The Effects of Nutritional Knowledge and Food Labels on Eating Behavior in the Context of Negative Affect

by

Samantha Lee Hochstadt

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Master's Thesis Committee:

Associate Professor Pamela McAuslan, Co-Chair
Associate Professor Marie Waung, Co-Chair

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Abstract

Purpose: Obesity is a growing issue worldwide, putting individuals at risk for various diseases including cardiovascular disease, diabetes, and stroke. The causes of obesity are multifaceted, however the present study focused on increased eating in the context of negative affect, termed emotional eating. Emotional eating occurs in an attempt to provide relief from negative emotions. It is an emotion-focused coping technique that is associated with increased consumption of food, specifically food high in calories and fat (Oliver & Wardle, 1999). The purpose of this study was to identify potential factors that could decrease the relationship between negative affect and increased food consumption. Nutritional knowledge and food labels have been associated with healthier diets including increased consumption of fruits and vegetables, lower overall energy intake, and lower intake of fat (Graham & Laska, 2012; Spronk, 2014). Therefore, these factors were considered as potential mechanisms to moderate the relationship between negative affect and increased food consumption.

Method: The data were collected from 61 undergraduate students from the University of Michigan-Dearborn. Participants completed various assessments that measured affect (PANAS; Watson, Clark, & Tellegen, 1988), perceived stress, daily hassles (Daily Hassles short version; Totenhagen, Curran, Serido, & Butler, 2013), general eating behavior (TFEQ-r18; Karlsson, Persson, Sjöström, & Sullivan, 2000) and nutritional knowledge (GNKQ; Paramenter & Wardle 1999). Participants were randomly assigned to

a food label group or non-food label group. Negative affect was induced by showing a short sad film clip. Last, participants completed a faux taste-task where the amount and type of food consumed was measured.

Results: Results indicated support for the emotional eating model, where negative affect was positively related to calorie consumption. However, there were no significant findings to indicate nutritional knowledge as moderator for negative affect and food consumption. Further, there were no significant findings to indicate nutrition labeling as a moderator for negative affect and food consumption. Last, there were no significant results indicating that nutritional knowledge and nutritional labeling produced an interactive effect to impact calories consumed.

Conclusions: Although most study hypotheses were not supported, there were indications of trending results in the expected direction. Limits on sample size greatly reduced the power of this study. It would be beneficial to conduct similar studies that could potentially aid in the development of educational programs aimed at increasing nutritional knowledge and nutrition label use.

Chapter I

There are many dangerous things in the world that pose a major risk to our health. We hear reports of life-threatening viruses such as Ebola or whole cities being devastated by natural disasters, such as tornados, hurricanes, or tsunamis. The fear of being the target of a terrorist attack is also prominent for many individuals. However, most do not realize that one of the leading causes of death stems from what and how much food we are consuming.

Obesity

Obesity impacts a substantial portion of the population. The National Institute of Health (NIH, 2012) reports that over two-thirds of Americans are considered to be overweight or obese, with over one-third specifically considered obese. The problem doesn't stop there. Obesity is now affecting children like it never has before. Ogden, Carroll, Kit, and Flegal (2012) report that one-third of all American children between the ages of six and nineteen are considered overweight or obese. Further, obesity is a major health concern worldwide. A systematic analysis for the Global Burden of Disease Study found that 2.1 billion people worldwide are considered obese or overweight, equal to about a third of the entire population (Ng et al., 2013). The World Health Organization reports that a majority of the world's population live in countries where obesity kills more people than being underweight (WHO, 2016).

Obesity is related to negative health consequences. It puts individuals at risk for a myriad of diseases including cardiovascular disease (CVD), diabetes, stroke, osteoarthritis, and certain cancers (WHO, 2015). As an individual's BMI increases, so does their chance of developing CVD and diabetes. The Framingham study found that the population attributable risk (PAR; the level of increased risk attributable to obesity) of CVD death was almost 30% in men and 15% in women considered obese (Wilson, D'Agostino, Sullivan, Parise, & Kannel, 2002). Similarly, PAR estimates of diabetes mellitus for obese individuals were around 22% for men and 7% for women (Wilson et al., 2002). Further, childhood diabetes rates have risen to 20% of all children in the United States (Scollan-Koliopoulos & David, 2011). With cardiovascular disease and stroke being the two leading causes of death in the world and diabetes falling in eighth place (WHO, 2014), there is great cause for concern. Therefore, it is important to understand the underlying causes of obesity.

Simply put, a person who has a body weight that is heavier than what is considered healthy for their height is considered to be either obese or overweight (Centers for Disease Control, 2012). The differentiation between these two is determined through a Body Mass Index (BMI) assessment. BMI is calculated by dividing a person's weight in kilograms by their height in meters squared. A common formula for those using the imperial system is [weight (lbs.) x 703]/height (in) ^{2}]. A BMI that is between 25.0 and 29.9 falls in the overweight range. Individuals considered obese have a BMI of 30.0 to 34.9. Furthermore, severely obese individuals fall into the range of 35.0 to 39.9. Lastly, individuals with a BMI of 40 or higher fall into the very severely obese category (Mayo Clinic, 2015).

The causes of obesity are multifaceted. Genetics, social factors, socioeconomic status, age, and medical problems are all contributing factors to obesity (Mayo Clinic, 2015). However, an imbalance between of the amount of calories consumed compared to the amount of calories expended per day is the fundamental cause of overweight and obesity (WHO, 2015). Therefore, a key contributor to obesity is an individual's diet and lack of physical activity. Physical inactivity in today's society can be attributed in part to a greater amount of time spent watching television (Dunstan et al., 2010), the sedentary nature of many jobs (WHO, 2015), and less active modes of transportation (Rodriguez, 2009). An individual's eating habits are also influenced by various factors including family culture (Axelson, 1986), race and poverty (Baker, Schootman, Barnidge, & Kelly, 2006) and genetics (Grimm & Steinle, 2011). Psychological factors are also involved in eating behaviors. A survey conducted by Ganasegeran, Al-Dubai, Qureshi, Al-Abed, Rizal and Aljunid (2012) found that reasons college students ate include: feeling lonely, feeling out of control, feeling upset or nervous, feeling bored, and because they were happy. Although there are many factors influencing eating behavior, this study will focus specifically on negative affect.

Stress and Negative Affect

There is a clear relationship between stress, negative affect, and eating behavior, however, it is first important to understand the relationship between stress and negative affect. Stress, as it is defined in this review, is based on Lazarus' transactional model of stress (Lazarus & Cohen, 1977). The model suggests that the environment is constantly impinging on us and we are constantly making cognitive appraisals and engaging in coping strategies. According to Lazarus (2000), there are primary, secondary, and tertiary

appraisals. Primary appraisals involve an individual assessing whether or not their values, intentions, or self will be compromised given the situation. An individual determines whether or not the internal or external demand merits action. Once it is determined that the situation is threatening, secondary appraisal involves the individual assessing what coping resources they have to handle the given situation. Finally, in tertiary appraisal or reappraisal, the individual determines if their coping strategy is efficient or if they need to adjust.

Lazarus describes three coping mechanisms which individuals use in an effort to manage the demands of a threatening situation. It is noted that there is no correct or incorrect coping strategy. Outcomes of coping strategies are dependent on the type of threat, the individual, and the point in time at which the coping strategy is used. First, there is *emotion-focused coping*. This coping strategy is used to ignore or distract the individual from the stressful situation as an attempt to regulate the emotions (Lazarus, 2000). Next, there is *problem-focused coping.* In this coping strategy, an individual gathers information and resources as preparation to confront and change the stressful situation. Last, there is what Lazarus calls *collective-coping*. Collective-coping involves telling loved ones and friends of the stressful situation in order to gain social support.

Lazarus' model of stress takes into account environmental threats and how individual differences determine whether a situation is a cause of stress. Further, the individual's coping resources also determine the extent of the stressful situation. This model of stress is closely related to an individual's emotions. Lazarus (1993) explains that psychological stress can be seen as a subset of emotions. He explains, "… anger, anxiety, guilt, shame, sadness, envy, jealousy, and disgust, which arise out of conflict, are

commonly referred to as the stress emotions" (Lazarus, 1993, p. 244). These stress emotions are closely related to negative affect.

Negative affect can be understood as reflecting an individual's negative emotional state. Watson and Clark (1984) explain that individuals with high state negative affect can experience anger, scorn, revulsion, guilt, self-dissatisfaction, a sense of rejection, and sadness (p. 465). Therefore, when an individual experiences something to evoke sadness, anger, or distress, they are said to be experiencing negative affect. Positive affect on the other hand, reflects an individual's positive emotional state. Excitement, alertness, and enthusiasm are all characteristic of positive affect (Lyubomirsky & Sin, 2009).

Stress has been found to be strongly related to negative affect. In the development of the Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) it was found that negative affect was related to self-reported stress and poor coping skills. In past experimental research numerous stress tasks have been used to manipulate affect (for review see Altarriba, 2012). These tasks include things such as watching film clips, processing emotional faces, listening to music, memory recall, and much more. Affect can also be affected by life events including daily hassles. Bolger, DeLongis, Kessler, and Schilling (1989) found that a large portion of variance (20% among men and 19% among women) in mood change was accounted for by daily stressors. Therefore, negative affect is related to both experimental stress manipulation, everyday stressors, and hassles.

Negative Affect and Eating Behaviors

Reasons for eating versus not eating in the context of negative affect vary for each individual. Eating behavior is a complex phenomenon with a large number of factors

related to whether a person will eat more in the context of negative affect. Various theories have been put forth that attempt to explain the relationship between negative affect and eating behaviors (Dallman et al., 2003; Gibson, 2006; Macht, 2008). A prominent theory is that individuals use food as an emotion-focused coping mechanism for dealing with stress. This theory was first proposed by Kaplan and Kaplan (1957; as cited in Ganley, 1989), explaining that eating is an anxiety reducer.

