, 2011). Engaging in these patterns and preference for foods high in fat, salt, calories and low nutrient density can lead to overweight and obesity.

There are a wide range of food motives for eating behaviors. While one study may not be able to assess all motives relevant in previous research, consistent motives have been identified in the consumption of energy-dense foods. These specific motives include: (a) eating due to environmental and external cues (Cleobury & Tapper, 2014; Prinsen, De Ridder, & De Vet, 2013); (b) social norms and social pressure (Stok, De Ridder, & De Vet, 2014); (c) coping with negative emotions (Cleobury & Tapper, 2014; Sproesser, Schupp, & Renner, 2014); (d) sensory appeal and taste (Renner, Sproesser, Strohbach, & Schupp, 2012); (e) availability and accessibility of energy-dense foods (Lowe et al., 2009); (f) experiencing positive affects (Evers, Adriaanse, De Ridder, & De Witt Huberts, 2013); (g) hunger (Cleobury & Tapper, 2014); (h) habit (Verhoeven, Adriaanse, Evers, & De Ridder, 2015); and convenience and price (Mahdzan & Cher, 2014; Pula, parks & Ross, 2014). While several studies have focused on emotional, social, cognitive, and biological motives in relation to food consumption and overweight and obesity, biological motives (physiological needs, genetics, hormones, etc.) are beyond the scope of this study.

Miloševic et al. (2012) analyzed an array of food choice motives using the Food Choice Questionnaire, which measures nine essential factors found to underpin food choice motivations: mood, convenience (availability and ease of preparation), price, health, sensory appeal (taste, appearance and smell), familiarity, natural content (e.g., no

additives), ethical concern (environmentally friendly packaging, politically approved country of origin), and weight control (low in fat and calories). The questionnaire was administered to 3085 adult participants in six western Balkan countries. The participants rated the importance of this 36 item questionnaire on a four-point scale with scores ranging from 1 (*not at all important*) to 4 (*very important*).

Overall the ranking of food motives was consistent across the analyzed countries with sensory appeal, purchase convenience, health, and natural content rated as factors most important, and ethical concerns and familiarity being least important. Respondents in Slovenian rated purchase convenience as more important compared to other countries studied, possibly due to higher incomes. The authors noted that since motives most reported were price, unconcerned, and mood, public health messages should be distinctive to these groups of people.

Verhoeven et al. (2015) conducted a broader study that explored psychological motives for energy-dense snack food consumption among a representative community sample of 1,544 participants. The Reasons to Snack Inventory Survey was administered to examine a wide range of motives at baseline and at a one-month follow-up. Exploratory and replication factor analyses identified motive categories, which included: coping with negative emotions, social pressure, opportunity induced eating, enjoying a special occasion, gaining energy, and rewarding oneself. The highest mean scores were for the motives of opportunity induced eating and enjoying a special occasion. Women had a higher score than men on enjoying a special occasion, coping with negative emotions, and gaining energy. Individuals who dieted showed a higher score for social pressure and rewarding oneself. The coping with negative emotions motive was most

related to higher BMI's. It was found that higher levels of education were associated with enjoying a special occasion while younger individuals reported a higher score in all motive categories except this one.

All motive categories were related to caloric intake for energy-dense snacks (ranging from r = .09 to r = .25, all p's = .001), revealing that all reasons were relevant, but not strongly related to caloric intake from energy-dense snacks. The authors suggested that future interventions should focus on these motives; particularly opportunity induced eating and enjoying a special occasion. There are a host of other food motives that have been studied in relation to energy intake and a few include dietary disinhibition, dietary restraint, and impulsivity.

The influence of food reinforcement on energy intake and BMI is moderated by disinhibition (Carr, Fletcher, & Epstein, 2014). Dietary disinhibition (lack of restraint) provides an index of responsivity for the inclination to eat based on environmental cues and high responsiveness to palatable cues (Bryant, King & Blundell, 2007). Dietary disinhibition is also associated with impulsivity (acting without thinking). Impulsivity and high food reinforcement are key factors of reinforcement pathology (Carr, Daniel, Lin, & Epstein, 2011). Reinforcement pathology is described as negative consequences that arise when there is high motivation to eat and low impulse control (Carr, Daniel, Lin, & Epstein, 2011). For example, individuals with this tendency are more likely to eat more and have a harder time losing weight than those with high impulse control and low food reinforcement. Dietary restraint and disinhibition may not only interact with food reinforcement to cross-sectionally predict BMI, but may also interact with food

reinforcement to prospectively predict weight change (Carr, Fletcher & Epstein, 2014; Carr, Daniel, Lin, & Epstein, 2011).

Many studies have focused on only food motives or food reinforcement in relation to weight gain and BMI. French et al. (2012) combined all of these factors in their examination of the reinforcing value of food, eating behaviors, food responsiveness, satiety responsiveness, eating disinhibition, eating motivation associated with enjoyment, eating in the absence of hunger, impulsivity/self-control, satiety responsiveness, food environments and their relationship with energy intake, BMI and weight change through a database search (mainly PubMed, Medline, PsychLIT). While each of these ideas has been developed independently, not much research has been done on how they overlap or how they predict food choice, energy intake, and weight gain in the natural environment.

For this review, 107 worldwide articles were reviewed for inclusion; however, only 66 met the criteria specified in relation to the associating factors (BMI, weight gain, food choice and energy intake). It was found that the dimensions most related to the eating motivation concept, which received vast attention in the reviewed literature in relation to obesity and eating behaviors, were enjoyment of food, food responsiveness (interest in eating) and satiety response (stop eating when full).

In the review, many studies found the enjoyment of food inversely correlated with slowness in eating and satiety responsiveness, but positively correlated with food responsiveness. While some cohort prospective studies found eating in the absence of hunger significantly associated with weight gain over consecutive years, others found a significant association only one year later. Consumption behaviors such as enjoyment of

food and high food responsiveness tended to be significantly associated with eating in the absence of hunger in experimental settings.

In relation to food reinforcement, in many of the studies, the reinforcing value of food was measured by working for food by using computer task involving selection of attractive foods or an attractive alternative such as a video games or reading. In cross-sectional studies, findings generally supported the association between BMI and the relative reinforcing value of food among children and adults. Most studies found greater relative reinforcing value of food scores among overweight adults in comparison to normal weight adults. Several studies found that there was a higher energy intake in the laboratory setting among individuals with higher relative reinforcing value of food compared to those with lower relative reinforcing value of food. In addition, there was a tendency among relevant studies that found food reinforcement positively associated with energy intake via food frequency questionnaires and 24-hour recalls.

Articles relative to eating disinhibition mostly used the Three-Factor Eating Questionnaire to identify eating behaviors associated with disinhibition (lack of restraint), restraint (restricting food intake) and hunger. In ten of the eleven cross-sectional studies and seven of the nine prospective studies, a positive association between BMI and disinhibition scores (measuring emotion-based eating, weak satiety, and food responsiveness) were found (French et al., 2012). In many of the studies, food reinforcement tended to be related to impulsivity and disinhibition constructs.

Many studies were reviewed relevant to self-control (inhibiting responses) and impulsivity (inability to delay gratification and not worry about consequences). Many of the findings suggested that individuals who are highly impulsive are less sensitive to

consequences and more sensitive to immediate rewards (French et al., 2012). They preferred an energy-dense food now, opposed to the delayed consequence of weight control later. Studies measuring self-control tended to use laboratory task such as delay discounting (inability to resist an immediate reward opposed to a greater reward later) and delay of gratification (ability to resist an immediate reward for a greater reward later) task and reaction times. Overall, impulsivity and disinhibition had the most consistent body of empirical data linking it to weight gain prospectively. Most available data showed positive cross-sectional associations with BMI, but fewer with food choices or energy intake. There was a consensus that weight gain is the result of a permissive food environment.

Summary

In Chapter 2, relevant studies that embodied the major themes and methods of this study were reviewed and areas needing further research were discussed. Factors such as energy-dense snacking as it relates to food reinforcement, food motives, food environment during work hours and non-work hours, and overweight and obesity were reviewed. The present overweight and obesity epidemic is accredited to a growing trend for snacking which may facilitate overeating and weight gain in association with quality of food choice, consumption frequency, and environment of eating (Bellisle, 2014). Between 1977-2008, the mean frequency of snacking increased from 1.0 to 2.2 snacks a day (Sebastian, Wilkinson & Goldman, 2011). In light of the statistics mentioned, additional research on food reinforcement and food motives, as it relates to snacking during work hours and non-work hours, may be beneficial to understanding weight gain risk factors and increasing BMIs.

In a typical work day, most adults spend 8-12 hours at work, which is likely to affect their dietary habits (Maruyama & Morimoto, 1996); therefore, it is important to investigate how the workplace food environment may influence energy intake and weight-related behaviors. Additional research is warranted for the food motives that drive food reinforcement and the energy-dense snacks consumed during work and non-work hours. As discussed in the literature, while taste, price, convenience, and availability lead in the food motive category, there is an array of other food motives that influence food choice. These motives can drive food reinforcement and food choice in different ways, depending on an individual's personality traits, food preference, nutrition knowledge, perceptions, culture, taste, health, and SES. In regards to SES, individuals with low income and education have less healthy dietary habits, partly due to higher priority for food choice motives such as price and familiarity, with less priority for health as a motive for energy-dense food purchases. SES disparities in relation to the food environment, energy intake, and food motives may influence energy-dense food consumption and obesity prevalence.

In the literature review there was a consensus that weight gain is the result of a permissive food environment. Food reinforcement is a significant contributor to weight gain and BMI change, and may have a significant effect on those most responsive to food cues. Prospective data indicate that the reinforcing value of food predicts weight gain in adults. Most studies found greater relative reinforcing value of food scores among overweight adults in comparison to normal weight adults. Several studies found that there was a higher energy intake in the laboratory setting among individuals with higher relative reinforcing value of food compared to those with lower relative reinforcing value

of food. In addition, questionnaire measures of eating motivations tend to correlate with weight gain and BMI. In cross-sectional studies, findings generally supported the association between BMI and the relative reinforcing value of food among children and adults.

Investigating and understanding the reasons individuals consume energy-dense snacks during work and non-work hours may help individuals and worksites develop strategies to reduce barriers to healthy eating in these food environments. There is extensive literature on barriers to healthy eating, but there is limited research concerning the difference in food reinforcement and motivation to consume energy-dense snack foods during work and non-work hours. Understanding if differences exist in food reinforcement during work and non-work hours may lead to essential need-based evidence to alter work and non-work hour food environments.

Chapter 3 will discuss the methodology used to examine these differences. This section will provide an introduction to the quantitative design approach. Additionally, the sampling and recruitment procedure, data collection, instrumentation, ethical procedures and limitations will be discussed.

Chapter 3: Research Method

Introduction

The purpose of this quantitative study was to investigate whether the difference between food reinforcement during work hours and non-work hours predicted BMI. In addition, food motives associated with energy-dense-snack food consumption were examined to assess whether they affect the relationship between food reinforcement and BMI. Understanding food reinforcement and motives for energy-dense snacking in different environments may help reduce associated weight gain (Carr, Lin, Fletcher, & Epstein, 2014; Koenders & van Strien, 2011).

In Chapter 3, I will discuss the study's methodology. The choice of methodology is essential to any type of research because a good method can yield good results when the research questions are answered accurately (Trochim, 2000). In addition, the rationale for specific procedures and instruments used to identify, select and analyze data, threats to validity, and ethical concerns will be discussed.

Research Design

In this quantitative cross-sectional study, the independent variables were food reinforcement and food motives; the dependent variable was BMI. The most appropriate methodology to investigate the research questions was a cross-sectional survey design. This design allowed for the (a) comparison of the population, in two different environments (work and non-work hours), at a single point in time; (b) comparison of different variables (e.g., age, gender, income, education, geographic locations and ethnicity); and (c) reduction of challenges with time constraints and expenses because it provided a clear, quick picture of the prevalence of the outcome at a single point in time

(Lavrakas, 2008; Levin, 2006). One weakness of this design is that causality cannot be tested definitively; however, the relationships are often used to support potential casual interpretations (Howitt & Cramer, 2010).

Population and Sampling Procedure

The target population for the research study was comprised of male and female U.S office workers, which included professionals, managers, technologists, administrative, financial, and clerical employees, who responded to the online media request via Facebook, craigslist, word of mouth, and Walden University's participant repository. The sample consisted of approximately 100 participants. The participants were obtained through self-selection, convenience sampling among those in the target population that responded to the online media survey request (Duffey & Popkin, 2011; French et al. 2013). This technique was chosen because it was more feasible in consideration of the time and resources associated with random sampling procedures (Khazaal, 2014). Self-selection sampling through online media request was the most viable recruitment option for this study.

Power to detect differences in reinforcement efficacy during work and non-work hours, among overweight and non-overweight participants, will be based on previous data from studies measuring reinforcing efficacy in overweight and non-overweight participants. A Cohen's D effect size of 0.35 was observed from these data (Feda et al., 2015; Wilson, 2001). The current study is different in that it measures each participant within two different environments (work hours and then again for non-work hours); essentially taking two measurements from each person. The estimated effect size of 0.35, a power of 0.8, and an alpha of 0.05 can be achieved with 65 participants (Wilson, 2001).

The estimated effect size is 0.35; however, a medium effect size (d = 0.5) was desired, so the difference could be large enough to be visible, if detected. Thus, the participants recruited were 100 to obtain ample power to detect a significant difference in food reinforcement during work and non-work hours if it exists.

Procedures For Recruitment, Participation, and Data Collection

Participants were obtained by self-selection, convenience sampling, among those in the target population that responded to the online media survey request. Participants were recruited via online social media request (Facebook, craigslist), word of mouth, and Walden University's participant repository to obtain study participants from all regions. The participants were directed to Survey Monkey to complete the survey. Once the participants accessed the site, they were prompted to view and agree to the informed consent electronically.

Informed consent was obtained from all participants for study approval by Walden University's Public Health Department Ethics Committee and the Institutional Review Board (approval number 01-12-17-0280961). In addition, the study participants were advised that completion of the survey is voluntary and they can decide to decline or not complete the survey without repercussions.

After the consent was provided, the participants were then directed to the survey. The survey consisted of questions concerning demographics (age, gender, income, region and SES), food motives, food reinforcement, and weight status to measure the independent, dependent and confounding variables. There were no follow-ups for the study since it was a cross-sectional survey. In the event that a survey was found incomplete, the survey was not used. Data from the first 100 complete, criterion eligible

surveys (full time U.S. adult office worker, age 18 years or older, understands/reads fluent English, not underweight, not pregnant, with a normal diet (no restrictions on food or eating) were used for the study.

Instrumentation

Demographic information, height and weight measurements, and three dietary habits questionnaires were administered via Survey Monkey. The complete survey consisted of three sections: (a) Relative Reinforcing Efficacy Survey (RRE) which measured the reinforcing value of snack foods (Hill et al., 2009); (b) Food Choice Questionnaire questions which measured nine motives that can influence food choice (Steptoe et al., 1995); and (c) MacArthur Sociodemographic Questionnaire which assessed social class, income and assets, occupational status and educational attainment (The Regents of the University of California, 2008). In addition, ten additional questions were added to the survey to assess demographics, employment status, BMI, disinhibition (lack of restraint), cognitive restraint (restricting food intake), emotional eating, exclusion criteria, and the food environment (Steptoe et al., 1995). The following section describes the instruments that were used to collect the data.