Eating as a Coping Mechanism

One theory explains eating in the context of negative affect or stress as a coping mechanism (Ganley, 1989). This behavior is related to comfort eating, stress eating, and emotional eating whereby eating is used as a mechanism to relieve negative emotions or affect. Thus, this theory suggests that an individual will eat more when stressed because doing so provides relief.

Ganley (1989) conducted a comprehensive review of the emotional eating literature which included both clinical and non-clinical studies, weight-loss and non-weight loss studies, and from both obese and non-obese populations. Ganley (1989) concluded that both obese and non-obese individuals partake in emotional eating, however, when emotional eating occurs, obese individuals tend to consume more. Emotions that are strongly related to increased eating and weight gain include depression, loneliness, and boredom. Individuals report experiencing a sense of relief from anxiety and frustration through eating; food was being used as a source of comfort, support, and satisfaction. People who eat in response to some environmental cue, such as a stressor, are termed “reactive eaters” (Ganley, 1989, p. 344).

Ganley (1989) reported that emotional eating tends to be episodic, most often occurring during stressful life events or when individuals are experiencing negative emotions. Not only does increased eating occur during a stressor, but the more negative emotions elicited, the more likely eating will occur as compared to if only a single emotion is elicited. Losing weight or maintaining weight loss was most difficult when experiencing negative emotions such as loneliness, frustration, anger, boredom, isolation and anxiety.

Heatherton and Baumeister (1991) proposed the escape theory to expand on Kaplan and Kaplan's (1957) comfort eating model. This theory suggests that overeating occurs as an attempt to escape from negative self-awareness. Escape theory describes how some individuals find it unpleasant or uncomfortable to acknowledge the negative implications of specific events (or stressors). Because it is difficult to simply ignore such demanding implications, individuals shift their attention to immediate or present stimuli, such as consuming food.

Survey research has considered whether participants believe they tend to eat more or less in the presence of stress. For example, Oliver and Wardle (1999) conducted a study in which 212 undergraduates from universities in London were administered a questionnaire that assessed stress and eating. Stress-induced eating was measured using a questionnaire that asked about the influence of stress on three areas that included the amount of food consumed, the amount of snacking, and the amount of food consumed from a specific list of foods. For the last area the items included foods from various meal-type foods (i.e. meat, fish, and vegetables), highly palatable snack foods, and bread. The majority of people (80%) reported that stress influenced their eating behavior. People

who tended to overeat, compared to people who were likely to undereat in the presence of stress, were divided fairly evenly. Dieters, individuals who limit what they eat in non-stressful situations, were more likely to eat in excess in stressful situations than non-dieters. Snacking between meals was reported by 73% of participants in the context of stress. It was also found that participants were more likely to eat more energy-dense, highly palatable, and easily prepared foods in the context of stress.

Experimental studies have also been conducted to demonstrate the relationship between stress and eating behavior. For example, Oliver, Wardle and Gibson (2000) conducted a laboratory study assessing stress and food choices. Participants consisted of 68 students and staff from the University (27 men and 41 women). All participants were between the age of 18 and 46. Half of the participants were exposed to stress (they were told that they would need to prepare and give a 10 minute speech to an audience) while the other half were not exposed to stress (they listened to a neutral dialogue). The PANAS was administered at baseline and after the stress task to measure self-reported mood. Participants also rated how stressful they viewed the stress task on a scale of 1 = "*not at all stressful*" to 7 = "*extremely stressful*." Next, researchers assessed food choice by showing 34 pictures of food and asking how desirable each was. Afterward, a meal was provided that included various foods from categories that included: bland low-fat, bland high-fat, salty low-fat, salty high-fat, sweet low-fat, and sweet high-fat foods. The food was weighed before and after intake to the nearest 0.1g. It was found that participants in the stress task condition exhibited significantly more negative affect than those in the neutral task condition. Although those who reported higher levels of negative affect did not eat a greater quantity of food as compared to those with lower levels of

negative affect, they did eat greater quantities of "unhealthy" food. Stressed participants ate more highly palatable, energy-dense food.

It is evident from the literature that there is a clear relationship between negative emotions and increased food consumption. This trend might not be so detrimental to health if the increased food consumption was limited to fruits and vegetables. Therefore, the type of food consumed when individuals experience negative affect should be considered.

Type of Food Consumed

Individuals who are stressed and are experiencing negative affect tend to consume specific types of food. In his review, Ganley (1989) found that high calorie and high carbohydrate food was the most prevalent food type consumed in emotional eating. Later studies, for example Oliver and Wardle's (1999) survey, found that participants were likely to eat more energy-dense, highly palatable, and easily prepared foods in the context of stress. In their laboratory study, Oliver and colleagues (2000) found that highly emotional eaters ate twice as much sweet fatty foods (e.g., chocolate, ice cream) compared to low emotional eaters. Many other studies report that individuals who are experiencing stress prefer energy dense, sweet, and fatty foods (Cartwright et al., 2003; McCann, Warnick, & Knopp, 1990; O'Connor, Jones, Conner, McMillan, & Ferguson, 2008; Weidner, Kohlmann, Dotzauer, & Burns, 1996; Zellner et al., 2006).

Zellner and colleagues (2006) conducted a two-part study, were in the first experiment they examined the effects of differing stress levels on an individual's food preference; in the second study they explored whether the foods consumed during stress were foods they typically ate. Results from the first study indicated that participants

induced to high stress levels were more likely to eat high-caloric sweet foods (M&M's), while participants in low stress condition were more likely to eat the healthy sweet choice (grapes). In the second experiment the Eating-When-Stressed questionnaire was administered to 34 undergraduate female students. A majority of participants (64%) reported that they ate sweet foods when they were stressed; of those individuals, most said that they normally avoided sweet foods. The most frequently mentioned food that participants reported eating when stressed was chocolate. Those that reported eating foods other than sweet when stressed reported eating "junk" food, or food that is perceived as being unhealthy, for example, potato chips.

Naturalistic studies have demonstrated a preference for specific food types when individuals are experiencing high stress or negative affect. For example, McCann and colleagues (1990) found that employees under a high workload and who reported higher perceived stress were more likely to consume a higher amount of calories and total fat when compared to those individuals who were under a lower workload and reported lower levels of stress. Similarly, undergraduate college students under high academic stress report higher negative affect and in turn exhibited more unhealthy eating behaviors than students under lower levels of stress and/or those who did not report negative affect (Weidner et al., 1996). Specifically, high negative affect and low positive affect were associated with less healthy diets. O'Connor and colleagues (2008) examined the effect of daily hassles on food consumption using food diaries completed by 422 individuals (66% female) in the United Kingdom. Daily hassles were positively related to increased intake of high-fat and high sugar snack foods and negatively related to vegetable consumption.

One study found a trend in whole dietary patterns and depressive symptoms. Akbaraly and colleagues (2009) conducted a survey in which they asked individuals with depressive symptoms about their dietary regimen. Participants were 3,486 white Europeans who were first administered the Food Frequency Questionnaire (FFQ; Brunner, Stallone, Juneja, Bingham, & Marmot, 2001) to identify dietary patterns. Individuals were then administered the Center for Epidemiological Studies-Depression scale (CES-D; Radloff, 1977) to assess depressive symptoms. Various covariates were accounted for including sociodemographic variables, health behaviors, and health status. Through statistical analysis, the authors identified two different dietary patterns; one that consisted of a diet of primarily whole foods and another diet that was high in processed foods. Foods that were included in the whole foods group included fruits, vegetables, and fish. Processed meat, chocolates, sweet desserts, fried food, refined cereals and high-fat dairy products are foods that were identified in the processed foods diet. It was found that the whole food diet was associated with lower CES-D scores, whereas the processed food diet was associated with higher CES-D scores.

From the review, it can be seen that individuals tend to prefer energy dense, high fat, and sweet foods in the context of negative affect and stress. Not only do individuals eat more of these energy-dense foods, but they also decrease their intake of healthy foods, such as fruits and vegetables. This trend of eating unhealthy "junk" food in the context of negative emotion could have serious health consequences. Eating high quantities of the energy-dense food puts people at risk for gaining weight. As discussed earlier, an imbalance between of the amount of calories consumed compared to the amount of calories expended per day is the fundamental cause of overweight and obesity (WHO,

2015). Therefore, it would be beneficial to find a factor to moderate the effect between negative affect and increased eating. Current research shows some evidence that nutritional knowledge impacts the amount of food people consume as well as their eating choices (Alaunyte, Perry, & Aubrey, 2015; Paramenter & Waller, 2000; Spronk, Kullen, Burdon, & O'Connor, 2014; Watson, Kwon, Nichols, & Rew, 2009; Worsley, 2002).

Nutritional Knowledge and Food Consumption

Potential mechanisms that can help to prevent obesity have been increasingly studied. Nutritional knowledge that could enable individuals to make healthier food choices is one of those mechanisms. Spronk, Kullen, Burdon, and O'Connor (2014) conducted a literature review of 29 studies that examined the relationship between nutritional knowledge and dietary intake. Individuals with higher nutritional knowledge tend to consume more fruits and vegetables, as well as have a higher intake of fiber and carbs than those with lower nutritional knowledge. These individuals also tend to follow the dietary guidelines more closely than those with lower nutritional knowledge. Findings demonstrated a negative relationship with overall nutritional knowledge and overall energy intake. Therefore, individuals with higher overall nutritional knowledge have a lower daily energy intake. Individuals with higher nutritional knowledge also tend to have a lower intake of fat and sweetened beverages than those with lower nutritional knowledge.