Relative Reinforcing Efficacy Survey (RRE)

RRE (relative reinforcing efficacy) survey is composed of 19 questions measuring the reinforcing value of snack foods. In measuring how much effort someone is willing to engage in to gain access to a snack food compared to an alternative, is also called the reinforcing value of food which is measured by the RRE (Hill et al., 2009). Differences in responsiveness to snacks can contribute to positive energy balance and risk for obesity (Hill et al., 2009). While laboratory methods (behavioral task where participants have to

respond to gain access to portions of food), and questionnaires to assess RRE have been developed and validated, the cross-sectional design of the RRE has also shown strong predictive validity similar to a laboratory setting and convergent validity with overweight status (Reslan, Saules & Greenwald, 2012). Correlations have been found between the LAB Omax (maximal amount of responses made on the highest reinforcement schedule completed ($r = 0.45$, $p < 0.05$) and the QUES Omax (maximum amount of money individuals are willing to spend for food), and between the LAB Omax ($r = .43$, $p < 0.05$) and the QUES Omax ($r = 0.52$, $p < 0.05$) and BMI (Epstein, Dearing & Roba, 2010).

The questionnaire presents valid measures of reinforcing efficacy that can be used as a substitute for traditional laboratory measures to establish demand curves that illustrate the behavioral maintaining properties relative to energy-dense snack foods and price (Epstein, Dearing & Roba, 2010; Epstein, Yokum, Feda & Stice, 2014; Feda et al., 2015; Reslan, Saules & Greenwald, 2012). This questionnaire can provide insight through demand curves to describe the behavior maintaining properties relative to energy-dense snack foods by assessing the responses for snack foods and the alternative through schedules of reinforcement (price). This is based upon the allocation and breakpoint in responses for each, reflecting the relative reinforcing value of each (Epstein, 2010).

In this survey the participants were asked on a typical day, "How many portions of (your preferred snack food) would you consume if they were ____ each at the following 19 prices?: Zero (free), $0.01, $0.05, $0.13, $0.25, $0.50, $1, $2, $3, $4, $5, $6, $11, $35, $70, $140, $280, $560, $1120 (Hill et al., 2009)." In the progressive ratio schedules utilized, schedule requirements are progressively increased after gaining access

to the reinforcer (snack food). For example, a study participant, being asked, "How much are you willing to pay for this cookie?" with the amount increasing each time to $1? $2? $3? etc. This determined the reinforcing value of the snack food. The reinforcing efficacy is considered the breakpoint or point in which participants stop responding (Epstein, Leddy, & Temple, 2007). Simply put, what's the most you would pay for this snack? In this example, participants with higher breakpoints would find the snack more reinforcing than participants with lower breakpoints. These questions were presented in the survey for answers concerning food reinforcement during work hours and then again for non-work hours. With this survey we may be able to determine how the environment during work hours and non-work hours affects the food reinforcement and food motives (during work hours) that drive motivation to consume the energy-dense snacks that affects BMI and promotes weight gain.

Food Choice Questionnaire (FCQ)

The food choice questionnaire consists of 36 questions which measure nine motives that can influence food choice (Steptoe et al., 1995). These motives include: Price, mood, convenience, weight concern, familiarity, sensory appeal, health, natural content, and ethical concern. The participants were asked to answer the following statement: "It is important to me that the food I eat on a typical day..." on a four-point scale with scores ranging from 1 (*not at all important*) to 4 (*very important*). Scale scores are between 1 and 4 and are computed by averaging (unweighted) item ratings per scale (Steptoe, Pollard & Wardle, 1995). The questionnaire structure was verified acceptable using confirmatory factor analysis on study samples (Steptoe, Pollard & Wardle, 1995). The internal consistency of the FCQ is acceptable with a Cronbach score

above 0.70 on all factors (Crossley & Nazir, 2002). Test-retest reliability (0.70) is also satisfactory for the three scales (Crossley & Nazir, 2002; Steptoe, Pollard & Wardle, 1995).

MacArthur Sociodemographic Questionnaire

The MacArthur Sociodemographic Questionnaire is composed of 11 questions concerning social class, income and assets, occupational status and educational attainment (The Regents of the University of California, 2008). The survey has shown good stability in test-retest reliability. Kappa values (95% CI) averaged 0.62 for the society ladder; 0.58 for the community-related ladder, and 0.67 for the work-related ladder (Giatti et al., 2012). This survey was used to assess participant demographics.

Ten additional questions were added to the survey with a multiple choice structure. These questions were added to assess age (18-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75 years or above), location (Midwest, Northeast, Southeast, Southwest or West), occupation (entry-level, supervisor, managerial or higher management), ethnicity (White, Hispanic/Latino, Black/African American, Asian, Indian/Native American, other), gender (male or female), children at home (yes or no), and BMI (self-reported height and weight). A question to verify if participants were eligible to participate based on exclusion criteria was also added: "Please answer yes if you fit all of the following criteria. Are you a full time U. S. adult office worker, age 18 years or older, understands/reads fluent English, not underweight, not pregnant, with a normal diet (no restrictions on food or eating)?" In addition, the survey included a measure of cognitive restraint (CR), uncontrolled eating (UE), and emotional eating (EE) on a 4-point response scale 1 (*definitely true)* to 4 (*definitely false*).

The following questions were utilized from the Three Factor Eating Questionnaire (TFEQ): (a) "When I feel blue, I often overeat" on a four-point scale, with scores ranging from 1 (*definitely false)* to 4 (*definitely true)*; (b) "On a scale of 1 to 8, where 1 means no restraint in eating (eating whatever you want, whenever you want it) and 8 means total restraint (constantly limiting food intake and never giving in), what number would you give yourself?;" and (c) "Sometimes when I start eating, I just can't seem to stop" on a four-point scale, with scores ranging from 1 (*definitely false)* to 4 (*definitely true).* The responses to these questions were given a score between 1 and 4. The 1–2 scores were coded as 1. The 3–4 scores were coded 2. The 5–6 scores were coded as 3 and the 7–8 scores were coded as 4 (de Lauzon, 2004). The higher scores for each of these questions on this scale were suggestive of higher cognitive restraint, emotional, or uncontrolled eating. The TFEQ has shown robust factor structure, good reliability and evidence of construct validity in obese and non-obese population studies (Allison, Kalinsky, & Gorman, 1992; Karlson, Persson & Sjostrom, 2000; Lauzon et al., 2004).

Operationalization

According to Trochim (2000) if concepts are not clearly defined the study can produce poor results with a faulty outcome. It is very important that variables and concepts are clearly operationalized so research questions can be answered accurately. The online survey was used to measure the independent variables (food reinforcement and food motives) and dependent variable (BMI) taking into consideration demographic factors such as gender, age, income, ethnicity, and SES status. Food reinforcement was measured using an interval level of measurement. The Relative Reinforcing Efficacy Survey (RRE) was used to measure the reinforcing value of snack foods during work

hours and non-work hours (Hill et al., 2009). Food motives were measured using an ordinal scale of measurement. The Food Choice Questionnaire, which measures price, mood, convenience, weight concern, familiarity, sensory appeal, health, natural content, and ethical concerns that influence food choice was used to measure food motives (Steptoe et al., 1995). The MacArthur Sociodemographic Questionnaire which assesses social class, income, assets, occupational status, and educational attainment was used to assess these covariates using an ordinal level of measurement (The Regents of the University of California, 2008).

In addition, ten additional questions were added to the survey to assess BMI and additional demographic information. The variables were operationalized by the following levels of measurements: age (nominal), gender (nominal), weight (ordinal), geographic region (nominal), BMI (interval), and inclusion criteria (nominal). An ordinal level of measurement was used to measure disinhibition (lack of restraint), cognitive restraint (restricting food intake), hunger, and the food environment (French et al., 2010; Lauzon et al., 2004; Liu, Han & Cohen, 2014; The Regents of the University of California, 2008). The dependent variable BMI (kg/m2) was measured using an interval level of measurement. BMI measures were used to determine if differences exist between food reinforcement, food motives, and BMI class. The BMI data (self-reported height and weight) from the participants was calculated (kg/m2) and categorized by BMI class. The CDC (2016) BMI class scale was utilized for the study: Normal weight (18.5-24.9), Overweight (25.0-29.9), Class I Obesity (30.0-34.9), Class II Obesity (35.0-39.0), and Class III Extreme Obesity (40.0 +).

Operationalization is a very important aspect of the research process. When operationalizing a variable or concept, it should be clearly defined, measurable, and understandable. How well the concepts are operationalized determines the study's validity, and strength of inferences (Trochim, 2000). This process is necessary because it ensures the research questions are being answered correctly.

Data Analysis Plan

The IBM Statistical Analysis Package for Social Sciences (SPSS) was used to analyze the collected data from the online cross-sectional survey (IBM Corporation, 2012). There were 117 participants who consented to the study which is more than the 65 participants required for statistical power; therefore, all data from participants missing values were deleted. There were 11 candidates who did not fit the inclusion criteria and 6 surveys that were missing values. After screening the data, 100 complete, criterion eligible surveys were available to complete the analysis.

Data cleaning and screening procedures were used to reduce this bias. Screening methods included cross tabulations and validated data entry. If outliers or inliers were detected the data was reviewed again to ensure correct entry and data was remeasured. It was determined that the amount of extreme values existing were not significant. Data collection and analysis with the cross-sectional survey answered the following research questions:

RQ1: Is there an association between food reinforcement and BMI among office workers?

$H_0$1: There is no association between food reinforcement and BMI among office workers.

H_A1: There is an association between food reinforcement and BMI among office workers.

RQ2: Is there a relationship between work hour food motives and BMI among office workers?

$H_0 2$: There is no relationship between work hour food motives during work hours and BMI among office workers.

$H_A 2$: There is a relationship between work hour food motives and BMI among office workers.

RQ3: Is there a difference in food reinforcement during work hours vs. non-work hours among office workers?

$H_0 3$: There is no difference in food reinforcement during work hours vs. non-work hours among office workers.

$H_A 3$: There is a difference in food reinforcement during work hours vs. non-work hours among office workers.

RQ4: Is there an association between food reinforcement and food motives during work hours among office workers?

$H_0 4$: There is no association between food reinforcement and food motives during work hours among office workers.

$H_A 4$: There is an association between food reinforcement and food motives during work hours among office workers.

Descriptive statistical processing was used to define the sample of 100 U. S. workers with regard to their personal demographic characteristics. Descriptive statistics

was also used to perform an exploratory analysis on food motives, eating behaviors, and food reinforcement during work and non-work hours.

Since a review of related literature indicated that age, gender, price, sensory appeal, convenience, natural content, ethical concern, cognitive restraint, uncontrolled eating, and emotional eating were significantly associated with BMI scores, these variables were added to the regression models as covariates (Epstein et al., 2014; Feda et al., 2016; Mohd-any, Mahdzan & Cher, 2014; Clark, Dewey & Temple, 2010; Epstein, Dearing & Roba, 2010; Temple et al., 2009).

The first research question was: Is there an association between food reinforcement and body mass index among office workers? An ordinal logistic regression was performed for this question to determine whether there was a relationship between work hour and non-work hour food reinforcement and the BMI class scores of the office workers for work and non-work hours.

The second research question was: Is the relationship between work hour food motives and BMI among office workers? Another ordinal logistic regression was performed for this question to determine whether there was a relationship between work hour food motives and the BMI class scores of the office workers. This was done to examine the relationship between FCQ scores and BMI class through raw scores of the nine motives (price, mood, convenience, weight concern, familiarity, sensory appeal, health, natural content, and ethical concern).

The third research question was: Is there a difference in food reinforcement during work hours vs. non-work hours among office workers? For example, a study participant, being asked, "How much are you willing to pay for a bag of potato chips?"

with the amount increasing each time to $1? $2? $3? etc. This determined the reinforcing value of the snack food. For research question 3, univariate analysis was conducted to determine whether there were differences in the office workers' food reinforcement between work and non-work hours. In addition, an ordinal logistic regression was performed on the study variables to ascertain whether the difference in Pmax, intensity, Omax and the break point were significant predictors for BMI class scores. The change score values for Pmax, intensity, Omax and break point were calculated by computing for the change in scores between work and non-work hours (work hours– non-work hours).

According to Pourhoseingholi, Baghestani, & Vahedi, (2012) logistic regression can control for numerous confounders that provide an odds ratio (adjusted ratio) because its values have been adjusted for other covariates or confounders. Ordinal logistic models were used to determine if potential changes in reinforcing efficacy, based on work vs. non-work environment, could predict BMI. This combination of analysis revealed the quantitative relationship between the escalating prices and demand for food through four indices: (a) breakpoint (first point/price at which consumption is zero); (b) Omax (maximum spent on snack food); (c) Pmax (price in which spending was maximized); and (c) intensity which is the number of snacks selected when the price was 0 (Hedeker & Gibbons, 2006).

The fourth research question was: Is there an association between food reinforcement and food motives during work hours among office workers? A pearson's product moment correlation was carried out to identify associations between food

reinforcement and food motives during work hours among office workers. In addition, threats to validity were addressed to reduce bias in results.

Threats to Validity

Validity of a measurement method is described as the extent to which it measures what it intends to measure (Oswald Price, 2006). Trochim (2000) described validity as how well the construct or concept is translated into a functioning and operating reality (operationalization). Validity is important because it determines the strength of inferences made. Three types of validity commonly examined in social research include internal, external and construct validity.

Internal Validity

According to Khazaal (2014), internal validity is an inductive estimate of the degree to which conclusions about cause and effect can be made (clear connection between the independent and dependent variable). In assessing threat to internal validity, the following were assessed: (a) cause and effect relationship; (b) if it can be concluded that changes in the independent variable cause observed changes in the dependent variable; (c) if the evidence for the conclusion was poor or good; (d) evidence for causality; and (e) confounding which was controlled for in the analysis.

Some of the most common threats to validity in quantitative research include attrition, self-selection effects, history effects, communication among subjects, maturation, and volunteer effects (Vogt, 2007). Plausible threats to internal validity with this study include attrition, self-selection effects, and volunteer effects. Attrition occurs when participants drop out or decide they no longer want to be a part of the study (Vogt, 2007). The cross-sectional survey was composed of less than 100 questions to avoid the

survey being too long or tedious for the participants. In addition, there were no follow-ups.

Self- selection effects occur when participants are not randomly assigned to groups that interest the researcher (Vogt, 2007). The study included only one group in which assignment was not necessary. Participants were recruited randomly through various advertisements. For recruitment the inclusion and exclusion criteria were clearly stated so only eligible participants were obtained for the study. Another threat to internal validity included self-selection bias in which only participants with an inherit bias may volunteer for the study (Khazaal, 2014). Since the study is not qualitative nor included open ended questions, bias in this respect may not significantly affect results. The participants were asked to answer each question truthfully and to the best of their ability.

Volunteer effects occur because individuals or groups cannot be studied without providing consent prior to the study, but those who do give consent are likely to differ from those who do provide consent (Vogt 2007). This was not foreseen as a significant threat because only participants who provided consent were allowed to take the survey. A study of these differences is suggested for future research.

External Validity

External validity is the extent to which internally valid results can be generalized (Price, 2006). One plausible threat to external validity includes the selection of participants. Since a convenience sample was used, the sample may not be representative of the entire population; therefore, limiting inferences made and lowering the external validity of the study. The data can only permit inferences of association between food reinforcement, food motives, and weight gain; therefore, no inferences can be made

regarding causality. These limitations were addressed by doing the following: (a) to ensure the study was potentially representative of the target population; the online media request was open to willing, eligible participants from all U. S. regions. This method helped obtain sociodemographic variation in the participants to increase the level of representativeness of the population; (b) The sample size was 100, instead of the required 65, to reduce the likelihood that the results were due to chance alone; and (c) specific inclusion and exclusion criteria was established in the beginning of the study to ensure eligible participants were correctly identified.