Other studies not included in the Spronk and colleagues' (2014) review also demonstrate a positive relationship between nutritional knowledge and healthier food choices. For instance, greater nutritional knowledge was positively correlated with consumption of more fruits and vegetables in professional rugby players (Alaunyte,

Perry, & Aubrey, 2015). A study by Parmenter and Waller (2000) assessed the nutritional knowledge of 1,040 adults. This study found that there was a positive correlation between nutritional knowledge and healthy eating habits. Specifically, participants who were in the top quintile of nutritional knowledge were 25 times more likely to meet current dietary recommendations for fruits, vegetables, and fat intake. In other research, students' eating behaviors significantly improved after completing a nutritional course compared to those who had not taken the course (Watson, Kwon, Nichols, & Rew, 2009).

Food Labelling and Food Consumption

Nutritional knowledge is important because it is related to healthier eating choices. However, having higher nutritional knowledge may only be a piece of the equation to healthier eating. In order for nutritional knowledge to be meaningful, individuals need to utilize the information and incorporate it into their everyday lives. One way to do this is by reading food labels.

There has been a recent increase in research on food label use and eating. (Chien-Huang & Hung-Chou 2010; Ellison, Lusk, &Davis, 2013; Graham & Laska, 2012; Soederberg Miller et al., 2015). For example, Graham and Laska (2012) conducted a survey of 1,201 college students in Minnesota to examine whether nutritional labels moderate attitudes toward eating and dietary behaviors. Compared to those who did not read labels, those who did were more likely to have a healthier diet. Specifically, label readers reported less fast food and sugar intake, as well as more fiber, fruits, and vegetables in their diet. Further, a relationship was found between checking labels and healthy eating such that those who more often read labels thought they were doing so in an effort to promote their healthy eating style. Even in those who did not place a high

value on eating healthy, checking nutrition labels positively related to a more healthy diet.

The relationship between label use and a healthy diet have also been assessed through objective measures. Soederberg Miller and colleagues (2015) assessed food label use through self-report measure, as well as via eye movement monitoring. Attention toward nutritional information on food labels was monitored through eye movements. Both self-reported food label use and eye monitoring were positively related to consuming a healthier diet.

Ellison, Lusk, and Davis (2013) conducted a field experiment to examine how nutrition labels would affect an individual's food choices at a restaurant. The sample consisted of 138 individual and was split fairly evenly between women (55.8%) and men. At the beginning of the study, participants did not know that their food choices were being recorded. The study consisted of three groups; a control group that received no nutritional information, a group that received only the calorie content of each dinner option, and a group that received the calorie content of the dinner options as well as "traffic light" symbols indicating calorie ranges. Dinner options that contained 400 or less calories displayed a green light symbol, options between 401 and 800 calories received a yellow light symbol, and dinner options 800 calories and above received a red light option. It was found that both the calorie only and calorie plus traffic light symbol groups ate significantly less calories than the control group with no calorie information presented. Further, those in the calorie plus traffic light group ate significantly fewer calories than both those in the calorie only group and the control group. This experiment demonstrates the importance of nutrition labels, specifically calorie content, and the

consumption of calories. However, research on caloric display at restaurants have produced inconsistent results (for review see Harnack & French, 2008; Long, Tobias, Cradock, Batchelder, & Gortmaker, 2015; Swartz, Braxton, & Viera, 2011). Many of these inconsistencies point to significant heterogeneity of methodology.

Nutritional Knowledge and Food Label Use

From the literature, it can determined that both nutritional knowledge and nutrition label use positively affects healthy eating choices. Further, research indicates that there is a relationship between nutritional knowledge and an individual's tendency to use nutritional labels (e.g., Soederberg Miller & Cassady, 2015). For example, Soederberg Miller and Cassady (2015) developed a theoretical model based on cognitive processing (attention, comprehension, memory and decision making) to understand the relationship between nutritional knowledge and food label use. The model suggests that individuals will pay attention to information on food labels, use their knowledge stores to understand the information, and then maintain that stored information to make a food-related decision. Therefore, those with greater nutritional knowledge are expected to use food labels more effectively; being able to distinguish relevant information, interpret that information, and make healthy eating choices. The authors then conducted a systematic review of 34 empirical studies and found the results coincided with their theoretical model. Individuals that displayed higher nutritional knowledge were more likely to use and understand nutritional labels. Results also indicated that individuals with higher nutritional knowledge made more healthful eating choices potentially through the mechanism of information processing of nutrition labels. However, it cannot be

determined if this finding is merely due to nutritional knowledge encouraging healthier food intake regardless of label use.

There has been some evidence that label use could moderate food consumption when a person is experiencing negative affect. Chien-Huang and Hung-Chou (2010) studied the impact of nutritional label use on variety seeking behavior in the context of negative affect. As described by authors, individuals attempt to alleviate boredom by purchasing a diverse number of snack foods and beverages; known as variety seeking behavior. Variety seeking behavior has been associated with overconsumption (Kahn & Wansink, 2004). Chien-Hauang and Hung-Chou (2010) found that the presence of food labels reduce the amount of variety seeking in people who are induced in negative mood providing some evidence that food label usage could be a potential moderator of negative affect and food consumption behaviors.

Disinhibition and Restriction

Extensive research has been done on the effects of disinhibition and restriction (for review see Gibson, 2012). Restrained and disinhibited theory provides insight as to which individuals will eat in the presence of negative affect (van Strien, Herman, & Verheijden, 2009). Restrained eating can be described as an individual restricting the amount of his/her daily food intake in an attempt to lose weight or maintain a desirable weight that may be below their normal set point. Individuals may do this in various ways which include avoiding fattening food, eating smaller portions than desired, and refraining from eating until satiation. Although this may seem like an effective strategy for maintaining a desirable weight, this is not necessarily the case. It has been found that

those who exhibit high restriction also tend to exhibit high disinhibition, or not restricting food intake, in the presence of stress or negative affect (Gibson, 2012).

Disinhibition, also referred to as counter regulation, is a concept introduced by Hibscher and Herman (1977) that refers to the lack of control over eating. This is a concept that is measured in both the Three-Factor eating Questionnaire (TFEQ; Stunkard & Messick, 1985) and the Dutch Eating Behavior Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986). Disinhibiting factors are those which interfere with restriction and lead to overeating, such as negative mood state (Yeomans & Coughlan, 2009). Disinhibition is proposed to occur in highly restrictive individuals in the presence of challenging emotions (Gibson, 2012). This effect has been consistently replicated in laboratory studies (Haynes, Lee, & Yeomans, 2003).

Although restriction and disinhibition are highly influential in eating behaviors, they are not an integral component of this study. However, their effect on food consumption cannot be ignored. In order to correctly identify the influence of nutrition knowledge and food labeling on eating behavior, disinhibition and restriction were controlled for as covariates.

The Present Study

Obesity is a growing issue worldwide. Many factors contribute to obesity, however, this study focused on food preference and psychological factors, such as personal negative affect. Complex mechanisms are behind the behaviors and decisions people make when choosing their food. Factors that influence eating choices include but are not limited to stress, BMI, nutritional knowledge, nutritional food labeling, disinhibition, restriction, and food type. The present study incorporated findings of past

research pertaining to how emotional eating influences food choices with how knowledge of nutritional facts and access to food labels influences food choices.

In order to get a full understanding of the level of stress individuals were experiencing, various assessments of stress were used. The Daily Hassles Scale short version (Totenhagen, Curran, Serido, & Butler, 2013) was used to assess the stress that participants experienced in their lives in the past six months and a five-point rating scale was used to assess the amount of stress the participant perceived before and after the film clip. To assess whether the stressful film clip elicited negative affect, the PANAS was administered before and after the film clip. As described above, negative affect has been found to influence eating, making people more likely to consume a higher quantity of food as well as consume more energy-dense food.

Research also suggests that greater nutritional knowledge is related to making healthier food choices. Specifically, this study looked to determine if having a higher nutritional knowledge score was related to the types of food that participants consumed (including healthy and less healthy options that were high in fat and calories). Further, the study examined nutritional knowledge as a potential moderator of the relationship between negative affect and food consumption such that individuals with higher nutritional knowledge consume less food.

Additionally, this study examined whether having access to nutritional information in the form of nutritional food labeling influences food choices. Past research has demonstrated that if people have the nutritional information in front of them, they will make healthier food choices. Therefore, nutritional labeling was expected to influence food consumption within the context of negative affect such that those who are

presented with food labels will make healthier food decisions; specifically, they will eat the healthier food options and consume fewer calories, fat, sugar, and sodium.

The literature emphasized the importance of disinhibition and restriction on eating behavior. Specifically, those with high levels of both disinhibition and restriction tend to eat the most calories, fat, and sugar. To control for their influence on eating behavior both disinhibition and restriction from the TFEQ-18 were considered as covariates. BMI was also considered as a covariate based off of previous empirical findings of BMI's positive relationship with food consumption (Ganley, 1989). Daily hassles have shown to be related to stress and negative affect. As such, a measure of daily hassles was included and considered as a covariate in the analyses.

A Theoretical Model

The literature review offers a basis for a proposed theoretical model for this study (see Figure 1). This model is foundationally built off of Lazarus's stress model (Lazarus & Cohen, 1977). In this stress model an individual encounters a stressor, appraises the stressor as threatening or not, chooses a coping technique, and then appraises the effectiveness of the chosen technique. Past research shows that stress is positively related to negative affect. Thus, inducing stress by having participants watch a particularly sad scene from *The Lion King* was expected to elicit negative emotions in participants.

Next, it was expected that negative affect would be positively related to food consumed. According to Lazarus's model, exposure to a stressor will cue a threat appraisal that will lead an individual to choose an emotion-focused coping mechanism - emotional eating. Individuals with higher negative affect were predicted to eat more total calories as well as more energy-dense foods, that is, foods that are high in sugar and fat.

Past research has demonstrated how nutritional knowledge influences eating behaviors (Spronk et al., 2014); however, studies have failed to account for negative affect. The author is not aware of any study that has looked at how nutritional knowledge affects eating choices in the context of negative affect. Therefore, in the context of emotional eating (i.e., eating following a stressor), nutritional knowledge could have the same influential effect. Specifically, nutritional knowledge may influence the relationship between negative affect and food consumed with those who are higher in nutritional knowledge eating less total calories and less energy-dense foods than those with lower levels of nutritional knowledge.