Construct validity

Construct validity refers to the extent to which inferences can be legitimately made from a study's operationalizations to the theoretical constructs on which these operationalizatons were based (Trochim, 2000). Feren et al. (2011) defined construct validity as whether the items in combination, in a specific construct, provide an adequate measure. One method used to minimalize threats to construct validity was to use objective, peer reviewed, operational definitions from well-established literature. This was done to reduce possibilities of generating inaccurate or misinterpreted data. Although the MacArthur Demographic survey had good reliability, there were no studies found that discussed the test validity; however, the instrument was well established in the literature (The Regents of the University of California, 2008). Its validity is suggested for future research.

The content of the instruments used (RRE, FCQ, and TFEQ) have been tested for reliability and validity and they are representative and relevant to the constructs of interest which include food reinforcement, food motives and eating behaviors

respectively (de Lauzon, 2004; Hill 2009; The Regents of the University of California, 2008). I added a few questions from the TFEQ which is considered a reliable survey with good validity (de Lauzon, 2004). The additional exploratory questions added concerning age, gender, ethnicity, geographic location, exclusion criteria, and BMI were not tested for reliability and validity; however, objective peer reviewed operational definitions that has been established in the literature were provided (Carr, Lin, Fletcher, & Epstein, 2014; CDC, 2016; French et al., 2010; Koenders & van Strien, 2011; Lauzon et al., 2004; Liu, Han & Cohen, 2014; The Regents of the University of California, 2008).

Validity is very important in the research process because if study results are not valid they are useless the study. Many threats exist to internal, external and construct validity and attempts should be made to mitigate these risk. If the concepts are not clearly operationalized or the instruments do not measure what they intend to measure, then the research question cannot be answered correctly. This would be a threat to conclusion validity because there would be a possibility that the relationship observed between the independent variables (food reinforcement and food motives) and the dependent variable (BMI) would not be accurate to determine an outcome. Assessing validity is essential because it helps analyze the appropriateness, usefulness, and significance of the research study (Khazaal, 2014).

Ethical Procedures

Participants were obtained by self-selection, convenience sampling, among those in the target population that responded to the online media survey request. Participants were recruited via online social media request (Facebook, craigslist), word of mouth, and

Walden University's participant repository to obtain study participants from all regions. The participants were directed to survey monkey to complete the survey. Once the participants accessed the site, they were prompted to view and agree to the informed consent electronically. Participants were informed that the purpose of the study was to assess food reinforcement and food motives in relation to consumption of energy-dense snack foods during work hours and non-work hours. It was advised that the survey consisted of questions concerning demographics (age, gender, income, ethnicity, region, education, job type, and SES), food motives, food reinforcement, and weight status. Data was obtained from the surveys to complete the analysis. There were no follow-ups for the study.

One ethical concern related to the recruitment materials and process was anonymity. According to Rudestam & Newton (2007) anonymity involves no one, not even the researcher, knowing the identity of the research participants. The participants were informed that questionnaires would not include their name or identifying information except on the consent form. This information will only be used to send summary results if this option was selected. Any information provided on the consent form was kept confidential by the researcher, and due to the anonymity of the survey, was not linked to scores. The consent forms were collected separately from the questionnaires. All information obtained from the surveys will be used for research purposes only, stored for 5 years and after it will be destroyed.

Another ethical concern includes exclusion criteria. The consent advised that exclusion criteria was provided because we are particularly interested in data concerning food reinforcement and food motives among adult office workers, age 18 years and older,

understands/reads fluent English, not underweight, not pregnant, with a normal diet (no restrictions on food or eating). This information was provided so volunteers could be made aware of the type of participants needed for the study and to relieve concerns about exclusion.

Ethical concerns can also arise from the data collection process. Study participants were advised that completion of the survey was voluntary and that they can decide to decline or not complete the survey without consequence. The participants were advised that if they felt uncomfortable with answering questions in the survey they could stop at any time without penalty. In the event that a survey was found incomplete, the survey was not used and the information was eliminated. Only the first 100 complete, criterion eligible surveys were used for the study. The participants were advised that there is no perceived risk in the research study and that they may gain some personal awareness as a result of their participation. The participants were advised that the survey would take approximately 20 minutes to complete based on pretesting of the survey. Participants were advised that it was optional to receive a summary of the research results. Informed consent was obtained from all participants for the study. The study was approved by Walden University's Public Health Department Ethics Committee and the Institutional Review Board (approval number 01-12-17-0280961).

Summary

Methodology is essential to any type of research because a good method can yield good results. In Chapter 3 the research design and methodology of the study was presented. The rationale for specific procedures and instruments used to identify, select and analyze data, threats to validity and ethical concerns were discussed. I chose a

research design, sampling method, research instruments, and analysis deemed most appropriate for the study. I was attentive to the methodology chosen to ensure variables are measured correctly, threats to validity are mitigated, ethical concerns are addressed, and research questions were sufficiently answered to yield accurate results. Chapter 4 will discuss the results of the study.

Chapter 4: Results

Introduction

Overweight and obesity are serious concerns due to the increased risk of hypertension, diabetes, cancers, heart disease, and many other conditions that can often lead to death (CDC, 2015). The prevalence of obesity in U.S. adults, age 20 and older, has more than doubled since 1960, increasing from 13.4% to 35.7% (CDC, 2010; Ogden et al., 2014). In light of statistics showing that nearly 66% of the nation is now overweight or obese, numerous studies have suggested that a significant portion of the nation's weight gain can be explained by the consumption of high energy-dense foods during the work day (Devine et al., 2007; Ogden et al., 2014; Shimotsu et al., 2007). Many of the nation's workers spend more than half their waking hours at work, which is where they consume half of their daily calories. Therefore, there is a need to recognize how snack food reinforcement, food motives, environmental factors, and the consumption of energy-dense snack foods during work hours contribute to the nation's overweight and obesity epidemic (Park et al., 2010; Truswell, 2006).

The purpose of this quantitative, cross-sectional study was to investigate whether the difference between food reinforcement during work and non-work hours predicted BMI among U. S. office workers. In addition, food motives associated with energy-dense-snack food consumption were assessed to see if they affected the relationship between food reinforcement and BMI.

This chapter presents the results of the research methodology outlined in Chapter 3. Before discussing the results of the statistical analyses, a description of the 100 U. S. office workers and the study variables is presented.

Description of the Sample

Of the 117 participants who consented to participate, 11 did not fit the inclusion criteria (full-time office worker) and six surveys suffered from randomly missing values. Thus, 100 criterion eligible surveys were available to complete the analysis. Descriptive statistical processing was used for the personal demographic characteristics of the sample (see Table 1). The sample was comprised of office workers, 34 men and 66 women, with ages ranging from 18–65 years or older (M = 34 years, S.D. = 1.10). The majority of the participants were Black/African American (55%) and White (21%). Most were from the Southeast region (39%), had an average family gross income of $35,000–$49,999 (30%), and worked in entry-level positions (48%). In terms of marital status, 43% were single and 43% were married. The dependent variable BMI (kg/m2) was measured using an interval level of measurement. BMI measures were used to determine if there were differences between food reinforcement, food motives, and BMI class. The BMI data (self-reported height and weight) was calculated (kg/m2) and categorized according to BMI class. The CDC (2016) BMI class scale was used for the study: Normal weight (18.5 kg/m2 - 24.9 kg/m2), Overweight (25.0 kg/m2 - 29.9 kg/m2), Class I Obesity (30.0 kg/m2 - 34.9 kg/m2), Class II Obesity (35.0 kg/m2 - 39.0 kg/m2), and Class III Extreme Obesity (40.0 kg/m2 +). Based on their BMI class scores, 34% of participants were obese, 38% were overweight, while only 28% were in the normal weight range.

Table 1

U. S. Workers by Personal Demographic Characteristics

Variable	Number of U. S. Workers	Percent
Age		
18-29 years old	29	29
30-41 years old	43	43
42-53 years old	16	16
54-64 years old	13	13
65 years or older	4	4
Total	100	100
Education		
High school diploma or equivalency (GED)	15	15
Associate degree (junior college)	15	15
Bachelor's degree	36	36
Master's degree	25	25
Doctorate	6	6
Professional (MD, JD, DDS, etc.)	3	3
Total	100	100
Gross Income		
Less than $5,000	3	3
$5,000 through $11,000	4	4
$12,000 through $15,000	2	2
$16,000 through $24,999	8	8
$25,000 through $34,999	20	20
$35,000 through $49,999	30	30
$50,000 through $74,999	19	19
$75,000 through $99,999	9	9
$100,000 and greater	2	2
No response	3	3
Total	100	100
Gender		
Female	66	66
Male	34	34
Total	100	100
Ethnicity		
White	21	21
Hispanic/Latino	9	9
Black/African American	55	55
Asian	6	6
Indian	5	5
Other	4	4
Total	100	100
Region		
Midwest	14	14
Northeast	23	23
Southeast	39	39
Southwest	14	14
West	10	10

Total	100	100
Marital Status		
Single	43	43
Married	43	43
Separated	7	7
Widowed	4	4
Other	3	3
Total	100	100
Job Position		
Entry-level	48	48
Supervisor	30	30
Managerial	18	18
Higher management	4	4
Total	100	100
BMI Class		
Normal Weight (18.5 to < 25 kg/m2)	28	28
Overweight (25.0 to < 30 kg/m2)	38	38
Class I (30 to < 35 kg/m2)	18	18
Class II (35 to < 40kg/m2)	10	10
Class III (40 kg/m2 or higher)	6	6
Total	100	100

Descriptive statistics were also used to perform an exploratory analysis on food motives, eating behaviors and food reinforcement during work and non-work hours. Overall, it was found that the workers were willing to exert more effort to access snack foods during work hours than non-work hours (Work Omax M = 3.41, SD = 8.294, Non-Work Omax M = 2.410, SD = 3.613; Work Pmax M = 3.858, SD = 3.453, Non-Work Pmax M = 2.951 SD = 2.340; Work BPT M = 8.677, SD = 11.746, Non-Work BPT M = 4.903 SD = 5.410; Work Intensity M = 12.610, SD = 15.368, Non-Work Intensity M = 6.260, SD = 6.432). A comparison between work and non-work hour mean measures for food reinforcement is shown in Table 2.

Table 2

Comparison of Work and Non-work Hour Food Reinforcement

Variable	Work Hours		Non-work Hours	
	Mean	Std. Deviation	Mean	Std. Deviation
OMAX: Number of responses (snacks) made on highest reinforcement schedule completed	3.410	8.294	2.410	3.613
PMAX: Highest reinforcement schedule (price) completed	3.858	3.453	2.951	2.340
BPT: Breakpoint (price) for the relative reinforcing value of food task	8.677	11.746	4.903	5.410
Intensity: Number of snacks selected when the price was 0	12.61	15.368	6.260	6.432

Table 3 shows the descriptive statistics for food motives (FCQ) that can influence food choices and eating behaviors from the Three Factor Eating Questionnaire. With regard to their food motivations (FCQ), scores ranged from 1 (*not at all important*) to 4 (*very important)*. The top considerations for the workers were price (M = 3.300, SD = .637), sensory appeal (M = 3.208, SD = .670) and convenience (M = 3.104, SD = .633).

In regards to their eating behaviors, scores ranged from 1 (*not at all important*) to 4 (*very important*). The participants showed considerable restraint (M = 2.62, SD = .736) and exhibited low likelihood to engage in uncontrolled eating (M = 1.96, SD = .695). However, they did tend to engage in emotional eating whenever they were sad (M = 2.32, SD = .863).

Table 3

Descriptive Statistics for Food Motives and Eating Behaviors of U. S. Office Workers

Variable	Mean	Std. Deviation
Food Choice Questionnaire		
Ethical Concern	2.23	0.81608
Snack Food Familiarity	2.6333	0.68247
Weight Control	2.85	0.87537
Factor Price	3.3	0.63652
Natural Content	2.62	0.8288
Sensory Appeal	3.2075	0.66955
Mood	2.587	0.83323
Convenience	3.104	0.6334
Health	2.896	0.74913
Eating Behaviors		
Cognitive Restraint	2.62	0.736
Uncontrolled Eating	1.96	0.695
Emotional Eating	2.32	0.863

The variables analyzed for the research questions included: a) the independent variables of food reinforcement and food motives; b) the dependent variable BMI; and c) the covariates (gender, age, price, cognitive restraint, emotional eating, uncontrolled eating, sensory appeal, convenience, natural content and ethical concern). Since a review of related literature indicated that age, gender, price, cognitive restraint, uncontrolled eating, emotional eating, sensory appeal, convenience, natural content and ethical concern were significantly associated with BMI scores, these variables were added to the regression models as covariates (Epstein et al., 2014; Feda et al., 2016; Mohd-any, Mahdzan & Cher, 2014; Clark, Dewey & Temple, 2010; Epstein, Dearing & Roba, 2010; Temple et al., 2009). The following sections include the results of the research questions

which were answered by using univariate analysis, ordinal regression, and correlation analysis.

RQ1: Is there an association between food reinforcement and body mass index among office workers?

An ordinal logistic regression was performed to determine whether there was a relationship between food reinforcement (intensity, Omax, Pmax, and breakpoint) during work and non-work hours and the BMI class scores of the office workers. The results of the analysis yielded a significant model ($\chi^2(18) = 32.801$, $p = .018$). The model was also a good fit to the data as evidenced by a pearson goodness of fit of $\chi^2 = 361.367$, $p = .722$. When the covariates were loaded along with the variables for food reinforcement, it was found that only work intensity was a significant predictor for the workers' BMI class scores. An increase in work intensity (measured by number of snacks selected when the price was 0) was associated with an increase in the odds of being obese, with an odds ratio of 1.050 (95% C.I. [1.016, 1.084]) for work intensity. Table 4 presents the coefficients for the components of food reinforcement.

Table 4

Results of the Ordinal Logistic Regression Predicting Workers' BMI Scale Scores for Food Reinforcement for Work and Non-work Hours

Variable	B	Sig.	*B*	95% Wald C.I. for *B*	
				Lower	Upper
Gender = Female	0.183	0.677	1.201	0.507	2.845
Gender = Male	0[a]	.	1	.	.
Age	-0.235	0.265	0.79	0.523	1.195
Price	-0.056	0.906	0.945	0.371	2.407
Cognitive Restraint	-0.27	0.354	0.764	0.432	1.351
Uncontrolled Eating	0.545	0.118	1.725	0.871	3.419
Emotional Eating	0.032	0.918	1.032	0.568	1.874

Sensory Appeal	0.564	0.153	1.757	0.812	3.803
Convenience	-0.53	0.28	0.588	0.225	1.54
Natural Content	0.376	0.211	1.456	0.809	2.622
Ethical Concern	-0.12	0.725	0.887	0.455	1.73
At Work OMAX	-0.017	0.519	0.983	0.934	1.035
AT Work Intensity	0.048	0.004	1.05	1.016	1.084
At Work PMAX	0.011	0.967	1.011	0.606	1.686
At Work BPT	-0.054	0.47	0.947	0.818	1.097
Non-work OMAX	-0.067	0.444	0.935	0.788	1.11
Non-work Intensity	0.073	0.122	1.075	0.981	1.179
Non-work PMAX	0.132	0.544	1.141	0.746	1.744
Non-work BPT	-0.019	0.834	0.981	0.82	1.173

[a] This parameter is set to zero because it is redundant

RQ2: What is the relationship between work hour food motives and BMI among office workers?

Another ordinal logistic regression was performed to determine whether there was a relationship between work hour food motives and the BMI class scores of the office workers. The results yielded a non-significant model ($\chi^2(14) = 19.549$, $p = .145$). Therefore, the null hypothesis was not rejected. This implied that none of the motives were significantly associated and were not predictors for the workers' BMI class scores ($p > .05$). Table 5 presents the results of the regression model for food motives where none of the variables were significant ($p > .05$).

Table 5

Results of the Ordinal Logistic Regression for Food Motives Predicting Workers' BMI Scale Scores

Variable	B	Sig.	*B*	95% Wald C.I. for *B*	
				Lower	Upper
Gender = Female	0.661	0.143	1.936	0.801	4.684
Gender = Male	0[a]	.	1	.	.
Health	-0.95	0.094	0.387	0.127	1.175
Mood	-0.357	0.277	0.7	0.367	1.333
Convenience	0.116	0.816	1.123	0.423	2.98
Sensory Appeal	0.722	0.094	2.058	0.885	4.787
Natural Content	0.771	0.065	2.162	0.953	4.908
Price	0.071	0.874	1.073	0.449	2.567
Weight Control	0.199	0.651	1.221	0.514	2.897
Familiarity	-0.175	0.651	0.839	0.393	1.794
Ethical Concern	-0.206	0.589	0.814	0.385	1.719
Age	-0.219	0.263	0.804	0.548	1.179
Cognitive Restraint	-0.18	0.543	0.836	0.469	1.49
Emotional Eating	0.196	0.513	1.217	0.676	2.192
Uncontrolled Eating	0.626	0.076	1.87	0.937	3.73

[a] This parameter is set to zero because it is redundant

RQ3: Is there a difference in food reinforcement during work hours vs. non-work hours among office workers?

Univariate analysis was conducted to determine whether there were differences in the office workers' food reinforcement (intensity, Omax, Pmax, and breakpoint) between work and non-work hours. After controlling for the covariates (gender, age, price, cognitive restraint, emotional eating, uncontrolled eating, sensory appeal, convenience, natural content and ethical concern), it was revealed that there was a statistically significant difference between the workers' work and non-work hour intensity, $p < .001$ (see table 6).

Table 6

Results of the Univariate Analysis for Work and Non-Work Hour Intensity

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	-1.352	11.622	-0.116	0.908	-24.449	21.744
Gender = Female	1.453	3.088	0.471	0.639	-4.683	7.589
Gender = Male	0[a]	.	.	.	.	.
Age	0.472	1.379	0.342	0.733	-2.269	3.212
Price	2.373	3.086	0.769	0.444	-3.76	8.506
Cognitive Restraint	1.823	1.975	0.923	0.358	-2.102	5.749
Emotional Eating	-0.149	2.054	-0.073	0.942	-4.231	3.933
Uncontrolled Eating	-0.258	2.413	-0.107	0.915	-5.053	4.537
Sensory Appeal	-0.77	2.64	-0.292	0.771	-6.017	4.477
Convenience	-0.473	3.149	-0.15	0.881	-6.732	5.786
Natural Content	1.179	2.067	0.571	0.570	-2.929	5.287
Ethical Concern	-3.159	2.309	-1.368	0.175	-7.749	1.43
Non-work Intensity	1.287	0.232	5.545	0.000	0.826	1.748

[a] This parameter is set to zero because it is redundant

After controlling for the covariates (gender, age, price, cognitive restraint, emotional eating, uncontrolled eating, sensory appeal, convenience, natural content and ethical concern), it was revealed that there was a statistically significant difference between the workers' work and non-work hour Omax (number of responses made on highest reinforcement schedule completed), $p < .001$ (see table 7). It was also determined that the office workers' Omax tended to vary depending on whether they engaged in emotional eating ($p = .037$) and uncontrolled eating ($p = .039$).

Table 7

Results of the Analysis for Work and Non-Work Hour Omax

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	8.093	6.372	1.27	0.207	-4.570	20.757
Gender = Female	-0.107	1.688	-0.063	0.950	-3.463	3.248
Gender = Male	0[a]	.	.	.	.	.
Age	-0.553	0.751	-0.736	0.464	-2.045	0.939
Price	0.355	1.672	0.212	0.832	-2.968	3.677
Cognitive Restraint	-0.154	1.088	-0.141	0.888	-2.316	2.009
Emotional Eating	2.376	1.12	2.122	0.037	0.151	4.601
Uncontrolled Eating	-2.815	1.343	-2.097	0.039	-5.483	-0.147
Sensory Appeal	-1.918	1.447	-1.325	0.189	-4.793	0.958
Convenience	0.971	1.713	0.567	0.572	-2.433	4.376
Natural Content	-1.097	1.13	-0.97	0.335	-3.343	1.149
Ethical Concern	-0.33	1.26	-0.262	0.794	-2.835	2.175
Non-work Omax	1.096	0.22	4.987	0.000	0.659	1.533

[a] This parameter is set to zero because it is redundant

After controlling for the covariates (gender, age, price, cognitive restraint, emotional eating, uncontrolled eating, sensory appeal, convenience, natural content and ethical concern), it was revealed that there was a statistically significant difference between the workers' work and non-work hour Pmax, $p < .001$ (see table 8).

Table 8

Results of the Analysis for Work and Non-Work Hour Pmax

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	2.74	2.334	1.174	0.244	-1.899	7.379
Gender = Female	-0.702	0.618	-1.137	0.259	-1.93	0.525
Gender = Male	0[a]	.	.	.	.	.
Age	-0.229	0.272	-0.842	0.402	-0.769	0.311
Price	-0.61	0.61	-1.001	0.320	-1.821	0.601
Cognitive Restraint	0.313	0.392	0.798	0.427	-0.466	1.092
Emotional Eating	-0.102	0.404	-0.251	0.802	-0.905	0.702
Uncontrolled Eating	0.566	0.473	1.196	0.235	-0.374	1.505
Sensory Appeal	-0.43	0.523	-0.822	0.413	-1.47	0.61
Convenience	0.101	0.621	0.163	0.871	-1.132	1.334

Natural Content	-0.224	0.412	-0.545	0.587	-1.042	0.594
Ethical Concern	0.622	0.457	1.363	0.177	-0.285	1.53
Non-work Hour Pmax	0.913	0.117	7.788	0.000	0.68	1.145

[a] This parameter is set to zero because it is redundant

After controlling for the covariates (gender, age, price, cognitive restraint, emotional eating, uncontrolled eating, sensory appeal, convenience, natural content and ethical concern), it was revealed that there was a statistically significant difference between the workers' work and non-work hour breakpoint, $p < .001$ (see table 9).

Table 9

Results of the Analysis for Work and Non-work Hour Breakpoint

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	10.254	8.473	1.21	0.229	-6.584	27.093
Gender = Female	-3.588	2.221	1.616	0.11	-8.001	0.825
Gender = Male	0[a]	.	.	.	.	.
Age	-0.893	0.983	0.908	0.366	-2.846	1.061
Price	-1.945	2.235	-0.87	0.387	-6.386	2.497
Cognitive Restraint	0.382	1.413	0.27	0.787	-2.426	3.19
Emotional Eating	-0.229	1.454	0.158	0.875	-3.119	2.661
Uncontrolled Eating	2.117	1.706	1.241	0.218	-1.273	5.507
Sensory Appeal	-1.618	1.893	0.855	0.395	-5.38	2.144
Convenience	0.5	2.233	0.224	0.823	-3.937	4.937
Natural Content	-0.477	1.492	-0.32	0.75	-3.443	2.489
Ethical Concern	1.663	1.648	1.009	0.316	-1.613	4.938
Non-work Hour Breakpoint	1.188	0.191	6.217	0.000	0.808	1.568

[a] This parameter is set to zero because it is redundant

Since the results of the univariate analysis were significant for Pmax, breakpoint, Omax and intensity, a follow-up ordinal logistic regression was performed on the study variables to ascertain whether the difference in Pmax, intensity, Omax and the breakpoint were significant predictors for BMI class scores. The change score values for Pmax, intensity, Omax and break point were calculated by computing for the change in scores between work and non-work hours (work hours – non-work hours). The regression analysis determined that the model was statistically significant ($\chi^2(14) = 24.977$, $p = .035$). However, only change in intensity (work hour intensity – non-work hour intensity) was a statistically significant predictor for the workers' BMI class scores, $p = .003$. Table 10 presents the results of the ordinal regression for each of the study variables' change scores.

Table 10

Results of the Ordinal Regression for Work and Non-Work Hour Differences in Food Reinforcement

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
Gender = Female	0.295	0.4303	-0.548	1.139	0.471	1	0.492
Gender = Male	0[a]	.	.	.	.	.	.
Change in Intensity	0.044	0.0151	0.015	0.074	8.558	1	0.003
Change in Pmax	-0.119	0.1714	-0.455	0.216	0.486	1	0.486
Change in Breakpoint	0.005	0.0463	-0.086	0.096	0.012	1	0.912
Change in Omax	-0.015	0.0254	-0.065	0.035	0.347	1	0.556
Age	-0.303	0.1973	-0.69	0.084	2.357	1	0.125
Price	-0.129	0.4365	-0.984	0.727	0.087	1	0.768
Emotional Eating	0.255	0.2898	-0.313	0.823	0.773	1	0.379
Cognitive Restraint	-0.29	0.2853	-0.849	0.269	1.033	1	0.310
Uncontrolled Eating	0.541	0.3368	-0.119	1.202	2.584	1	0.108
Sensory Appeal	0.429	0.3725	-0.301	1.159	1.325	1	0.250
Convenience	-0.158	0.469	-1.077	0.761	0.113	1	0.736
Natural Content	0.338	0.2912	-0.233	0.909	1.348	1	0.246
Ethical Concern	-0.268	0.3252	-0.905	0.37	0.678	1	0.410

[a] This parameter is set to zero because it is redundant.

RQ4: Is there an association between food reinforcement and food motives during work hours among office workers?

A pearson's product moment correlation was carried out to identify associations between food reinforcement and food motives during work hours among office workers. The analysis revealed that there were small, negative correlations between work hour Omax and sensory appeal (r = -.25, p = .01), work Omax and natural content (r = -.20, p = .04), work intensity and ethical concern (r = -.23, p = .02), work Pmax and price (r = -.23, p = .02), and work breakpoint and price (r = -.29, p < .001). This means that as the number of snacks that the workers wanted at the maximum value they were willing to pay increased (Omax), the importance of sensory appeal and natural content decreased. Moreover, when the initial number of snacks that they wanted increased (work intensity), the importance of ethical concern decreased. This also means that as the value of the maximum price that they were willing to pay increased (Pmax), the importance of price decreased. Finally, as the breakpoint for food reinforcement increased, the importance of price decreased. Table 11 presents the results of the correlational analysis.

Table 11

Pearson's Product Moment Correlation for the Study Variables

Variable	Statistic	Health	Mood	Convenience	Sensory Appeal	Natural Content	Price	Weight Control	Familiar	Ethical Concern
At Work OMAX	Pearson Correlation	-0.15	-0.11	-0.14	-.25*	-.20*	0.14	-0.07	-0.12	-0.19
	Sig. (2-tailed)	0.14	0.26	0.15	0.01	0.04	0.16	0.51	0.23	0.07
At Work Intensity	Pearson Correlation	-0.13	-0.16	0.02	-0.09	-0.08	0.00	0.00	-0.04	-.23*
	Sig. (2-tailed)	0.21	0.11	0.88	0.37	0.45	1.00	0.97	0.72	0.02
At Work	Pearson Correlation	-0.05	-0.04	-0.13	-0.14	-0.01	-.23*	-0.07	-0.09	0.05

PMAX	Sig. (2-tailed)	0.64	0.70	0.22	0.16	0.94	0.02	0.51	0.37	0.66
At Work BPT	Pearson Correlation	-0.05	-0.06	-0.17	-0.15	0.02	-29**	-0.04	-0.11	0.06
	Sig. (2-tailed)	0.61	0.58	0.08	0.15	0.81	0.00	0.72	0.27	0.56

[a] Listwise N = 100
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Summary

The aim of this quantitative, cross-sectional study is to gain an understanding of the differences between snack food reinforcement and associated food motives and their relation to BMI and weight gain during work hours and non-work hours among U. S. office workers. A composite of three survey instruments namely, the Relative Reinforcing Survey, Food Choice Questionnaire, and the MacArthur Socio-demographic Questionnaire was used to collect data from 100 U. S. workers to obtain answers to the research questions that guided this study. The results of the analysis determined that intensity was a significant predictor for the workers' calculated BMI class scores and that food motives were not associated with BMI class scores. In addition, the results also revealed that during work-hours, workers were willing to exert more effort to obtain snack foods (intensity, omax, and breakpoint) and that they were willing to pay more to obtain these snacks (Pmax) than during non-work hours. Additionally, it was also found that there were differences in the initial number of snacks that the workers wanted during work and non-work hours when they tended to engage in uncontrolled or emotional eating. The analysis also revealed that there were small negative correlations between work Omax and sensory appeal; work Omax and natural content; work intensity and ethical concern; work Pmax and price; and work breakpoint and price. The implications of the findings in this chapter will be discussed in greater detail in Chapter 5.

This chapter presented the findings of the study and the analysis conducted to test the research questions and hypothesis. These analyses have provided support for hypotheses that food reinforcement is greater during work hours than non-work hours among office workers. Chapter 5 will provide a summary of the interpretation of these findings. In addition, limitations, recommendations, and implications for positive social change will be presented.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The present overweight and obesity epidemic has been partly credited to a growing trend for snacking and sedentary work behaviors. The workplace food environment may play a significant role in this growing problem, but with additional research and preventive measures, the workplace may become a key resource in the improvement of employee health (Park et al., 2010). Several factors influence food choice especially in the workplace. Food reinforcement is an empirical indicator of food choice and motivation to eat snack foods (Carr, Lin, Fletcher, & Epstein, 2014; Epstein et al., 2012). The motivation of an individual to eat energy-dense snacks during the work day may differ his or her consumption of these foods during their non-work hours. While there is extensive literature on barriers to healthy eating, there is little on the difference in food reinforcement during work and non-work hours, and the relationship between this reinforcement and to the energy intake that leads to overweight and obesity.

The purpose of this cross-sectional study was to investigate whether the difference between food reinforcement during work and non-work hours predicted BMI. In addition, food motives associated with energy-dense-snack food consumption were examined to assess if whether they affected the relationship between food reinforcement and BMI. Descriptive, correlational, and exploratory analysis were used. The study was designed to obtain data to describe and expound on other relevant research on food reinforcement and food motives in correlation with BMI among U. S. office workers, while taking into consideration demographic factors such as gender, age ethnicity, and SES status.

This chapter provides an overview of the study, a review of the hypotheses, and a discussion of the study's results in relation to current literature and the theories of food reinforcement, individual differences, and the behavioral choice. Implications for social change and recommendations for future studies will also be discussed.

Summary of the Findings

Four research questions guided this study to investigate the relationship between food reinforcement during work and non-work hours, food motives and BMI. Three survey instruments were used to collect data: Relative Reinforcing Survey, Food Choice Questionnaire, and the MacArthur Socio-demographic Questionnaire. The participants were U.S. office workers: 34 men and 66 women with ages ranging from 18-65 years or older (M = 34 years, S.D. = 1.10). The majority of the participants were Black/African American (55%) and White (21%). Most were from the Southeast (39%). The average gross family income was $35,000–$49,999. Almost half worked in entry-level positions (48%). Most participants were either single (43%) or married (43%). Based on their BMI class scores, 34% were obese, 38% were overweight, while only 28% were in the normal BMI class weight range.