Similar to nutritional knowledge, food label use has shown to be related to food consumption (Graham & Laska, 2012). Individuals who read food labels tend to eat healthier diets, which consist of eating less energy-dense food and more healthy foods such as fruits and vegetables. Therefore, food labels were expected to influence the relationship between negative affect and food consumption such that those in the food label condition would consume less total calories and consume less energy-dense foods in the context of negative affect.

Finally, if an individual has both high levels of general nutritional knowledge and food labels available to them, they will make healthier decisions than having either one independently. A resulting interactive effect would thus occur. Therefore, people with greater nutritional knowledge who are exposed to food labels will consume the least amount of calories and be least likely to consumed energy-dense foods.

As described throughout the paper there are many variables that affect eating behavior. This study focused primarily on nutritional knowledge, food labels, and

negative affect. However, other influential variables were also considered as covariates for analyses including BMI, hunger, daily hassles, as well as general eating behaviors (i.e., restriction, disinhibition and emotional eating).

Hypotheses

1. (a) Although negative affect was induced in all participants, the actual level of negative affect experienced was expected to vary across participants. It was predicted that negative affect would be positively related to total calories and grams of fat, sugar, and sodium consumed.

   (b) It was predicted that the film clip stress assessment would be positively related to total calories and grams of fat, sugar, and sodium consumed.

   (c) It was predicted that film clip assessment and post-PANAS scores would be positively related.

2. (a) Nutritional knowledge would be related to food consumption such that those with greater nutritional knowledge would consume fewer total calories, as well as fewer grams of fat, sugar, and sodium.

   (b) Nutritional Knowledge was expected to be related to healthier eating such that those with high nutritional knowledge would consume more grapes and wheat crackers than those with low nutritional knowledge.

   (c) Furthermore, nutritional knowledge was expected to moderate the relationship between negative affect and food consumption such that negative affect would be positively related to food consumption more so for those with low levels of nutritional knowledge.

3. (a) Food labels were expected to influence food consumption such that participants will consume fewer total calories and grams of fat, sugar, and sodium in the label condition as compared to the non-label condition.

   (b) Food labels were expected to encourage healthier eating, such that participants will consume more grapes and wheat crackers than those in the non-label group.

   (c) Further, food labeling was expected to moderate the relationship between negative affect and food consumption such that negative affect will be more positively related to food consumption in the non-label condition than in the condition with food labels.

4. An interaction between nutritional knowledge and food labeling was predicted. It was hypothesized that individuals high in nutritional knowledge in the food label condition will eat less food and less high fat, energy-dense food than those with no food labels and less nutritional knowledge.

Chapter II

Method

Participants

The sample consisted of 61 undergraduate students from the University of Michigan-Dearborn. Four participants were excluded from analysis. Two were excluded because they failed to refrain from eating two hours before the study session. Another individual was excluded because they reported a previous diagnosis of an eating disorder. A final participant was excluded as an outlier. The final sample consisted of 57 individuals, 38 males (64.9%) and 20 (35.1%) females. The average age of participants was 19.52 (*SD*=2.41) years of age with a range of 18 to 32 years. In terms of race/ethnicity 63.8% (*n*=37) identified as Caucasian, 8.6% (n=5) identified as Black or African American, 6.9% (*n*=4) as Asian, and 20.7% (*n*=12) as mixed or other (see Table 1).

Measures

Screening questions. Before the study began, participants were asked if they refrained from eating in the past 2 hours and if they have had a fever in the past 24 hours. Any participant who failed to refrain from eating or had a fever was not included in the study.

Demographic measure. Demographic information included age, gender, and ethnicity. See Appendix A for a copy of the measures used in the study.

Physiological state questionnaire. Participants were asked to rate their hunger, tiredness, fullness, and thirst on a five-point Likert scale with 1 indicating *not hungry at all* and 5 indicating *very hungry*.

Body Mass Index (BMI). Body mass index was obtained by measuring participant's weight and height. BMI was calculated using the formula: BMI= (weight in lbs * 703)/ height in inches^2).

Affect. Affect was assessed using the Positive Affect Negative Affect (PANAS; Watson et al., 1988). The PANAS was developed to briefly measure positive and negative affect. It consists of 20-items, which include 10 items measuring positive affect and 10 items measuring negative affect. For each item, participants were asked to rate on a 5-point scale (1=*very slightly or not at all*, 2=*a little*, 3=m*oderately*, 4=*quite a bit*, 5=*extremely*) the extent to which they are experiencing the item. For the purpose of this study, the wording was altered, to indicate the participant's current mood state, to "indicate the extent you feel this right now, that is, at the present moment" instead of "how you feel on average." High reliability has been demonstrated in undergraduate samples, ranging from .86 to .90 for positive affect and .84 to .87 for negative affect (Watson, Clark, & Tellegan, 1988). The current study demonstrated a reliability of .79 for participant's negative affect before mood manipulation and .85 for negative affect after the mood manipulation.

Perceived stress. Perceived stress was assessed using a five-point scale asking individual how stressed they currently feel. Perceived stress ratings ranged from 1 indicating *very slightly* to 5 indicating *extremely*.

Dailey hassles. Daily hassles were measured using the Daily Hassles Scale short version (Totenhagen, Curran, Serido, & Butler, 2013) adapted from the 53-item Hassles and Uplifts scale (DeLongis, Folkman, & Lazarus, 1988). Totenhagen and colleagues only used the Hassles portion of the original scale. The scale has 15 items and represents eight factors including household, finances, work, environmental and social issues, home maintenance, health, personal life, family, and friends. For each item, participants are asked to rate how much hassle each caused with 0 indicating *none* to 3 indicating *a great deal*. To compute overall severity, all of the items are summed. In past research, the scale has demonstrated good reliability with a Cronbach's alpha of .90 (Totenhagen et al., 2013). Cronbach's alpha in the present study was .64.

General eating behavior. The Three-Factor Eating Questionnaire-r18 (TFEQ-r18; Karlsson, Persson, Sjöström, & Sullivan, 2000) is a shortened version of the original Three-Factor Eating Question (TFEQ; Stunkard & Samuel, 1985) and was used to assess general eating behavior. The 18 items assess three components of eating behavior that include: cognitive restraint (CR) measuring a participant's tendency to restrict food intake in non-stressful situations, uncontrolled eating (UE) measuring a person's lack of control overeating, and emotional eating (EE) which measures an individual's tendency to eat when experiencing negative emotions. Participants rated each statement on the following four-point scale: *definitely true*, *mostly true*, *mostly false*, and *definitely false.* The CR subscale is composed of six items and includes items such as "I deliberately take small helpings as a means of controlling my weight." The UE subscale consists of nine items and includes items such as "Sometimes when I start eating, I just can't seem to stop." The EE subscale includes three items (e.g., "When I feel anxious, I find myself

eating"). All subscales demonstrated adequate reliability in past research (alphas ranging from .77 to .85) as well as high validity (Karlsson et al., 2000) and in the present study (alphas ranging from .74 to .88). As suggested by Jan Karlsson (personal communication, March 31, 2016), one author of the TFEQ-18, transformed scale scores were computed for the TFEQ-18 subscales so that the participant scores represent the percentage endorsed of the total possible raw scores, where higher scores indicate that the individual exhibits more of that general eating behavior.

Nutritional Knowledge. Nutritional knowledge was assessed using the General Nutritional Knowledge Questionnaire (GNKQ; Paramenter & Wardle 1999). The original measure contains 50 items assessing knowledge on four subscales which include: dietary recommendations, sources of nutrients, choosing every day foods, and diet-disease relationship. For the purpose of the present study, the subscales "choosing every day foods" and "diet-disease relationship" were not included (both because of time constraints and because this information was deemed to be less relevant than the other subscales). Therefore, the measure included in the present study contained 25 items. The dietary recommendations subscale consists of four items and includes multiple choice and open-ended questions such as "How many servings of fruit and vegetables a day do you think experts are advising people to eat (one serving could be, for example, an apple or a handful of chopped carrots)?" The sources of nutrients subscale consists of 21 items and includes questions such as "Polyunsaturated fats are mainly found in" with response options of "*(a) vegetable oils, (b)dairy products, (c) both (a) and (b), and (d) not sure"*. Total knowledge scores were calculated by summing both participant subscale scores

(dietary recommendations and choosing everyday foods) of the GNKQ with higher scores indicating greater general nutritional knowledge.

Food rating scale. To measure participant's preferences in food, a modified version of the Food Rating Scale (Galloway, 2011) was used. The measure asks questions pertaining to the four different foods presented in such a way that participants could answer without consuming the food. An example item on the scale includes "The color of the food is appealing to me" with response options ranging from 1 indicating *highly disagree* to 7 indicating *highly agree*. This measure was used as a distractor task so that participants were unaware that the real intent was to measure food consumption.

Materials

Food weight measurement. Identical paper food bowls containing the four types of food were measured before and after the participant completed the taste task. The food was measured using a concealed Valor 1000 scale that provides measurement to the nearest ten thousandths of a gram.

Negative affect induction. Past research has demonstrated that negative affect is effectively induced using video film clips (Lazar & Pearlmann-Avnion, 2014). Therefore, negative affect was induced by showing a 3:13 minute film clip from *The Lion King* (1994) on a computer monitor. The film clip is of King Mufasa's death and includes factors touching on remorse, betrayal, guilt, and exile. The clip was selected based on the results of a pilot study that was conducted with a convenience sample of friends and coworkers (n=14).

Procedure

Participants were recruited through the University's Subject Pool. The Subject Pool includes students from introductory psychology courses who are required to participate in research or complete an alternate assignment as part of the course requirements, as well as students from advanced psychology courses who can earn course credit for participation in research. All Subject Pool students are required to complete a general screening questionnaire at the beginning of each semester using the SONA system. Individuals who indicated that they had a food allergy were automatically excluded from the study. The study description also requested that individuals who had a previous diagnosis of an eating disorder or diabetes not sign up for the study. These three factors (a history of food allergies, eating disorders and diabetes) were used as exclusion criteria either because of the potential to impact the individual's eating habits and/or because participation in this study could pose a threat to their health. Notifications were sent out the night before via email reminding participants to refrain from eating two hours prior to the session time. This was done to ensure that participants were hungry enough to participate in the food tasting portion of the experiment. Participants earned a half hour of credit for participation.

Upon arrival, participants were asked the screening questions to determine if they had had a fever in the last 24 hours and if they had refrained from eating two hours prior to the study. If either of these conditions were not met, the participant was asked to reschedule and not granted credit until completion of the study. If it was determined after the session (via questionnaire) that the participant did not refrain from eating, then data was not used in analysis, however the participant was still granted credit. After exclusion

criteria were assessed, participants were given two identical copies of the consent form to review; one for their personal records and one for the experimental records. Next, participants heard a brief description of the study and procedures and were asked if they had any questions. After signing the consent form, baseline affect was measured through administration of the PANAS. Along with the pre-manipulation PANAS, participants completed the perceived stress rating, measures of demographic information, physiological state, general eating behavior, daily hassles, and nutritional knowledge. This portion of the study took approximately 10 minutes on average.

The second phase of the experiment consisted of mood manipulation via watching the film clip. Participants were informed before the film clip that if at any point they felt uncomfortable or wished to discontinue the film clip to alert the researcher and the film would be discontinued. As participants were watching the film, the researcher discretely observed to make sure participants were paying attention as well as not becoming overly distressed. After the film clip, participants were administered the PANAS and perceived stress rating for a second time to gauge post-film affect and perceived stress.

The third phase involved a faux "taste task." Each participant was randomly assigned to either the food label or non-label condition. Random assignment was administered via participant numbers with all even numbered participants assigned to the non-label condition and all odd numbered participants assigned to the label condition. Those in the label condition were provided with information about serving size, calories, total fat, saturated fat, trans fat, sodium, and sugar nutrition information (see Appendix B). Those in the non-label condition received no nutritional information.

Before participants arrived, all food was prepared, weighed, and recorded and then placed on the table. Four different food options were available, representing sweet high-fat (individual M&Ms), salty high-fat (Lays Potato Chips), salty low-fat (Triscuit Crackers), and sweet low-fat (individual red grapes) options. Food labels were placed behind each paper bowl in the label condition. After participants watched the film clip, they were asked to complete a taste task and were given a food rating scale. They were reminded that the purpose of the task was to explore peoples' food preferences while watching films, similar to buying concessions at the movie theater. Participants were informed that they were not required to eat anything. However, to encourage eating, they were informed that if they wanted to eat, that they eat while completing the food ratings because no food was allowed out of the room due to "food safety regulation" and that all food would be thrown out after the session. They were instructed to leave all food not consumed in the paper bowl. The researcher then told the participant that they had to leave the room to grab additional paperwork but would be back to finish the study session. The researcher would then leave giving the participant five minutes to complete the measures and consume food. A stopwatch was used to ensure that the researcher was gone for no more or less than five minutes. After five minutes had passed, the researcher re-entered the room to finish the study session. At this point, the researcher asked the participant for permission to take their height and weight measurements for BMI calculation. Once the participant agreed, the participant first stood with their back against the wall against a measuring tape. Next, a body weight scale was pulled out from concealment and they were asked to step on.

Debriefing. After the participant completed the height and weight measurement portion of the experiment, they were informed that the true purpose of the study was to assess the amount and type of food consumed while experiencing a negative mood given how much they knew about nutritional facts. Participants were given a resource sheet (see Appendix C) if they were interested in finding out any more information on the subject. Participants were also asked that they not discuss the true purpose with the experiment with anyone. After the participant was debriefed and left the lab room, all paper bowls were weighed a second time. Food was then thrown away after being weighed and recorded.

Chapter III

Results

The data was entered into SPSS, cleaned, and basic descriptive statistics were run. Skewness and the amount of missing data was assessed. An analysis of standard residuals was carried out on the data to identify any outliers, which indicated that participant 19 needed to be removed. Scales were created using average scores that took into account the number of valid answers participants had; there were no missing values for scale scores.

For each participant four food consumption scores were calculated for each type of food (grapes, crackers, M&Ms, and chips) by subtracting the post weight of the food bowl (the weight of the bowl after the participant completed the taste task) from the pre-weight (the weight of the bowl before the participant arrived). For each food item, calories, fat, sugar, and sodium were calculated to represent the amount consumed for each per gram. Finally, total calories, fat, sugar, and sodium values were calculated by summing the amount for each of the four foods. Means and standard deviations for total calorie, fat, sugar, and sodium for each of the four foods are presented in Table 2.

Did Watching the Lion King Clip Increase Negative Affect?

In order to determine if negative affect increased in participants after viewing *The Lion King* film clip, difference scores were calculated (post-PANAS minus pre-PANAS = difference where a positive number indicates an increase in negative affect). Although overall negative affect increased slightly (M=0.68, SD=5.15), this was not the case for all

participants. Further analyses indicate that not all participants had an increase in negative affect (see Table 3). In fact, some participants' affect remained unchanged (n=8; 14.04 %) and some participants actually had a decrease in negative affect (n=22; 38.60%). Thus, only 27 (47.37%) of participants reported increased negative affect following the film clip. Table 3 also contains descriptive information about the negative affect change score for each group (increased, unchanged, and decreased).

Assessing the Relationships between Variables

Correlations were conducted to assess the relationship between all potential covariates (BMI, hunger, cognitive restriction, uncontrolled eating, emotional eating, and daily hassles) predictor variables (negative affect, nutritional knowledge, and perceived stress), and outcome variables (total calories consumed, total fat consumed, total sugar consumed, and total sodium consumed; see Table 4). Total calories consumed, total fat in grams consumed, total sugar in grams consumed, and total sodium in grams consumed were highly correlated (*M correlation* =0.84, *SD*=0.12), therefore, all further analyses only used the total calories consumed variable.

Establishing covariates. A number of measures were included as potential covariates and correlational analyses were conducted to determine which to include in the analyses that follow. BMI was moderately positively related to total sugar consumed and marginally positively related to total calories consumed and total fat consumed. None of the TFEQ-18 subscales (i.e., Uncontrolled Eating, Emotional Eating and Cognitive Restraint) were significantly or marginally related to any predictor or outcome variables; therefore they were not included as covariates. Daily Hassles showed a moderate positive relationship with both negative affect and perceived stress rating after film clip. Hunger

was moderately positively related to total sodium consumed and marginally positively related to total calories consumed and total fat consumed. Therefore, the analyses that follow included BMI, hunger, and daily hassles as covariates.

Was Negative Affect a Factor?

In hypothesis 1(a) it was predicted that negative affect would be positively related to total calories, and grams of fat, sugar, and sodium consumed. As described above, because the four variables were so highly correlated, only total calories consumed was used for this analysis. Contrary to predictions, negative affect (post-PANAS score) was unrelated to total calories consumed (r=22, p=ns, n=58). However, when correlations between negative affect and total calories consumed were re-run with only those participants who had an increase in negative affect after viewing the film clip, negative affect and total calories consumed were significantly positively related (r=.43, p <.05, n=27). An r-to-z transformation was conducted using an online calculator (Lowry, 2016) to determine if there was a significant difference between correlations of the total sample and only those who had an increase in negative affect. Although the correlation between negative affect and total calories consumed was stronger for the group who had increased negative affect following the film clip, it was not significantly stronger than the correlation for the full sample (z=-.96, p=ns).

Hypothesis 1(b) predicted that the perceived stress after watching the film clip would be positively related to total calories, and grams of fat, sugar, and sodium consumed. Only total calories consumed was considered. Contrary to predictions, perceived stress was not related to calories consumed (see Table 4). As predicted in

Hypothesis 1(c) perceived stress following film viewing and post-PANAS negative affect scores were strongly positively related (r=0.57, p<0.001).

Did Nutritional Knowledge Influence Food Consumption?

In hypothesis 2(a) it was predicted that nutritional knowledge would be negatively related to total calories consumed, and grams of fat, sugar and sodium consumed. Because of the high inter-correlations between the outcomes, only total calories consumed were considered. Nutritional knowledge was unrelated to total calories consumed (see Table 4).

In hypothesis 2(b) it was predicted that nutritional knowledge would be related to healthier food choices, such that individuals with high nutritional knowledge would eat more of the grapes and wheat crackers than those with low nutritional knowledge. First, a median split was conducted to establish high and low nutritional knowledge scores. All scores 44 and below were labeled low nutritional knowledge. All scores 45 and above were deemed high nutritional knowledge. Next, independent measures t-tests were conducted to analyze the differences in total grape consumption and total wheat cracker consumption between high and low nutritional knowledge. Participants with high nutritional knowledge consumed slightly more grapes and wheat crackers (grapes: M=82.85, SD=43.35; wheat crackers: M=10.68, SD=12.05) than those with low nutritional knowledge (grapes: M= 81.78, SD=40.48; wheat crackers: M=7.13, SD=9.65) however these differences were not significant (grapes: t(55)=-.10, p=ns; wheat: t(55)=-1.22, p=ns).