Descriptive, correlational, and exploratory analysis were used in this study. The results of the study determined: (a) there was a statistically significant difference in food reinforcement during work hours versus non-work hours; (b) only change in intensity (work hour intensity – non work hour intensity) was a statistically significant predictor for the workers' BMI class scores, $p = .003$; and (c) food motives were not associated with BMI class scores. Moreover, during work-hours, workers were willing to exert more effort to obtain snack foods (intensity, omax and breakpoint) and they were willing to pay

more to obtain these snacks (Pmax) than during non-work hours. It was also found that there were differences in the initial number of snacks that the workers wanted during work and non-work hours when they tended to engage in uncontrolled or emotional eating. Lastly, the analysis also revealed that there were small negative correlations between work Omax and sensory appeal; work Omax and natural content; work intensity and ethical concern; work Pmax and price, and work breakpoint and price. These findings support the hypotheses that food reinforcement is greater during work hours than non-work hours among office workers.

Interpretation and Summary of Findings

In this section, the findings will be described in how they confirm, refute, or extend knowledge in the discipline by comparing them to the literature featured in Chapter 2. These findings will also be analyzed and interpreted in the context of the theoretical framework as appropriate.

RQ1: Is there an association between food reinforcement and body mass index among office workers?

An ordinal logistic regression was performed to determine whether there was a relationship between work and non-work hour food reinforcement and the BMI class scores of the office workers. The results of the analysis revealed that only work intensity was a significant predictor for the workers' BMI class scores. An increase in work intensity was associated with an increase in the odds of being obese, with an odds ratio of 1.050 (95% C.I. [1.016, 1.084]).

This study extends the knowledge in the discipline. Previous researchers explored the relationship between food reinforcement and the BMI of individuals, but not

necessarily about office workers. Food reinforcement predicts BMI and weight gain in adults and children, which is associated with regular and repeated eating of energy-dense foods (Saelens & Epstein, 1996; Temple et al., 2009; Temple et al., 2011). While the present study was specific to the population of office workers, the results still provided support to related studies that found an association between food reinforcement, BMI and weight gain among various populations (Carr, Lin, Fletcher, & Epstein, 2014; Epstein, Yokum, Feda & Stice, 2014; Temple et al., 2011; Giesen et al., 2010; Temple et al., 2009).

According to the behavioral choice theory, the many choices that impact consumption habits and weight gain are viewed as alternatives, in which one choice may be more luring or reinforcing than the other (Epstein, Leddy & Temple, 2007, Glasser, 1998). Vending machines are located in most office workplaces. These vending machines sell energy-dense snack items, which include: muffins (averaging 500 calories), assorted trail mix (averaging 580 calories), pastries (averaging 450-500 calories), candy bars (averaging 280 calories), potato chips (averaging 200-320 calories) and sodas averaging 250 calories (Keane, 2008; Self -Nutrition Data, 2014). Environments can influence food choice; however, individual behavior to make healthier food choices can happen in only supportive environments with affordable and accessible healthy food choices (Story et al., 2002). The foods in vending machines are more often than not very accessible to office workers. Office workers tend to buy food in vending machines because it is what is available to them and it is convenient. Cleobury and Tapper (2014) stated that eating is not always initiated by hunger, but can also be initiated by other motives such as

emotional eating in response to negative emotions (e.g., stress at work or home) and external eating in response to food cues.

This information might be helpful for individuals and organizations. Knowing that work intensity affects the food reinforcement of office workers, which then affects their BMI, companies and organizations should offer a variety of foods that are healthier, with fewer calories, at possibly cheaper prices.

RQ2: What is the relationship between work hour food motives and BMI among office workers?

Another ordinal logistic regression was performed to determine whether there was a relationship between work hour food motives and the BMI class scores of the office workers. The results of the analysis revealed that there was no relationship between work hour food motives and BMI among office workers ($p > .05$). This implied that none of the motives were significantly associated and were not predictors for the workers' BMI class scores.

This finding extends the knowledge about food motives and BMI. Previous researchers have focused on food motives or food reinforcement in relation to weight gain and BMI. Moreover, these previous researchers have not explored the relationship between these two variables within the context of office workers. French et al. (2012) conducted a meta-analysis of 66 studies. There was a consensus that weight gain is the result of a permissive food environment. Most available data showed positive cross-sectional associations with BMI, but fewer with food choices or energy intake as with the present study (French et al., 2012). The difference in results may have been due to the target population in each study. The French et al. (2012) study was a meta-analysis which

included 66 studies assessing various populations; while the present study target population only included office workers, which is a population already at risk for weight gain due the their sedentary work behaviors (Barr-Anderson et al., 2009; Chaput et al., 2011; Sisson et al., 2009)

Interpreting this finding from the lens of reinforcement theory and behavioral choice theory, it might be the fact that the food motives listed in the survey questionnaire did not include the food motives of the participants that might influence their food reinforcement and choices. Another interpretation is that the food motives of the participants might be too varied to conclude a relationship between food motives and the BMI of the participants.

RQ3: Is there a difference in food reinforcement during work hours vs. non-work hours among office workers?

Univariate analysis was conducted to determine whether there were differences in the office workers' food reinforcement between work and non-work hours. After controlling for the covariates (gender, age, price, cognitive restraint, emotional eating, uncontrolled eating, sensory appeal, convenience, natural content and ethical concern), the results revealed that there was a statistically significant difference in food reinforcement (intensity, pmax, omax, and breakpoint) during work and non-work hours. Food reinforcement was highest during work hours; however, only change in intensity (work hour intensity – non-work hour intensity) was a statistically significant predictor for the workers' BMI class scores (p = .003).

This finding extends the knowledge in the discipline about food reinforcement among office workers. There has been no other study about food reinforcement during

work hours vs. non-work hours among office workers. This finding provides an insight about the difference of food reinforcement of office workers during work and non-work hours.

From the lens of reinforcement theory, it can be inferred that various factors reinforce the food intake of office workers. The results indicated that price played a significant role in the number of snacks selected at each reinforcement schedule. Work intensity is a significant factor in the difference in food reinforcement of office workers during work and non-work hours. The results indicated that as price decreased, the number of energy-dense snacks selected increased. This supports the recommendation that increasing the price of energy-dense items and reducing the price of healthy food items may decrease high energy-dense food consumption.

In the study, the participants had the choice to keep responding as price for the snack food increased or stop responding when they reached their breakpoints in price (Work Hour Bpt: M = 8.677, SD = 11.746, Non-work Hour Bpt: M = 4.903, SD = 5.410). Individuals have different motives behind how they respond. In regards to the reinforcement theory, B.F. Skinner proposed that individual differences among individuals stem from that fact that they come from different environments in which their learning behavior has been molded and reinforced in different ways (Skinner, 1974). The observed differences seen among shifts in increasing and decreasing responses may have been due to individual differences in food reinforcement and the food motives that drive the choice behaviors elicited in different environments (work and non-work hours).

What we choose to consume and how much we consume plays a significant role in determining risk for weight gain. Additional research identifying individual differences

in food reinforcement could help identify who may benefit most from interventions that involve increasing the behavioral cost (price) to obtain energy-dense snack foods. This is a broad topic and it is essential to further research how individual differences may influence food reinforcement and weight gain.

RQ4: Is there an association between food reinforcement and food motives during work hours among office workers?

A pearson's product moment correlation was carried out to identify associations between food reinforcement and food motives during work hours among office workers. The analysis revealed that there were small, negative correlations between work Omax and sensory appeal (r = -.25, p = .01), work Omax and natural content (r = -.20, p = .04), work intensity and ethical concern (r = -.23, p = .02), work Pmax and price (r = -.23, p = .02), and work breakpoint and price (r = -.29, p < .001). This means that as the number of snacks that the workers wanted at the maximum value they were willing to pay increased (Omax), the importance of sensory appeal and natural content decreased. Moreover, when initial the number of snacks that they wanted increased (work intensity), the importance of ethical concern decreased. This also means that as the value of the maximum price that they were willing to pay increased (Pmax), the importance of price decreased. Finally, as the breakpoint for food reinforcement increased, the importance of price decreased.

This finding also extends knowledge in the discipline. There have been no previous studies about an association between food reinforcement and food motives during work hours among office workers. This finding contributes valuable information about food reinforcement during work and non-work hours and food motives among

office workers. The results revealed that office workers take into consideration the number of snacks, work intensity, cost, and ethical concerns when it comes to food reinforcement and food motives during work hours. Food motives may drive food reinforcement as well as behavioral choice.

Limitations of the Study

Several limitations were observed in the study such as research methodology, survey design, and potential for bias. The cross-sectional design and sample size were also limitations to the study. In this section these limitations and how some of these limitations were addressed will be discussed.

One limitation to the study was the research methodology. The quantitative research method only aimed to determine the relationship between the variables. This research method did not provide any context to the temporal nature of the relationship. In addition, the quantitative cross-sectional survey design excludes the manipulation and control typical of experimental studies; therefore allowing for threats to external and internal validity (Frankfort-Nachmias & Nachmias, 2008). The data only permitted inferences of association between food reinforcement, food motives, and weight gain; therefore, no inferences could be made regarding causality. With cross-sectional/correlational designs these factors must be controlled statistically (Frankfort-Nachmias & Nachmias, 2008). The statistical method used was regression. According to Pourhoseingholi, Baghestani, & Vahedi (2012), logistic regression can control for numerous confounders that provide an odds ratio (adjusted ratio) because its values have been adjusted for other covariates or confounders. Logistic models were used to

determine if potential changes in reinforcing efficacy, based on work vs. non-work environment, could predict BMI.

Another limitation of the study was the small sample size. The small sample size makes the findings specific to only the target population and not generalizable to the whole population of workers. In addition, since a convenience sample was used, the sample may not be representative of the entire population; therefore, limiting inferences made and lowering the external validity of the study. Moreover, the participants included only office workers which may not reflect the experiences and results of other occupations.

Self-reporting also served as a limitation. The content of the instruments used have been tested for reliability and validity. However, the answers of the participants could have been influenced by desirability and embarrassment in reporting weight, food motives, and the reinforcing value of snack food. The participants may not have answered as truthfully because they were embarrassed by their answers. This limitation could have affected the interpretation of the results in regards to the relationships found between food reinforcement, food motives, and BMI. Another possibility is that participants could have provided answers that they thought would benefit the study. This limitation was addressed in the consent form by reassuring the participants that the data they provide would remain confidential. The participants were also reminded that their honest answers would benefit the study.

Another limitation was the instrument. In the study, food motives were not significantly associated with BMI scores. There might be possible significant eating motives that were not provided in the questionnaire options. The survey only included

those motives assessed in the FCQ. This could have caused underestimation of food motives for eating energy-dense snacks. Assessment of additional food motives as it relates to food reinforcement is suggested for future research.

Recommendations for Future Research

Additional research could elaborate on and extend the present study. Future researchers could use a qualitative research methodology or a mixed methodology. A qualitative research methodology could provide rich descriptions and inferences about the association between food reinforcement, food motives, and weight gain. This research could include using case studies, focus groups, or individual interviews to obtain a more in depth insight. Using interviews and focus group discussions as instruments could also limit the self-reporting bias among participants. In interviews and focus group discussions, if the participants show that they might not be answering honestly because of embarrassment or response bias, the researcher could use strategies to address these biases. This could include confidentiality statements, making the participants feel comfortable to answer truthfully, and advising of the importance of honest answers for beneficial research. The open-ended questions could reassure the participant that there are no right or wrong answers to the questions. The focus group discussions could also provide a safe avenue for participants to share their experiences as they could feel that they share the same experiences with others. In addition, a mixed methodology could provide advantages of both quantitative and qualitative research methodology.

A modification in the target population and sample size is also recommended. For qualitative methodologies, the sample size might have to be lower to account for the needs of the research methodology. This could include a nested qualitative study of a

smaller subgroup of this population. Another recommendation is to widen the target population to account for other workers in different occupations. The present study included only office workers which may not reflect the experiences and results of other occupations; however, we were able to gain an insight into the level of food reinforcement among office workers during work hours vs non-work hours. Future research could extend the study of snack food reinforcement to other occupations such as blue collars workers or those with less sedentary jobs. Evidence from a study such as this would provide awareness of when food reinforcement is highest among these occupations as well.

Including meals and not just focusing on snacks in regards to food reinforcement is also recommended. Future researchers could compare the eating patterns during work hours and non-work hours and determine the factors that influence their eating patterns. Knowing and understanding the eating patterns of office workers could help in improving their dietary habits and physical health since they spend more than half their work day wake hours in the workplace.

Food reinforcement is a broad topic and there is still much to be learned. While the future research recommended was beyond the scope of this study, these recommendations can help better understand the factors that influence the motivation to eat and the reinforcing value of food. A better understanding of the importance of work related factors during work hours may assist in the design and development of workplace interventions and policies addressing overweight and obesity.

Implications for Social Change

Food choices and food reinforcement are shaped by food motives and the complex world in which people live and work. Understanding if differences exist in food reinforcement during work and non-work hours may lead to essential need-based evidence to alter these food environments. The results of the study determined that intensity was a significant predictor for the workers' calculated BMI class scores and that food motives were not associated with BMI class scores. In addition, the results also revealed that during work-hours, workers were willing to exert more effort to obtain snack food (intensity and breakpoint) and that they were willing to pay more to obtain these snacks (Pmax) than non-work hours. This study has contributed to relevant research adding to this body knowledge, particularly on how food motives and food reinforcement of snack foods, during work hours and non-work hours, influence energy intake and BMI. These findings may help inform and provide knowledge to the referenced population and assist with individual and workplace mitigation of risk associated with obesogenic food environments.

Potential implications for positive social change include relative policy changes within companies, tailoring the worksite environment to meet individual needs, providing healthier food choices, increasing prices on energy-dense foods, and providing non-food alternatives to breaks. Non-food alternatives to breaks could include the incorporation of a non-food break room where workers can exercise on exercise equipment (weights, treadmills etc.) or just read, watch television, play games and socialize. Another non-food alternative could include the initiative of a same break group walk, where those having the same break can take walks around the building or parking lot. Since the reinforcing value of snacks depend on available alternatives, strategies to increase the reinforcing

value of healthy snacks and non-food alternatives, or reducing access to highly reinforcing foods that drive motivation to eat, may reduce energy-dense snack consumption (Epstein, Yokum, Feda, & Stice, 2014; Giesen et al., 2010; Temple et al., 2008). However, future research is needed to assess whether these initiatives would work with workers with high food reinforcement.

In the study, as price increased, the number of energy-dense snacks selected decreased. Price was a significant factor in the number of snacks participants selected at each reinforcement schedule. Moreover, dietary intake can be influenced by environmental strategies such as increasing the price of energy-dense items, reducing the price of healthy foods in vending machines and cafeterias, increasing the availability of healthy food options, and nutrition education (Block et al., 2004; French et al., 2001; French et al., 2010). These strategies could be implemented through industry collaborations and policy initiatives (French et al., 2010). If worksites offer more nutrient-dense, low fat, sodium and cholesterol items in vending and cafeterias, that are also tasty, healthy, and appealing, caterers, vendors, and food service management may see greater sales and increased food service activity participation (Wilber 1983).

Many people tend to find energy-dense foods more reinforcing; however, increasing purchasing of both energy-dense foods through subsidies and taxes, along with decreasing accessibility of these items, can promote healthier food choices (Epstein et al., 2010; Lin et al., 2013). In assessing the absolute reinforcing value of energy-dense snack foods, individual differences may play a large role in choice behaviors. Workplace interventions that offer healthful eating options in vending machines and cafeterias have the potential to greatly benefit organizations, employees and their families.

Conclusion

The purpose of this quantitative study was to investigate if the difference between food reinforcement during work and non-work hours predicted BMI. In addition, food motives associated with energy-dense-snack food consumption were examined to assess if they affect the relationship between food reinforcement and BMI. Foods available and consumed during work hours may be one of the largest contributors to excess energy intake and weight gain (Maruyama & Morimoto, 1996). Understanding food reinforcement and motives for energy-dense snacking in different environments may help reduce associated weight gain and obesity among individuals.

The most significant finding in this study is that intensity was a significant predictor for the workers' calculated BMI class scores and that food motives were not associated with BMI class scores. During work-hours, workers were willing to exert more effort to obtain snack food (intensity, Omax, and breakpoint) and that they were willing to pay more to obtain these snacks (Pmax) than during non-work hours. Moreover, there were also differences in the initial number of snacks that the workers wanted during work and non-work hours when they tended to engage in uncontrolled or emotional eating. These findings are helpful in determining and understanding the food reinforcement and food motives of office workers. There is much to be learned about how food reinforcement develops, what maintains food reinforcement, and how food motives may influence these factors. A better understanding of behavioral factors that influence food reinforcement and snack food consumption may be important to improving the effectiveness of public health efforts to reduce the prevalence of overweight and obesity. A better understanding of the importance of work related factors

and how it relates to eating behaviors may assist in the design and development of workplace interventions and policies addressing overweight and obesity.

Knowing and understanding the eating patterns of office workers could help in improving their dietary habits and physical health since they spend more than half their work day wake hours in the workplace. The workplace environment can provide opportunities for dietary, physical and worksite environmental change as well as individual behavior changes. It is important to continue to investigate how the workplace food environment may influence energy intake and weight-related behaviors to create awareness among this population. The more individuals and organizations know about these environmental food-related behaviors, the more opportunity they may have to take action in mitigating risk for weight gain during work and non-work hours.

References

Allison, D. B., Kalinsky, L. B., & Gorman, B. S. (1992). A comparison of the psychometric properties of three measures of dietary restraint. *Psychological Assessment*, *4*(3), 391-398. doi:10.1037//1040-3590.4.3.391

American Heart Association. (2014). *The Price of Inactivity*. Retrieved from http://www.heart.org/HEARTORG/GettingHealthy/PhysicalActivity/StartWalking/ThT-Price-of-Inactivity_UCM_307974_Article.jsp

Barr-Anderson, D. J., Larson, N. I., Nelson, M. C., Neumark-Sztainer, D., & Story, M. (2009). Does television viewing predict dietary intake five years later in high school students and young adults? *International Journal of Behavioral Nutrition and Physical Activity*, *6*(1), 7. doi:10.1186/1479-5868-6-7

Bellisle, F. (2014). Meals and snacking, diet quality and energy balance. *Physiology & Behavior*, *134*, 38-43. doi:10.1016/j.physbeh.2014.03.010

Bennie, J. A., Pedisic, Z., Timperio, A., Crawford, D., Dunstan, D., Bauman, A., … Salmon, J. (2014). Total and domain-specific sitting time among employees in desk-based work settings in Australia. *Australian and New Zealand Journal of Public Health*, *39*(3), 237-242. doi:10.1111/1753-6405.12293

Bes-Rastrollo, M., Sanchez-Villegas, A., Basterra-Gortari, F. J., Nunez-Cordoba, J. M., Toledo, E., & Serrano-Martinez, M. (2010). Prospective study of self-reported usual snacking and weight gain in a Mediterranean cohort: The SUN project. *Clinical Nutrition*, *29*(3), 323-330. doi:10.1016/j.clnu.2009.08.017

Block, G., Block, T., Wakimoto, P., & Block, C. H. (2004). Demonstration of an e-mailed worksite nutrition intervention program. *Preventing Chronic Disease*, *1*(4), A06.

Booth, D. (1988). Mechanisms from models? Actual effects from real life: The zero-calorie drink-break option. *Appetite*, *11*, 94-102. doi:10.1016/0195-6663(88)90050-5

Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereira, M. A., & Ludwig, D. S. (2004). Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics*, *113*(1), 112-118. doi:10.1542/peds.113.1.112

Brown, J. (2004). Pavlov's physiology factory: Experiment, interpretation, laboratory enterprise. *Canadian-American Slavic Studies*, *38*(4), 452-453. doi:10.1163/221023904x00098

Bryant, E. J., King, N. A., & Blundell, J. E. (2007). Disinhibition: its effects on appetite and weight regulation. *Obesity Reviews*, *9*(5), 409-419. doi:10.1111/j.1467-789x.2007.00426.x

Caban, A. J., Lee, D. J., Fleming, L. E., Gómez-Marín, O., LeBlanc, W., & Pitman, T. (2005). Obesity in US workers: The National Health Interview Survey, 1986 to 2002. *American Journal of Public Health*, *95*(9), 1614-1622. doi:10.2105/ajph.2004.050112

Carr, K. A., Daniel, T. O., Lin, H., & Epstein, L .H. (2011). Reinforcement pathology and obesity. *Current Drug Abuse Reviews*, *4*(3), 190-196. doi:10.2174/1874473711104030190

Carr, K. A., Lin, H., Fletcher, K. D., & Epstein, L. H. (2013). Food reinforcement, dietary disinhibition, and weight gain in non-obese adults. *Obesity*, *22*(1), 254-259. doi:10.1002/oby.20392

Centers for Disease Control and Prevention. (2010). *National Center for Health Statistics. National Health and Nutrition Examination Survey.* Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm.

Centers for Disease Control (2010). *Summary health statistics for U.S. adults: National Health Interview Survey*. Retrieved from cdc.gov/nchs/data/series/

Centers for Disease Control and Prevention Control. (2012). *Adult overweight and obesity.* Retrieved from http://www.cdc.gov/obesity/index.html

Centers for Disease Control and Prevention. (2015). *Adult overweight and obesity.* Retrieved from http://www.cdc.gov/obesity/adult/index.html

Centers for Disease Control and Prevention. (2015). *Finding a balance.* Retrieved from http://www.cdc.gov/healthyweight/calories/index.html

Centers for Disease Control and Prevention. (2016). *Defining adult overweight and obesity.* Retrieved from https://www.cdc.gov/obesity/adult/defining.html

Chaput, J., Klingenberg, L., Astrup, A., & Sjödin, A. M. (2010). Modern sedentary activities promote overconsumption of food in our current obesogenic environment. *Obesity Reviews*, *12*(5), e12-e20. doi:10.1111/j.1467-789x.2010.00772.x

Cleobury, L., & Tapper, K. (2014). Reasons for eating unhealthy snacks in overweight and obese males and females. *Journal of Human Nutrition and Dietetics, 27*(4), 333-341. doi:10.1111/jhn.12169

Courtemanche, C. (2009). Longer hours and larger waistlines? The relationship between work hours and obesity. *Forum for Health Economics & Policy, 12*(2). doi:10.2202/1558-9544.1123

Crossley, M. L., & Mubarik, A. (2002). A comparative investigation of dental and medical student's motivation towards career choice. *British Dental Journal, 193*(8), 471-473. doi:10.1038/sj.bdj.4801599

Currie, J., DellaVigna, S., Moretti, E., & Pathania, V. (2010). The effect of fast food restaurants on obesity and weight gain. *American Economic Journal: Economic Policy, 2*(3), 32-63. doi:10.1257/pol.2.3.32

Cutler, D. M., Glaeser, E. L., & Shapiro, J. M. (2003). Why have Americans become more obese? *Journal of Economic Perspectives, 17*(3), 93-118. doi:10.1257/089533003769204371

Darmon, N. & Drewnowski, A. (2008). Does social class predict diet quality? *American Journal of Clinical Nutrition, 87*(5), 1107-1117.

de Lauzon, B., Romon, M., Deschamps, V., Lafay, L., Borys, J. M.,…Fleurbaix Laventie Ville Sante Study Group. (2004). The Three-Factor Eating Questionnaire-R18 is able to distinguish among different eating patterns in a general population. *The Journal of Nutrition, 134*(9), 2372-80.

Devine, C. M., Nelson, J. A., Chin, N., Dozier, A., & Fernandez, I. D. (2007). "Pizza is cheaper than salad: Assessing workers' views for an environmental food intervention." *Obesity*, *15*(1S), 57S-68S. doi:10.1038/oby.2007.388

Drewnowski, A. (2004). Community gardens and urban agriculture: Reclaiming the market. Retrieved from http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1029&context=socssp

Drummond, S. E., Crombie, N. E., Cursiter, M. C., & Kirk, T. R. (1998). Evidence that eating frequency is inversely related to body weight status in male, but not female, non-obese adults reporting valid dietary intakes. *International Journal of Obesity, 22*(2), 105-112. doi:10.1038/sj.ijo.0800552

Duffey, K. J., & Popkin, B. M. (2011). Energy density, portion size, and eating occasions: Contributions to increased energy intake in the United States, 1977–2006. *PLoS Medicine, 8*(6), e1001050. doi:10.1371/journal.pmed.1001050

Dumagan, J. C., & Hackett, J. W. (1995). *U.S. trends in eating away from home, 1982-89: A survey by eating occasion, type of foodservice establishment and kind of food.* Washington, DC: Diane Publishing.

Eertmans, A., Victoir, A., Vansant, G., & Van den Bergh, O. (2005). Food-related personality traits, food choice motives, and food intake: Mediator and moderator relationships. *Food Quality and Preference, 16*(8), 714-726. doi:10.1016/j.foodqual.2005.04.007

Emery, C. F., Olson, K. L., Lee, V. S., Habash, D. L., Nasar, J. L., & Bodine, A. (2015). Home environment and psychosocial predictors of obesity status among

community-residing men and women. *International Journal of Obesity*, *39*(9), 1401-1407. doi:10.1038/ijo.2015.70

Epstein, L. H., Carr, K. A., Lin, H., & Fletcher, K. D. (2011). Food reinforcement, energy intake, and macronutrient choice. *American Journal of Clinical Nutrition*, *94*(1), 12-18. doi:10.3945/ajcn.110.010314

Epstein, L. H., Carr, K. A., Lin, H., Fletcher, K. D., & Roemmich, J. N. (2012). Usual energy intake mediates the relationship between food reinforcement and BMI. *Obesity*, *20*(9), 1815-1819. doi:10.1038/oby.2012.2

Epstein, L. H., Dearing, K. K., & Roba, L. G. (2010). A questionnaire approach to measuring the relative reinforcing efficacy of snack foods. *Eating Behaviors*, *11*(2), 67-73. doi:10.1016/j.eatbeh.2009.09.006

Epstein, L. H., Leddy, J. J., Temple, J. L., & Faith, M. S. (2007). Food reinforcement and eating: A multilevel analysis. *Psychological Bulletin*, *133*(5), 884-906. doi:10.1037/0033-2909.133.5.884

Epstein, L. H., Salvy, S. J., Carr, K. A., Dearing, K. K., & Bickel, W. K. (2010). Food reinforcement, delay discounting, and obesity. *Physiology & Behavior*, *100*(5), 438-445. doi:10.1016/j.physbeh.2010.04.029

Epstein, L. H., Yokum, S., Feda, D. M., & Stice, E. (2014). Food reinforcement and parental obesity predict future weight gain in non-obese adolescents. *Appetite*, *82*, 138-142. doi:10.1016/j.appet.2014.07.018

Escoto, K. H., & French, S. A. (2011). Unhealthy and healthy weight control behaviors among bus operators. *Occupational Medicine*, *62*(2), 138-140.

Escoto, K. H., French, S. A., Harnack, L. J., Toomey, T. L., Hannan, P. J., & Mitchell, N. R. (2010). Work hours, weight status, and weight-related behaviors: A study of metro transit workers. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 91. doi:10.1186/1479-5868-7-91

Evers, C., De Ridder, D. T., & Adriaanse, M. A. (2009). Assessing yourself as an emotional eater: Mission impossible? *Health Psychology*, *28*(6), 717-725. doi:10.1037/a0016700

Feda, D. M., Roemmich, J. N., Roberts, A., & Epstein, L. H. (2015). Food reinforcement and delay discounting in zBMI-discordant siblings. *Appetite*, *85*, 185-189. doi:10.1016/j.appet.2014.11.023

Forslund, H. B., Torgerson, J. S., Sjöström, L., & Lindroos, A. K. (2005). Snacking frequency in relation to energy intake and food choices in obese men and women compared to a reference population. *International Journal of Obesity, 29*(6), 711–719. doi:10.1038/sj.ijo.0802950

Frankfort-Nachmias, C., & Nachmias, D. (2008). *Research methods in the social sciences* (7th ed.). New York, NY: Worth, pp. 153-185.

French, S. A. (2003). Pricing effects on food choice. *The Journal of Nutrition, 133*(3), 841s-843S.

French, S. A., Hannan, P. J., Harnack, L. J., Mitchell, N. R., Toomey, T. L., & Gerlach, A. (2010). Pricing and availability intervention in vending machines at four bus garages. *Journal of Occupational and Environmental Medicine*, *52*(Supplement), S29-S33. doi:10.1097/jom.0b013e3181c5c476

French, S. A., Story, M., & Jeffery, R. W. (2001). Environmental influences on eating and physical activity. *Annual Review of Public Health*, *22*(1), 309-335. doi:10.1146/annurev.publhealth.22.1.309

Gardner, A. (2011). *Sedentary jobs helping to drive the obesity epidemic*. Retrieved from http://health.usnews.com/health-news/diet fitness/fitness/articles/2011/05/26/sedentary-jobs-helping-to-drive-obesity-epidemic

Gatenby, A.O., Anderson. A. D., Southon, S., & Mela, D. J. (1995). Meals and snacks. Implications for eating patterns in adults. *Appetite, 24,* 292.

Giatti, L., Camelo, L. D., Rodrigues, J. F., & Barreto, S. M. (2012). Reliability of the MacArthur scale of subjective social status - Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). *BMC Public Health, 12*(1). doi:10.1186/1471-2458-12-1096

Giesen, J. C., Havermans, R. C., Douven, A., Tekelenburg, M., & Jansen, A. (2010). Will work for snack food: The association of BMI and snack reinforcement. *Obesity, 18*(5), 966-970. doi:10.1038/oby.2010.20

Glasser, W. (1998). *Choice theory: A new psychology of personal freedom.* New York, NY: HarperCollins.

Guthrie, J. F., Lin, B., & Frazao, E. (2002). Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: Changes and consequences. *Journal of Nutrition Education and Behavior*, *34*(3), 140-150. doi:10.1016/s1499-4046(06)60083-3

Hill, C., Saxton, J., Webber, L., Blundell, J., & Wardle, J. (2009). The relative reinforcing value of food predicts weight gain in a longitudinal study of 7-10-y-old children. *American Journal of Clinical Nutrition*, *90*(2), 276-281. doi:10.3945/ajcn.2009.27479

Hill, J., Wyatt, H., Reed, G., & Peters, J. (2003). Obesity and the environment: Where do we go from here? *Science, 299*, 853–855.

Hiza, H. A., Casavale, K. O., Guenther, P. M., & Davis, C. A. (2012). Diet quality of Americans differ by age, sex, race/ethnicity, income, and education level. *Journal of the Academy of Nutrition and Dietetics*, *113*(2), 297-306. doi:10.1016/j.jand.2012.08.011

IBM Corporation. (2012). *SPSS Statistics* (Version 21) [Software]. Available from www.ibm.com/legal/copytrade.shtml

Jarmolowicz, D. P., & Hudnall, J. L. (2014). Concurrent progressive-ratio schedules: Built-in controls in the study of delayed reward efficacy. *Journal of Neuroscience Methods, 233*, 172-176. doi:10.1016/j.jneumeth.2014.06.024

Jimenez-Gomez, C., & Shahan, T. A. (2012). Concurrent-chains schedules as a method to study choice between alcohol-associated conditioned reinforcers. *Journal of the Experimental Analysis of Behavior*, *97*(1), 71-83. doi:10.1901/jeab.2012.97-71

Johnson, G. H., & Anderson, G. H. (2010). Snacking definitions: Impact on interpretation of the literature and dietary recommendations. *Critical Reviews in Food Science and Nutrition*, *50*(9), 848-871. doi:10.1080/10408390903572479

Kant, A. K., Schatzkin, A., Graubard, B. I., & Ballard-Barbash, R. (1995). Frequency of eating occasions and weight change in the NHANES epidemiologic follow-up

study. *International Journal of Obesity and Related Metabolic Disorders, 22,* 19, 468–474.