Hypothesis 2(c) predicted that nutritional knowledge would moderate the relationship between negative affect and food consumption such that negative affect would be positively related to food consumption moreso for those with low levels of nutritional knowledge. To test this relationship a hierarchical multiple regression was calculated to predict total calories consumed with negative affect and total nutritional knowledge as potential predictors and BMI, hunger, and daily hassles as covariates. In the first step, the covariates were entered. In the second step, post negative affect was entered and in the third step total nutritional knowledge was entered. The covariates as a group did not significantly contribute to the prediction of total calories; however, BMI and hunger were marginally significant predictors of total calories consumed in the final model. Negative affect marginally contributed to the prediction of total calories consumed ($F(4, 56)=2.56$, $p<.10$). Finally, the addition nutritional knowledge as a predictor did not significantly improve on prediction of total calories consumed. Overall, negative affect and nutritional knowledge, while controlling for BMI, hunger, and daily hassles accounted for a marginal amount of variance in total calories consumed $F(5,56)=2.14$, $p<.10$, $R^2=0.17$, $R^2_{adujusted}=0.09$). See Table 5 for the complete results of the hierarchical multiple regression.

Although the hierarchical multiple regression showed that nutritional knowledge did not improve on prediction of total calories consumed, for the purpose of exploration, further analyses were conducted. Bivariate correlations between negative affect and total calories consumed were conducted separately for the low and high general nutritional knowledge groups (low: $r=.10$, p=ns, $n=27$; high: $r=.34$, p=ns, $n=30$). Next, r-to-z transformations were conducted (Lowry, 2016). Results from the r-to-z transformation

(z=-.90, p=ns) suggest that while the relationship between negative affect and total calories consumed was stronger for the high general nutritional knowledge group, it did not significantly differ from the low general nutritional knowledge group. Therefore general nutritional knowledge level did not moderate the relationship between negative affect and total calories consumed. The test was repeated with only those who had an increase in negative affect (low: r=.26, p=ns, n=9; high: r=.54, p<.05, n=18). Again, r-to-z transformations were conducted (Lowry, 2016). For those who experienced increased negative affect following the film clip and had high levels of general nutritional knowledge, negative affect was strongly positively related to total calories consumed. Negative affect was unrelated to total calories consumed for those with a low level of general nutritional knowledge. However, the difference between these correlations was not significant (z=-.7, p=ns)

Did Food Labels Influence Food Consumption?

In hypothesis 3(a) it was predicted that food labels would influence food consumption such that participants would consume fewer total calories and grams of fat, sugar, and sodium in the label condition as compared to the non-label condition. As described above, because the outcome measures were highly correlated, only total calories consumed was considered as a dependent variable in this analysis. An independent measures t-test was conducted to analyze the differences in total calories consumed between the label and non-label group. Although participants consumed slightly more total calories in the non-label group (M=188.30, SD=126.48) as compared to total calories consumed by those in the label group (M=181.80, SD=123.80), this difference was not significant $t(55)$ =-0.20, p=ns.

In hypothesis 3(b) it was predicted that food labels would encourage healthier eating choices, such that those in the label group would consume more grapes and wheat crackers compared to those in the non-label group. Independent measures t-tests were conducted to analyze the differences in total grape consumption and total wheat cracker consumption between the label and non-label group. Participants in the label group consumed more grapes and slightly less wheat crackers (grapes: *M*=87.14, *SD*=40.67; wheat crackers: *M*=8.78, *SD*=9.92) as compared to the non-label group (grapes: *M*=77.38, *SD*=42.79; wheat crackers: *M*=9.23, *SD*=12.26), however, these differences were not significant (grapes: $t(55)=.88$, *p*=ns.; wheat cracker: $t(55)=-.16$, *p*=ns).

In hypothesis 3(c) it was predicted that food labeling would moderate the relationship between negative affect and food consumption such that negative affect would be more positively related to food consumption in the non-label condition than in the condition with food labels. To test this relationship a hierarchical multiple regression was calculated to predict total calories consumed with negative affect and label status as potential predictors and BMI, hunger, and daily hassles as covariates. Label status was dummy coded in order to perform the multiple regression. In the first step of the regression, all covariates were entered. In the second step negative affect was added and in the final step the dummy coded label status was added. The covariates as a group did not significantly contribute to the prediction of total calories consumed; however, BMI and hunger were marginally significant predictors of total calories consumed in the final model. Negative affect marginally contributed to the prediction of amount of total calories consumed ($F(4, 56)=2.56$, $p<.10$). Finally, the addition of label status as a predictor did not significantly improve on prediction of total calories consumed. Overall,

negative affect and label status, while controlling for BMI, hunger, and daily hassles accounted for a marginal amount of variance in total calories consumed ($F(5,56)=2.06$, $p=<.10$, $R^2=0.17$, $R^2_{adujusted}=0.09$). See Table 6 for the complete results of this hierarchical multiple regression.

Although the hierarchical multiple regression showed that nutrition labels did not improve on prediction of total calories consumed, for the purpose of exploration, further analyses were conducted. Bivariate correlations between negative affect and total calories consumed were conducted separately for the label and non-label groups (label: $r=.29$, $p=$ns, $n=29$; non-label: $r=.15$, $p=$ns, $n=28$). Next, an r-to-z transformation was conducted (Lowry, 2016; $z=.53$, $p=$ns) suggesting that the relationship between negative affect and total calories consumed did not significantly differ between label status conditions. Therefore, label status did not moderate the relationship between negative affect and total calories consumed. Analyses were then re-run for only those who had an increase in negative affect (label: $r=.62$, $p<.05$, $n=16$; non-label: $r=.02$, $p=$ns, $n=11$). For those who experienced an increase in negative affect following the film clip and were in the label condition, negative affect was strongly positively related to total calories consumed. Negative affect was unrelated to the total calories consumed for those in the non-label condition. The r-to-z transformation ($z=1.57$, $p=$ns) suggested that the relationship between negative affect and total calories consumed did not significantly differ between label status conditions.

Was There an Interaction between Nutritional Knowledge and Food Labels?

Lastly, it was predicted that there would be an interaction between nutritional knowledge and food labeling, such that individuals with high nutritional knowledge in

the label group condition would eat fewer calories and less high-fat, energy-dense food than those with no food labels and low nutritional knowledge. A One-way ANCOVA was conducted with nutritional knowledge and nutrition labels as independent variables, total calories consumed as the dependent variables, and BMI, hunger, and daily hassles as covariates. Hunger is the only covariate that was marginally significant in this model ($F(1,50)=3.10$, $p<.10$). Contrary to predictions, neither of the main effects [general nutritional knowledge: $F(1,50) =.00$, p=ns; food label: $F(1,50)=.03$, p=ns] nor the interaction of general nutritional knowledge and food label [$F(1,50)=.20$, p=ns] were significant. Means and standard deviations for each group are presented in Table 7.

Chapter IV

Discussion

Obesity is a prominent health issue worldwide. The most simplistic cause of obesity is an excess amount of calories consumed compared to the amount of calories used in a day. However, eating behavior is much more complex and is influenced by many factors including negative affect (Ganley, 1989; Gibson, 2006; Heatherton & Baumeister, 1991). The purpose of this study was to determine potential factors that could decrease the effect that negative affect has on eating behaviors. This study is unique because it considers the potential influence that two factors, general nutritional knowledge and food label use, might have on the relationship between negative affect and food consumption. All participants in the study watched a film clip which was expected to increase perceived stress and negative affect followed by a food rating task that allowed for the consumption of four different types of food. Negative affect was expected to relate to total food consumption. Further, it was expected that those who displayed high nutritional knowledge would consume less total calories and less energy-dense food than those with low nutritional knowledge in the context of negative affect. It was also expected that those in the group that were presented with food labels would consume less food and less energy-dense food than those not presented with food labels in the context of negative affect. Finally, it was expected that those participants who had

both high nutritional knowledge and were presented with food labels would eat the least amount of calories and energy-dense food.

Negative Affect and Food Consumed

In the present study, negative affect was positively related to total calories consumed. When considering only those individuals who had an increase in negative affect, significant positive relationships were found between negative affect and total calories consumed, total fat consumed, and total sodium consumed and a trending positive relationship for total grams of sugar consumed. This finding supports past literature demonstrating that increased negative affect is positively related to increased food consumption (Ganley, 1989), termed emotional eating. For example, Ganley's (1989) literature review on emotional eating concluded that when individuals encounter negative emotions such as loneliness, frustration, anger, boredom, isolation and anxiety, increased food consumption is a result. However, the relationship between negative affect and food consumption was not found for the entire study sample. This was most likely due to the fact that negative affect was not induced for all of the participants. Interestingly, some individual's negative affect actually decreased after watching the film clip. This could have occurred for various reasons. Perhaps individuals were happy to watch a film clip after filling out questionnaires for 10 minutes. Or, the film could have had a nostalgic effect, reminding the participants of their younger years.

Nutritional Knowledge and Food Consumption

Past research has found a positive relationship between nutritional knowledge and healthier eating habits (Alauynte et al., 2014; Paramenter & Waller, 2000; Spronk et al., 2014). For example, research has found that individuals with higher nutritional

knowledge tend to eat more fruits and vegetables (Alauynte et al., 2014; Paramenter & Waller, 2000; Spronk et al., 2014), fiber, and carbs (Spronk et al., 2014). These individuals also were more likely to have a lower intake of fat and sweetened beverages (Spronk et al., 2014). The present study did not support these findings. There was no relationship found between nutritional knowledge and either total calories, fat, sugar, or sodium consumed. There was also no significant difference between consumption of healthier foods (grapes and crackers) between those with high nutritional knowledge and those with lower nutritional knowledge, although, individuals with high nutritional knowledge did eat slightly more grapes and wheat crackers than the low nutritional knowledge group. Further analyses indicated that although negative affect remained a marginal predictor of total calories consumed, nutritional knowledge did not significantly add to the prediction.

One important consideration for the difference between the present study and past research is the methodology in which eating behavior was measured. For instance, Alauynte and colleagues (2014) used the FFQ to measure eating behavior, Paramenter and Waller (2000) used a survey, and Spronk and colleagues' (2014) literature review used the FFQ, dietary records, and 24-hour recall. On the other hand, the present study measured eating in a laboratory setting. Thus there could discrepancies in what people report eating versus what they actually eat. Also, participant's regular eating habits could have been impacted by the unfamiliar environment of the lab. Therefore, the differences of methodology could have accounted for some of the differences in findings between the present study and past research.

Further explorative analyses were conducted to determine if general nutritional knowledge had a moderating effect on the relationship between total calories consumed and negative affect. Because past research has demonstrated that nutritional knowledge positively impacts eating choices (Spronk et al., 2014) it was expected that nutritional knowledge would positively impact eating choices in the presence of negative affect. Specifically, analyses were looking to determine if the relationship between negative affect and total calorie consumption was significantly different for those with high and low general nutritional knowledge. It was expected that those in the low general nutrition knowledge group would display a stronger relationship between negative affect and total calorie consumption when compared to the high general nutrition knowledge group. Analyses were done on the whole sample, as well as on only those who experienced an increase in negative affect. For both the complete sample and the smaller sample, there was not sufficient evidence to conclude that nutritional knowledge moderates the relationship between negative affect and eating behavior. One potential reason that no moderating effect was found is because emotional eating is an emotional construct whereas nutritional knowledge is a cognitive construct. Perhaps nutritional knowledge influences eating behavior better when individuals are using cognitive processing techniques to make healthier eating decisions. However, when eating is being triggered by emotions, as in emotional eating, nutritional knowledge as a cognitive tool might no longer be effective.

However, within the moderation analyses there were some interesting findings that ran contrary to hypotheses. Specifically, for individuals who had an increase in negative affect after viewing *The Lion King* clip, there was a strong positive relationship

found between total calories consumed and negative affect in the participant group who had high nutritional knowledge but not the low nutritional knowledge group. It was expected that those with higher nutritional knowledge would consume *fewer* calories as has been reported in past research (see Spronk et al., 2014 for review). One potential reason is the sample for this analysis was limited to 18 individuals, thus the parameter estimates may not be representative of the larger population.

Label use and Food consumption

Past research demonstrated that individuals who use labels were more likely to exhibit healthy eating behaviors (Soederberg Miller et al., 2015). The present study did not demonstrate the same relationship. Although results from the present study showed that participants in the non-label group consumed slightly more calories than the label group, these results were non-significant. It has been found that those who read nutrition labels report eating more fruits, vegetables, and fiber in their diet compared to those who did not read nutrition labels (Graham & Laska, 2012). Again, the present study did not support past literature. In the present study, participants in the label group consumed slightly more grapes than the non-label group, but again the results were non-significant. Further, analyses determined that in predicting total calorie consumption with negative affect and food label condition as predictors, food label status did not improve on prediction of total calories consumed. Therefore, nutritional labeling was not found to be a good predictor of total calorie consumption in the context of negative affect. One reason that no relationship was found between label use and eating in the context of negative affect is that the present study had no manipulation check to determine if

participants were actually using the labels. Therefore, just because there were labels present during the taste task does not mean participants were actually using them.

Another important consideration as to why the present study was not consistent with past research regarding label use is the concept of "point of purchase" (POP) versus "point of consumption" (POC). Past studies (Chien-Huang & Hung-Chou, 2010; Ellison et al., 2013; Soederberg et al., 2015) all assessed the relationship between food label use and food choices via POP mechanisms. This is where there is a decision-making process of what to buy at a store, such as purchases at a grocery store or restaurant. On the other hand, the present study measured this same relationship via POC, where the food was already placed in front of them. It is possible that there are different cognitive mechanisms in place between POP and POC. For example, a person may rationally decide that they do not want to purchase M&M's, however, if M&M's are placed in front of them to freely eat, they may have a harder time controlling the desire to eat the candy.

Additional analyses were conducted to further explore the potential role of nutritional labeling as a moderator of the relationship between negative affect and total calories consumed. It was expected that the relationship between total calories consumed and negative affect would be significantly different between those in the label group versus the non-label group. Specifically, it was expected that there would be a stronger relationship between total calories consumed and negative affect for the non-label group compared to the label group. The analysis was done once for the whole sample and then again for only those who had an increase in negative affect. For both analyses, there was not sufficient nor significant evidence of moderation. This is inconsistent with past research demonstrating that those exposed to food labels in the context of negative affect

make healthier food choices (Chien-Hauang & Hung-Chou 2010). Specifically, those with high negative affect consume less junk food when exposed to food labels compared to those individuals who are not exposed to food labels. Again, perhaps the differences found between the present study and past research is that it in the present study participants were not actually reading the food labels and/or using that information to make decisions about what to consume.

There was an interesting finding when conducting the analyses to determine whether label use moderated the relationship between negative affect and total calories consumed. When analyses were limited to only those who had an increase in negative affect after watching *The Lion King* clip, a strong positive relationship between negative affect and total calories consumed was found in the label group but not in the non-label group; which runs contrary to the study predictions. As described in Ellison and colleagues (2013), nutrition labeling was related to decreased calorie consumption when compared to those with no nutrition labels; therefore the present study's findings are inconsistent with past research. This discrepancy could have occurred because the sample for this finding was limited to 16 participants, therefore estimations of population trends are unstable. This could lead to indications of a relationship when there actually are none. There could also be a third variable influencing this relationship in the individuals who had an increase in negative affect. Perhaps by random chance, those in the label group who experienced an increase in negative affect ate more because their session occurred in the morning and they were thus hungrier. However, this cannot be determined because the time of day in which the session took place was not recorded.

The Interaction of Nutritional Knowledge and Food Label Use

Past research indicated that those with higher nutritional knowledge and food label use independently produced similar results of healthier eating habits, therefore, it was expected that there would be an interactive effect if they were both examined together. It was expected that those in the label group with high general nutritional knowledge would consume the least amount of total calories, whereas those in the non-label group with low general nutritional knowledge would consume the most total calories. Looking at calories consumed as the measurement variable, there was no main effect for either label status or general nutritional knowledge. However, mean values were trending in the expected direction. For example, those in the low nutritional knowledge group ate slightly more calories than those in the high nutritional knowledge group; likewise, those in the non-label group ate slightly more calories than those in the label group. Further, the interaction between label status and nutritional knowledge was also non-significant. Therefore, when taken together, general nutritional knowledge and label status does not significantly impact consumption of total calories.

Limitations, Strengths, and Future studies

There are a number of limitations associated with the present study. To begin, one of the most significant limitations is the sample size. There were various results that did not attain statistical significance but were trending in the expected direction. For example, participants with high general nutritional knowledge ate slightly more of the healthier food options than those with low general nutritional knowledge, participants from the non-label group consumed more calories than the label group, participants in the

label group ate more grapes, etc. Perhaps with a larger sample size, these trends would develop into significant results.

Another limitation of this study relates to the effectiveness of the negative affect induction. The negative affect induction only worked in slightly less than half of all participants. Furthermore, in those participants where the negative affect induction was successful, the change in PANAS scores were not drastic. Therefore, the strength of the negative affect induction was problematic and generally failed to put participants in a high level of emotional distress. Further, over a third of participants actually had a decrease in negative affect. Therefore, the intended affect manipulation did not work for over half of the sample. This appears to have impacted the outcomes of the study. A number of the analyses were re-run using only those who had an increase in negative affect. Although the results generally failed to attain statistical significance, the values appeared to be much closer to the study predictions. As discussed above, a positive relationship between negative affect and total calories consumed was only found when analyses were restricted to those who had an increase in negative affect. Therefore, using a different negative affect induction task may be beneficial for future studies.

Ego-threatening stress tasks have been shown to be effective in producing negative affect in eating studies. Emotional eating has been proposed to be related to high levels of self-awareness (Heatherton & Baumeister, 1991). Wallis and Hetherington (2004) propose that ego-threatening stressors will cause emotional eaters to eat more because their attention is shifted to their own shortcomings. Therefore, participants will divert their attention to food and eat as a distraction mechanism. Wallis and Hetherington (2004) conducted a study in which participants were presented three different stress tasks

(an ego-threatening, a cognitive-demanding, and a control). Following the stress task, participants were offered chocolate. Emotional eaters consumed more chocolate exclusively after the ego-threatening task compared to the cognitive-demanding task and control condition. Therefore, future studies should use an ego-threatening task to induce negative affect (such as receiving negative feedback during a mental arithmetic task).

The study is also limited by restriction of range for negative affect. Negative affect induction was attempted for the entire sample. Therefore, there was no comparison group to determine if it was the negative affect induction that was influencing eating behavior or some other variable. Since only individual variation in negative affect was measured, limited implications can be drawn about increased negative affect and total food calorie consumption. It would be beneficial for future studies to include a control group, where half of the participant do not receive the negative affect induction. Further, more insight could be gained if there was a group where positive affect is induced. This way, a more comprehensive model of emotional eating can be attained.

Measurement of general nutritional knowledge could have been a potential limitation in the study. Only two of the four subscales of the General Nutritional Knowledge Questionnaire (GNKQ; Paramenter & Wardle 1999) were used because of time constraints. Thus, information was lost in the areas of "*choosing every day foods*" and "*diet disease relationship*". Future studies should incorporate all four subscales in order to get a more representative assessment of an individual's nutritional knowledge.

Another concern is determining whether or not participants actually used the labels when deciding which foods to eat. Participants were not asked if they read the labels or questioned about the content of the labels in the present study. Therefore future

studies should implement a manipulation check (e.g. did you read the food labels?) to determine those who actually used the food labels. To increase the chances of food label use, participants could be informed that testing on the label information would occur after the taste task. Other technologically advanced options could include eye tracking equipment as Soederberg Miller and colleagues (2015) used in their study. Although more costly, this method would be more reliable that self-report assessments of food label use.