Keane, J. (2008). *25 popular snacks: But how many calories?* Retrieved from http://www.sheknows.com/health-and-wellness/articles/806958/25-popular-snacks-but-how-many-calories

Kegler, M. C., Alcantara, I., Haardörfer, R., Gazmararian, J. A., Ballard, D., & Sabbs, D. (2014). The influence of home food environments on eating behaviors of overweight and obese women. *Journal of Nutrition Education and Behavior*, *46*(3), 188-196. doi:10.1016/j.jneb.2014.01.001

Khazaal, Y., Van Singer, M., Chatton, A., Achab, S., Zullino, D., Rothen, S., … Thorens, G. (2014). Does self-selection affect samples' representativeness in online surveys? An investigation in online video game research. *Journal of Medical Internet Research*, *16*(7), e164. doi:10.2196/jmir.2759

Koenders, P. G., & Van Strien, T. (2011). Emotional eating, rather than lifestyle behavior, drives weight gain in a prospective study in 1562 employees. *Journal of Occupational and Environmental Medicine, 53*(11), 1287-1293. doi:10.1097/jom.0b013e31823078a2

Konttinen, H., Sarlio-Lähteenkorva, S., Silventoinen, K., Männistö, S., & Haukkala, A. (2013). Socio-economic disparities in the consumption of vegetables, fruit and energy-dense foods: the role of motive priorities. *Public Health Nutrition*, *16*(05), 873-882. doi:10.1017/s1368980012003540

Kosslyn, S. M., Thompson, W. L., Kim, I. J., Rauch, S. L., & Alpert, N. M. (1996). Individual differences in cerebral blood flow in area 17 predict the time to

evaluate visualized letters. *Journal of Cognitive Neuroscience*, *8*(1), 78-82. doi:10.1162/jocn.1996.8.1.78

Külpe, O. (1985). The emotions and impulses. *Outlines of psychology: Based upon the results of experimental investigation*, 320-334. doi:10.1037/12926-007

Laraia, B., Siega-Riz, A., Kaufman, J., & Jones, A. (2004). Proximity of supermarkets is positively associated with diet quality index for pregnancy. *Preventive Medicine*, *39*(5), 869-75. doi:10.1016/s0091-7435(04)00176-8

Larson, N. I., Neumark-Sztainer, D., Hannan, P. J., & Story, M. (2007). Family meals during adolescence are associated with higher diet quality and healthful meal patterns during young adulthood. *Journal of the American Dietetic Association*, *107*(9), 1502-1510. doi:10.1016/j.jada.2007.06.012

Larson, N., & Story, M. (2009). A review of environmental influences on food choices. *Annals of Behavioral Medicine*, *38*(S1), 56-73. doi:10.1007/s12160-009-9120-9

Lavrakas, P. (2008). *Encyclopedia of survey Research Methods.* Thousand Oaks, CA: SAGE Publications, Inc.

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, *7*(1), 24-25. doi:10.1038/sj.ebd.6400375

Lin, H., Carr, K. A., Fletcher, K. D., & Epstein, L. H. (2013). Food reinforcement partially mediates the effect of socioeconomic status on body mass index. *Obesity*, *21*(7), 1307-1312. doi:10.1002/oby.20158

Liu, J. L., Han, B., & Cohen, D. A. (2015). Associations between eating occasions and places of consumption among adults. *Appetite, 87*, 199-204. doi:10.1016/j.appet.2014.12.217

Livingstone, M. B., & Pourshahidi, L. K. (2014). Portion size and obesity. *Advances in Nutrition: An International Review Journal*, *5*(6), 829-834. doi:10.3945/an.114.007104

Lowe, M. R., Butryn, M. L., Didie, E. R., Annunziato, R. A., Thomas, J. G., Crerand, C. E., … Halford, J. (2009). The power of food scale. A new measure of the psychological influence of the food environment. *Appetite*, *53*(1), 114-118. doi:10.1016/j.appet.2009.05.016

Luckhaupt, S. E., Cohen, M. A., Li, J., & Calvert, G. M. (2014). Prevalence of obesity among U.S. workers and associations with occupational factors. *American Journal of Preventive Medicine*, *46*(3), 237-248. doi:10.1016/j.amepre.2013.11.002

Maruyama, S., & Morimoto, K. (1996). Effects of long workhours on life-style, stress and quality of life among intermediate Japanese managers. *Scandinavian Journal of Work, Environment & Health*, *22*(5), 353-359. doi:10.5271/sjweh.153

McAdams, D. P., & Olson, B. D. (2010). Personality development: Continuity and change over the life course. *Annual Review of Psychology*, *61*(1), 517-542. doi:10.1146/annurev.psych.093008.100507

McClelland, J. W. (2011). Nutrition: Concepts & controversies. *Journal of Nutrition Education and Behavior*, *43*(5), 424.e5. doi:10.1016/j.jneb.2011.05.014

Milošević, J., Žeželj, I., Gorton, M., & Barjolle, D. (2012). Understanding the motives for food choice in Western Balkan Countries. *Appetite, 58*(1), 205-214. doi:10.1016/j.appet.2011.09.012

Mohd-Any, A., Shahnaz Mahdzan, N., & Siang Cher, C. (2014). Food choice motives of different ethnics and the foodies segment in Kuala Lumpur. *British Food Journal, 116*(12), 1879-1896. doi:10.1108/bfj-07-2013-0170

Morland, K. B., Wing, S., Diez, R. Charles, A. & Charles, P. (2002). Neighborhood characteristics associated with the location of food stores and food service places. *American Journal of Preventative Medicine, 22*(1), 23-29.

Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in energy intake in U.S. between 1977 and 1996: Similar shifts seen across age groups. *Obesity Research, 10*(5), 370-378. doi:10.1038/oby.2002.51

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA, 311*(8), 806. doi:10.1001/jama.2014.732

Park, S., Sappenfield, W. M., Huang, Y., Sherry, B., & Bensyl, D. M. (2010). The impact of the availability of school vending machines on eating behavior during lunch: The youth physical activity and nutrition survey. *Journal of the American Dietetic Association, 110*(10), 1532-1536. doi:10.1016/j.jada.2010.07.003

Pourhoseingholi, M. A., Baghestani, A. R., & Vahedi, M. (2012). How to control confounding effects by statistical analysis. *Gastroenterology and Hepatology From Bed to Bench, 5*(2), 79–83.

Powell, L. M., & Chaloupka. J. (2009). Food prices and obesity: Evidence and policy implications for taxes and subsidies. *Milbank Quarterly*, *87*(1), 229-257. doi:10.1111/j.1468-0009.2009.00554.x

Prinsen, S., De Ridder, D. T., & De Vet, E. (2013). Eating by example. Effects of environmental cues on dietary decisions. *Appetite*, *70*, 1-5. doi:10.1016/j.appet.2013.05.023

Pula, K., Parks, C. D., & Ross, C. F. (2014). Regulatory focus and food choice motives. Prevention orientation associated with mood, convenience, and familiarity. *Appetite*, *78*, 15-22. doi:10.1016/j.appet.2014.02.015

Quintiliani, L., Poulsen, S., & Sorensen, G. (2010). Healthy eating strategies in the workplace. *International Journal of Workplace Health Management*, *3*(3), 182-196. doi:10.1108/17538351011078929

Renner, B., Sproesser, G., Strohbach, S., & Schupp, H. T. (2012). Why we eat what we eat. The Eating Motivation Survey (TEMS). *Appetite*, *59*(1), 117-128. doi:10.1016/j.appet.2012.04.004

Reslan, S., Saules, K. K., & Greenwald, M. K. (2012). Validation of an online questionnaire measure of the relative reinforcing value of food. *Eating Behaviors*, *13*(3), 278-280. doi:10.1016/j.eatbeh.2012.03.009

Richardson, A. S., Boone-Heinonen, J., Popkin, B. M., & Gordon-Larsen, P. (2012). Are neighborhood food resources distributed inequitably by income and race in the USA? Epidemiological findings across the urban spectrum. *BMJ Open*, *2*(2), e000698. doi:10.1136/bmjopen-2011-000698

Rudestam, K. E., & Newton, R. R. (2007). *Surviving your dissertation* (3rd ed.). Thousand Oak, California: Sage Publications, Inc.

Ruidavets, J. B., Bongard, V., Bataille, V., Gourdy, P., & Ferrières, J. (2002). Eating frequency and body fatness in middle-aged men. *International Journal of Obesity, 26*(11), 1476-1483. doi:10.1038/sj.ijo.0802143

Saelens, E., & Epstein, L. H. (1996). Reinforcing value of food in obese and non-obese women. *Appetite, 27*(1), 41-50. doi:10.1006/appe.1996.0032

Sebastian, R. S., Wilkinson Enns, C., & Goldman, J. D. (2011). *Snacking patterns of U.S. adults: What we eat in America, NHANES 2007-2008* (Issue Brief No. 4). Retrieved from https://www.ars.usda.gov/ARSUserFiles/80400530/.../DBrief/4_adult_snacking_0708.pd...

Self-Nutrition Data. (2014). *Food Facts, Information & Calorie Calculator.* Retrieved from http://nutritiondata.self.com

Sen, B. (2006). Frequency of family dinner and adolescent body weight status: Evidence from the National Longitudinal Survey of Youth, 1997. *Obesity, 14*(12), 2266-2276. doi:10.1038/oby.2006.266

Shaikh, R. A., Sikora, A., Siahpush, M., & Singh, G. K. (2015). Occupational variations in obesity, smoking, heavy drinking, and non-adherence to physical activity recommendations: Findings from the 2010 National Health Interview Survey. *American Journal of Industrial Medicine, 58*(1), 77-87. doi:10.1002/ajim.22405

Shimotsu, S. T., French, S. A., Gerlach, A. F., & Hannan, P. J. (2007). Worksite environment physical activity and healthy food choices: measurement of the worksite food and physical activity environment at four metropolitan bus garages. *International Journal of Behavioral Nutrition and Physical Activity*, *4*(1), 17. doi:10.1186/1479-5868-4-17

Sisson, S., Church, T., Martin, C., Tudor-Locke, C., Smith, S., Bouchard, C., … Katzmarzyk, P. (2009). Profiles of sedentary behavior in children and adolescents: The US National Health and Nutrition Examination Survey, 2001-2006. *International Journal of Pediatric Obesity*, 1-7. doi:10.1080/17477160902934777

Sizer, F. S. and Whitney, E. (2011). *Nutrition: Concepts and Controversies*. United States: Wadsworth, Cengage Learning.

Skinner, B. F. (1938). *The Behavior of Organisms: An Experimental Analysis.* Cambridge, Massachusetts: B.F. Skinner Foundation.

Skinner, B. F. (1948). Superstition' in the pigeon. *Journal of Experimental Psychology, 38,* 168-172.

Sobal, J., & Wansink, B. (2007). Kitchenscapes, tablescapes, platescapes, and foodscapes: Influences of microscale built environments on food intake. *Environment and Behavior*, *39*(1), 124-142. doi:10.1177/0013916506295574

Sproesser, G., Schupp, H. T., & Renner, B. (2014). The bright side of stress-induced eating. *Psychological Science*, *25*(1), 58-65. doi:10.1177/0956797613494849

Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: The Food Choice Questionnaire. *Appetite, 25*(3), 267-284. doi:10.1006/appe.1995.0061

Stok, F. M., De Ridder, D. T., De Vet, E., & De Wit, J. B. (2013). Don't tell me what I should do, but what others do: The influence of descriptive and injunctive peer norms on fruit consumption in adolescents. *British Journal of Health Psychology, 19*(1), 52-64. doi:10.1111/bjhp.12030

Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association, 102*(3), S40-S51. doi:10.1016/s0002-8223(02)90421-9

Stubbs, R., & Whybrow, S. (2004). Energy density, diet composition and palatability: influences on overall food energy intake in humans. *Physiology & Behavior, 81*(5), 755-764. doi:10.1016/j.physbeh.2004.04.027

Summerbell, C., Moody, R., Shanks, J., Stock, M., & Geissler C. (1995). Sources of energy from meals vs snacks in 220 people in four age groups. *European Journal of Clinical Nutrition, 49,* 33–41.

Swinburn, B. A., Caterso., Seidell, J. C, & James, W. P. (2004). Diet, nutrition and the prevention of excess weight gain and obesity. *Public Health Nutrition, 7,* 123–46.

Temple, J. L., Bulkley, A. M., Badawy, R. L., Krause, N., McCann, S., & Epstein, L. H. (2009). Differential effects of daily snack food intake on the reinforcing value of food in obese and non-obese women. *American Journal of Clinical Nutrition, 90*(2), 304-313. doi:10.3945/ajcn.2008.27283

Temple, J. L., & Epstein, L. H. (2011). Sensitization of food reinforcement is related to weight status and baseline food reinforcement. *International Journal of Obesity, 36*(8), 1102-1107. doi:10.1038/ijo.2011.210

Terracciano, A., Sutin, A. R., McCrae, R. R., Deiana, B., Ferrucci, L., Schlessinger, D., … Costa, P. T. (2009). Facets of personality linked to underweight and overweight. *Psychosomatic Medicine, 71*(6), 682-689. doi:10.1097/psy.0b013e3181a2925b

The Regents of the University of California. (2008). Sociodemographic questionnaire. Retrieved November 10, 2015 from http://www.macses.ucsf.edu/research/socialenviron/sociodemographic.php

Trochim, W. (2000). *The Research Methods Knowledge Base* (2nd ed.). Cincinnati, OH: Atomic Dog Publishing.

Truswell, A. S. (2006). Food at work. Workplace solutions for malnutrition and chronic diseases. *Nutrition Dietetics*, *63*(2), 128-128. doi:10.1111/j.1747-0080.2006.00058.x

Verhoeven, A. A., Adriaanse, M. A., De Vet, E., Fennis, B. M., & De Ridder, D. T. (2015). It's my party and I eat if I want to. Reasons for unhealthy snacking. *Appetite*, *84*, 20-27. doi:10.1016/j.appet.2014.09.013

Webb, D. (2013). Snacking benefits. *Today's Dietitian, 15*(10), 4.

Wilbur, C. S. (1983). The Johnson & Johnson program. *Preventive Medicine*, *12*(5), 672-681. doi:10.1016/0091-7435(83)90225-6

Wilson, D.B. (2001). *Practical Meta-Analysis Effect Size Calculator*. Available from http://www.campbellcollaboration.org/resources/effect_size_input.php

Wolf, A. M., & Colditz, G. A. (1998). Current estimates of the economic cost of obesity in the United States. *Obesity Research*, *6*(2), 97-106. doi:10.1002/j.1550-8528.1998.tb00322.x

World Health Organization. (2016). *Obesity and overweight*. Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/

Yokum, S., Ng, J., & Stice, E. (2011). Attentional bias to food images associated with elevated weight and future weight gain: An fMRI Study. *Obesity*, *19*(9), 1775-1783. doi:10.1038/oby.2011.168

Yoquinto, L. (2011). *25% calories come from snacks.* Retrieved from http://www.livescience.com/14769-snacking-calories-increase.html

Young, L. R., & Nestle, M. (2002). The contribution of expanding portion sizes to the U.S. obesity epidemic. *American Journal of Public Health*, *92*(2), 246-249. doi:10.2105/ajph.92.2.246

Zizza, C. A., Arsiwalla, D. D., & Ellison, K. J. (2010). Contribution of snacking to older adults' vitamin, carotenoid, and mineral intakes. *Journal of the American Dietetic Association*, *110*(5), 768-772. doi:10.1016/j.jada.2010.02.009

Appendix A: Survey Instrument

Are you a full time US adult office worker, age 18 years or older, understands/reads fluent English, not underweight, not pregnant, with a normal diet (no restrictions on food or eating)?

- Yes
- No to one or more of the above.

SECTION 1

1. What is the highest degree you've earned?

- _____High school diploma or equivalency (GED)
- _____Associate degree (junior college)
- _____Bachelor's degree
- _____Master's degree
- _____Doctorate
- _____Professional (MD, JD, DDS, etc.)
- _____Other specify
- _____None of the above (less than high school)

2. How much did you earn, before taxes and other deductions, during the past 12 months?

- _____Less than $5,000
- _____$5,000 through $11,999
- _____$12,000 through $15,999
- _____$16,000 through $24,999
- _____$25,000 through $34,999
- _____$35,000 through $49,999
- _____$50,000 through $74,999
- _____$75,000 through $99,999
- _____$100,000 and greater
- _____Don't know
- _____No response

3. Which of these categories best describes your total combined family income for the past 12 months? This should include income (before taxes) from all sources, wages, rent from properties, social security, disability and/or veteran's benefits, unemployment benefits, workman's compensation, help from relatives (including child payments and alimony), and so on.

- _____Less than $5,000
- _____$5,000 through $11,999
- _____$12,000 through $15,999
- _____$16,000 through $24,999
- _____$25,000 through $34,999
- _____$35,000 through $49,999
- _____$50,000 through $74,999
- _____$75,000 through $99,999
- _____$100,000 and greater
- _____Don't know
- _____No response

4. What is your gender?

- Male
- Female

5. Please indicate your race/ethnicity.

- White
- Hispanic/Latino
- Black/African American
- Asian
- Indian
- Other

6. Please select your geographic location.

- Midwest
- Northeast
- Southeast
- Southwest

- West
- Other (please specify)

7. What is your age?

- 18-29 years old
- 30-41 years old
- 42-53 years old
- 54-64 years old
- 65 or older?

8. What is your marital status?

- Single
- Married
- Separated
- Widowed
- Other

9. Do you have children living in the home under the age of 18?

- Yes
- No

10. Please choose your job position

- Entry-level
- Supervisor
- Managerial
- Higher management

11. How would you describe your weight?

- Underweight
- Normal weight
- Overweight
- Extremely overweight (obese)

12. What is your height in feet and inches?

13. What is your current weight in pounds (lbs.)? Please enter your weight.

14. When I feel sad, I often eat too much.

- Definitely true
- Mostly true
- Mostly false
- Definitely false

15. On a scale of 1 to 8, where 1 means no restraint in eating (eating whatever you want, whenever you want it) and 8 means total restraint (constantly limiting food intake and never giving in), what number would you give yourself?"

- 1 NO Restraint
- 2
- 3
- 4
- 5
- 6
- 7
- 8 Total Restraint

16. Sometimes when I start eating, I just can't seem to stop.

- Definitely true
- Mostly true
- Mostly false
- Definitely false

SECTION 2A

In this section we ask you to ONLY think about your responses when you are IN THE WORKPLACE.

Imagine a TYPICAL WORK DAY, in which you could eat your favorite snack food. Your preferred snack food can be any snack food such as your favorite potato chips, cookies, cupcake, candy bar etc.

Now that you have your favorite snack in mind, answer each question imagining how many portions of your favorite snack food you would consume if they cost various amounts of money.
Assume you have the same income/savings that you have now and NO ACCESS to any snack food other than your favorite snack food offered at these prices. In addition, assume that you would consume the food that you request on that day; that is you cannot save or stockpile the food for a later date. Please respond to the questions keeping your favorite snack food in mind.

You can either use the slider to answer or answer by just indicating the number of portions you would consume in the box to the right of the slider.

17. How many portions of your favorite snack food would you consume if they were $0/free at your workplace?

0 **50** **100**

18. How many portions of your favorite snack food would you consume if they were $0.01 at your workplace?

0 **50** **100**

19. How many portions of your favorite snack food would you consume if they were $0.05 at your workplace?

0 **50** **100**

20. How many portions of your favorite snack food would you consume if they were $0.13 at your workplace?

0 **50** **100**

21. How many portions of your favorite snack food would you consume if they were $0.25 at your workplace?

0 **50** **100**

22. How many portions of your favorite snack food would you consume if they were $0.50 at your workplace?

0 **50** **100**

23. How many portions of your favorite snack food would you consume if they were $1 at your workplace?

0 **50** **100**

24. How many portions of your favorite snack food would you consume if they were $2 at your workplace?

0 **50** **100**

25. How many portions of your favorite snack food would you consume if they were $3 at your workplace?

0 **50** **100**

26. How many portions of your favorite snack food would you consume if they were $4 at your workplace?

0 **50** **100**

27. How many portions of your favorite snack food would you consume if they were $5 at your workplace?

0 **50** **100**

28. How many portions of your favorite snack food would you consume if they were $6 at your workplace?

0 **50** **100**

29. How many portions of your favorite snack food would you consume if they were $11 at your workplace?

0 **50** **100**

30. How many portions of your favorite snack food would you consume if they were $35 at your workplace?

0 **50** **100**

31. How many portions of your favorite snack food would you consume if they were $70 at your workplace?

0 **50** **100**

32. How many portions of your favorite snack food would you consume if they were $140 at your workplace?

0 **50** **100**

33. How many portions of your favorite snack food would you consume if they were $280 at your workplace?

0 **50** **100**

34. How many portions of your favorite snack food would you consume if they were $560 at your workplace?

0 **50** **100**

35. How many portions of your favorite snack food would you consume if they were $1,120 at your workplace?

0 **50** **100**

SECTION 2B

In this section, we now ask you to ONLY think about your responses when you are OUTSIDE THE WORKPLACE (DURING NON-WORK HOURS).

Imagine a TYPICAL DAY OUTSIDE THE WORKPLACE (DURING NON-WORK HOURS), in which you could eat your favorite snack food. Your preferred snack food can be any snack food such as your favorite potato chips, cookies, cupcake, candy bar etc.

Now that you have your favorite snack in mind, answer each question imagining how many portions of your favorite snack food you would consume if they cost various amounts of money.
Assume you have the same income/savings that you have now and NO ACCESS to any snack food other than your favorite snack food offered at these prices. In addition, assume that you would consume the food that you request on that day; that is you cannot save or stockpile the food for a later date. Please respond to the questions keeping your favorite snack food in mind.

You can either use the slider to answer or answer by just indicating the number of portions you would consume in the box to the right of the slider.

36. How many portions of your favorite snack food would you consume if they were $0/free outside of the workplace (during non-work hours)?

0 **50** **100**

37. How many portions of your favorite snack food would you consume if they were $0.01 outside of the workplace (during non-work hours)?

0 **100**

38. How many portions of your favorite snack food would you consume if they were $0.05 outside of the workplace (during non-work hours)?

0 **50** **100**

39. How many portions of your favorite snack food would you consume if they were $0.13 outside of the workplace (during non-work hours)?

0 **50** **100**

40. How many portions of your favorite snack food would you consume if they were $0.25 outside of the workplace (during non-work hours)?

0 **50** **100**

41. How many portions of your favorite snack food would you consume if they were $0.50 outside of the workplace (during non-work hours)?

0 **50** **100**

42. How many portions of your favorite snack food would you consume if they were $1 outside of the workplace (during non-work hours)?

0 **50** **100**

*43. How many portions of your favorite snack food would you consume if they were $2 outside of the workplace (during non-work hours)?

0 **50** **100**

44. How many portions of your favorite snack food would you consume if they were $3 outside of the workplace (during non-work hours)?

0 **50** **100**

45. How many portions of your favorite snack food would you consume if they were $4 outside of the workplace (during non-work hours)?

0 **50** **100**

46. How many portions of your favorite snack food would you consume if they were $5 outside of the workplace (during non-work hours)?

0 **50** **100**

47. How many portions of your favorite snack food would you consume if they were $6 outside of the workplace (during non-work hours)?

0 **50** **100**

48. How many portions of your favorite snack food would you consume if they were $11 outside of the workplace (during non-work hours)?

0 **50** **100**

49. How many portions of your favorite snack food would you consume if they were $35 outside of the workplace (during non-work hours)?

0 **50** **100**

50. How many portions of your favorite potato chips would you consume if they were $70 outside of the workplace (during non-work hours)?

0 **50** **100**

51. How many portions of your favorite snack food would you consume if they were $140 outside of the workplace (during non-work hours)?

0 **50** **100**

52. How many portions of your favorite snack food would you consume if they were $280 outside of the workplace (during non-work hours)?

0 **50** **100**

53. How many portions of your favorite snack food would you consume if they were $560 outside of the workplace (during non-work hours)?

0 **50** **100**

54. How many portions of your favorite snack food would you consume if they were $1,120 outside of the workplace (during non-work hours)?

0 **50** **100**

SECTION 3

Several different factors influence our choice of food. For every person, there will be a different set of factors that is important. In the next set of questions, we are interested in finding out what factors influence your choice of food in the WORKPLACE (during work hours). Listed below are a series of factors that may be relevant to your choice of foods. Read each item carefully and decide how important the item is to you. Select the option that best reflects your feelings. Remember, there are no right or wrong answers - we are interested in what is important to you.

It is important to me that the food I eat on a typical day at work:

	Not important at all	A little important	Moderately important	Very important
Is easy to prepare	Is easy to prepare Not important at all	Is easy to prepare A little important	Is easy to prepare Moderately important	Is easy to prepare Very important
Contains no additives	Contains no additives Not important at all	Contains no additives A little important	Contains no additives Moderately important	Contains no additives Very important
Is low in calories	Is low in calories Not important at all	Is low in calories A little important	Is low in calories Moderately important	Is low in calories Very important
Tastes good	Tastes good Not important at all	Tastes good A little important	Tastes good Moderately important	Tastes good Very important
Contains natural ingredients	Contains natural ingredients Not important at all	Contains natural ingredients A little important	Contains natural ingredients Moderately important	Contains natural ingredients Very important
Is not expensive	Is not expensive Not important at all	Is not expensive A little important	Is not expensive Moderately important	Is not expensive Very important
Is low in fat	Is low in fat Not important at all	Is low in fat A little important	Is low in fat Moderately important	Is low in fat Very important
Is familiar to me	Is familiar to me Not important at all	Is familiar to me A little important	Is familiar to me Moderately important	Is familiar to me Very important
Is high in fiber and roughage	Is high in fiber and roughage Not important at all	Is high in fiber and roughage A little important	Is high in fiber and roughage Moderately important	Is high in fiber and roughage Very important
Is nutritious	Is nutritious Not important at all	Is nutritious A little important	Is nutritious Moderately important	Is nutritious Very important

Is easily available in shops and supermarkets	Is easily available in shops and supermarkets Not important at all	Is easily available in shops and supermarkets A little important	Is easily available in shops and supermarkets Moderately important	Is easily available in shops and supermarkets Very important
Is good value for money	Is good value for money Not important at all	Is good value for money A little important	Is good value for money Moderately important	Is good value for money Very important
Cheers me up	Cheers me up Not important at all	Cheers me up A little important	Cheers me up Moderately important	Cheers me up Very important
Smells nice	Smells nice Not important at all	Smells nice A little important	Smells nice Moderately important	Smells nice Very important
Can be cooked very simply	Can be cooked very simply Not important at all	Can be cooked very simply A little important	Can be cooked very simply Moderately important	Can be cooked very simply Very important
Helps me cope with stress	Helps me cope with stress Not important at all	Helps me cope with stress A little important	Helps me cope with stress Moderately important	Helps me cope with stress Very important
Helps me control my weight	Helps me control my weight Not important at all	Helps me control my weight A little important	Helps me control my weight Moderately important	Helps me control my weight Very important
Has a pleasant texture	Has a pleasant texture Not important at all	Has a pleasant texture A little important	Has a pleasant texture Moderately important	Has a pleasant texture Very important
Is packaged in an environmentally friendly way	Is packaged in an environmentally friendly way Not important at all	Is packaged in an environmentally friendly way A little important	Is packaged in an environmentally friendly way Moderately important	Is packaged in an environmentally friendly way Very

				important
Comes from countries I approve of politically	Comes from countries I approve of politically Not important at all	Comes from countries I approve of politically A little important	Comes from countries I approve of politically Moderately important	Comes from countries I approve of politically Very important
Is like the food I ate when I was a child	Is like the food I ate when I was a child Not important at all	Is like the food I ate when I was a child A little important	Is like the food I ate when I was a child Moderately important	Is like the food I ate when I was a child Very important
Contains lots of vitamins and minerals	Contains lots of vitamins and minerals Not important at all	Contains lots of vitamins and minerals A little important	Contains lots of vitamins and minerals Moderately important	Contains lots of vitamins and minerals Very important
Contains no artificial ingredients	Contains no artificial ingredients Not important at all	Contains no artificial ingredients A little important	Contains no artificial ingredients Moderately important	Contains no artificial ingredients Very important
Keeps me awake and alert	Keeps me awake and alert Not important at all	Keeps me awake and alert A little important	Keeps me awake and alert Moderately important	Keeps me awake and alert Very important
Looks nice	Looks nice Not important at all	Looks nice A little important	Looks nice Moderately important	Looks nice Very important
Helps me relax	Helps me relax Not important at all	Helps me relax A little important	Helps me relax Moderately important	Helps me relax Very important
Is high in protein	Is high in protein Not important at all	Is high in protein A little important	Is high in protein Moderately important	Is high in protein Very important
Takes no time to prepare	Takes no time to prepare Not important at all	Takes no time to prepare A little important	Takes no time to prepare Moderately important	Takes no time to prepare Very important

Keeps me healthy	Keeps me healthy Not important at all	Keeps me healthy A little important	Keeps me healthy Moderately important	Keeps me healthy Very important
Is good for my skin/teeth/hair/nails etc.	Is good for my skin/teeth/hair/nails etc. Not important at all	Is good for my skin/teeth/hair/nails etc. A little important	Is good for my skin/teeth/hair/nails etc Moderately important	Is good for my skin/teeth/hair/nails etc Very important
Makes me feel good	Makes me feel good Not important at all	Makes me feel good A little important	Makes me feel good Moderately important	Makes me feel good Very important
Has the country of origin clearly marked	Has the country of origin clearly marked Not important at all	Has the country of origin clearly marked A little important	Has the country of origin clearly marked Moderately important	Has the country of origin clearly marked Very important
Is what I usually eat	Is what I usually eat Not important at all	Is what I usually eat A little important	Is what I usually eat Moderately important	Is what I usually eat Very important
Helps me to cope with life	Helps me to cope with life Not important at all	Helps me to cope with life A little important	Helps me to cope with life Moderately important	Helps me to cope with life Very important
Can be bought in shops close to where I live or work	Can be bought in shops close to where I live or work Not important at all	Can be bought in shops close to where I live or work A little important	Can be bought in shops close to where I live or work Moderately important	Can be bought in shops close to where I live or work Very important
Is cheap	Is cheap Not important at all	Is cheap A little important	Is cheap Moderately important	Is cheap Very important

Please click DONE below to submit the survey. Thank you so much!