An assumption of the present study assumes that if an individual has a higher level of nutritional knowledge, they will know how to apply that knowledge to food labels. It fails to consider a concept known as nutrition literacy (Zoellner, Connell, Bounds, Crook, & Yadrick, 2009). They describe nutrition literacy as "the degree to which people have the capacity to obtain, process, and understand basic nutrition information" (pg. 1). Nutrition literacy not only involves having nutritional knowledge but being able to comprehend and apply that knowledge to everyday eating choices. Therefore, even though nutritional knowledge and nutritional literacy are most likely highly related, one does not necessarily translate into the other. For example, just because someone is knowledgeable in defining what a carbohydrate is, does not mean they can correctly identify the daily recommended amount for a carb. Therefore, if we hypothetically assume that individuals with high nutritional knowledge are reading the food labels, it does not necessarily mean they know how to use the information to make healthier food choices.

Future studies may benefit from incorporating a nutrition literacy assessment. Weiss and colleagues (2005) developed an instrument for measuring nutrition literacy

known as Newest Vital Sign (NVS). This assessment gives the individual information from a nutrition label and then asks various questions about how they would use and interpret the information presented. The NVS demonstrates good sensitivity, good internal reliability, and validity (Weiss et al., 2005). It also only takes three minutes to administer.

Another limitation of this study is its restricted generalizability to the population. The sample mostly consisted of young college students. It is likely that young adults have different eating habits and preferences than older populations. Future research should examine a more diverse age group to increase generalizability. Future studies should also take into consideration cultural implications of eating habits. For instance, some of the individuals partake in strict dietary regimens (e.g. eating only Halal certified food). This was not a factor considered until one of the participants inquired about the Halal certification of the foods. This could be a potential confounding factor for future research to consider.

Another variable to consider is the time allotted for participants to consume food. In the present study, participants were given 5 minutes for the "taste task." Perhaps allotting more time would encourage increased eating and allow for a better assessment of food preference. Various eating studies provided participants more time. For example, Yeomans and Caoughlan (2009) allowed their participants 20 minutes to eat. Other studies (Wallis & Hetherington, 2004) allowed their participants as much time as they desired and were left with a buzzer to inform experimenters when they were finished eating. Further, some studies (Zellner et al., 2006) administered the stress task and eating task together so that the participants completed the stress task (a difficult anagram) while

snacking on food. Therefore, giving participants more time to eat might be beneficial in future studies.

A final variable to consider is the participant's gender. The present study had a sample population that contained more male participants than female participants. This factor may have influenced the study results in a variety of ways. To begin, there have been mixed results on whether or not men are affected by emotional eating in the same way that women are affected. In his review, Ganley (1989) found more consistent emotional eating trends in women compared to men. Other studies have found that men prefer more savory meal-related foods when engaging in emotional eating compared to women, who prefer sweet snack foods (Wansink, Cheney, & Chan, 2003). Differences have also been found between men and women, in that men tend to eat in the presence of positive emotions, whereas women are more likely to eat in the presence of negative emotion (Dubé, LeBel, & Lu, 2005). Thus, consideration of gender in future studies may be beneficial.

There are also various strengths associated with the present study. To begin, the study incorporated four food options representing different food types. This included a salty low-fat option, a salty high-fat option, a sweet low-fat option, and a sweet high-fat option. Therefore, the study provided multiple healthy and unhealthy food options. The food options also consisted of highly processed and unprocessed variety. This is important because past research indicates that individuals who emotionally eat are more prone to eat sweet, high fat, and highly processed foods (Ganley, 1989; Oliver & Wardle, 1999; Zellner et al., 2006).

Another strength of the present study is that it offers some unique methodology compared to past research. For example, to the author's knowledge, this was the first study that considered nutritional knowledge as a moderator to emotional eating. Most reviewed emotional eating studies looked into factors that contributed to emotional eating rather than lessening its impact (Ganley, 1989; Oliver & Wardle 1999; Oliver et al., 2000). Further, past nutritional knowledge studies only assessed an individual's knowledge in relation to food choices. The present study is unique in that it adds the factor of negative affect, thus assessing emotional eating. The way in which food consumption was assessed is also unique. As discussed before, other studies used questionnaires, dietary records, and 24-hour recall (Alaunynte et al., 2014; Paramenter & Waller, 2000; Spronk et al., 2014). On the other hand, this study used a laboratory setting and measured the amount of food consumption. This method is more reliable than self-report, where people may under-report or over-report certain food items to make themselves look more favorable to the experimenter.

The covariates that were considered is another strength to the present study. Past research has demonstrated that various trait eating behaviors such as restriction and disinhibition are very influential in the emotional eating model (Gibson, 2012; Haynes et al., 2003). Therefore, in order to assess only state eating behaviors, it was important to control for those trait eating behaviors. Another important covariate that was considered was daily hassles. The present study was only looking to assess the negative affect that was induced in the lab, therefore it was necessary to account for other potential causes of negative affect that were unrelated to the negative affect induction. Past research has

indicated that daily hassles contribute to an individual's negative affect (Bolger et al., 1989), thus it was important to control for them in the present study.

Implications

Although not all hypotheses were supported in the present study, there is still valuable insight to gain. Past studies have only identified that negative affect is a factor leading to overeating and obesity (Ganley, 1989). To the author's knowledge, there are no studies that attempt to reveal factors that would decrease the relationship between negative affect and increased eating. Since stress and negative affect are commonly encountered on a daily basis, it is logical to identify factors to prevent emotional eating.

Through exploration, some of the results either supported or demonstrated slight trending relationships toward support of the importance of nutritional knowledge and nutrition label use on healthier eating in the context of negative affect. More insight could be gained by implementing the suggestions given for future research. Therefore, the present study could be a good starting point for future studies to build off of.

Future studies similar to this one are important for developing health policies and programs aimed at reducing obesity by promoting healthier food consumption decisions. Findings from these studies could provide insight as to areas that need to be focused on. For example, since nutritional knowledge was related to healthier eating habits, there could be a push for more public education programs on nutrition. Findings could also lead to more government health policies to inform the public about the food they are consuming. For example, current FDA policies (FDA, 2015) are in the process of implementing mandatory nutrition labeling on all food (such as point of purchase, fast food, and sit down restaurants), which could encourage healthier eating.

Last, this concept of nutrition literacy appears to be an important concept surrounding healthy behaviors. As this study attempted to demonstrate, it is important to not only have nutritional knowledge but also implement it in daily activities, such as label usage. A more comprehensive education program could be designed to teach people about the importance of nutrition and as well as how to read and decipher nutrition labels and incorporate them into everyday life. It is important to continue to search for solutions in order to tackle this worldwide problem of obesity.

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Tables

Table 1

Summary of Demographic Questionnaire

Variable	n	%	Mean(SD)	Range
Age	57		19.52(2.41)	18-32
Race				
White/Caucasian	36	63.2		
Black/African American	5	8.8		
Asian	4	7		
Mixed/Other	12	21.1		
Gender				
Male	37	64.9		
Female	20	35.1		
Eaten Today				
Yes	41	70.7		
No	17	29.3		
Minutes since Last Snack	56		370.02 (303.35)	105-1440
BMI	57		24.78 (4.98)	17.55-44.93

Table 2

Summary of Mean Calorie, Fat (g), Sugar (g), and Sodium (g) Consumption and the Break-Down for each Food Category

	Mean	Std. Deviation
Total Calories consumed	196.14	149.41
M&M's	53.28	81.23
Lay's Potato Chips	47.20	51.40
Triscuit	39.72	47.66
Grapes	55.95	28.034
Total Fat Consumed	6.64	6.31
M&M's	2.28	3.48
Lays Potato Chips	2.95	3.21
Triscuit	1.16	1.39
Grapes	0.25	0.12
Total Sugar Consumed	20.67	14.08
M&M's	6.84	10.43
Lay's Potato chips	0.30	0.32
Triscuits	0	0
Grapes	13.53	6.78
Total Sodium Consumed	0.12	0.10
M&M's	0.01	0.02
Lay's Potato chips	0.05	0.05
Triscuit	0.06	0.07
Grapes	0	0

Note. Total Calories Consumed and calories consumed for M&M's, Lay's, Triscuits, and grapes are measured in kilocalories (kcal). All fat, sugar, and sodium consumed calculations are measured in grams (g).

Table 3

Post Negative Affect Scores and Negative Affect Change Scores for Individuals Whose Negative Affect Increased, Remained the Same, and Decreased.

		Post Negative Affect Scores				Negative Affect Change Score			
Negative Affect	*n*	*M (SD)*	*Min*	*Max*	*Range*	*M (SD)*	*Min*	*Max*	*Range*
Total	57	15.96 (5.55)	10	31	21	0.69 (5.19)	-14	17	31
Increase	27	17.63 (6.23)	11	3	20	4.22 (4.80)	1	17	16
Unchanged	8	12.38 (2.33)	10	17	7	0	0	0	0
Decrease	22	14.52 (4.68)	10	25	15	-3.39 (3.11)	-1	-14	13

Note. Post Negative Affect Scores = negative affect subscale from the PANAS after film clip, Negative Affect Change Score = score participant received after subtracting their pre-PANAS negative affect score from their post-PANAS negative affect score, total = complete study sample, increase = participants whose negative affect increased, unchanged = participants whose negative affect did not change from pre- to post-PANAS assessment, decrease = participants whose negative affect score decreased.

Table 4

Bivariate Correlations between Potential Covariates, Predictors, and Outcomes (N=57)

		1	2	3	4	5	6	7	8	9	10	11	12
1	BMI												
2	Hunger	-0.05											
3	Cognitive Restraint	.31*	-0.18										
4	Uncontrolled Eating	0.20	.26*	-0.05									
5	Emotional Eating	0.13	-0.01	0.02	0.26								
6	Daily Hassles	-0.05	0.10	0.13	.29*	0.02							
7	Negative Affect	0.01	0.08	-0.06	0.18	-0.06	.40**						
8	Nutritional Knowledge	-0.12	-0.11	0.04	-0.07	0.15	0.06	0.07					
9	Perceived Stress	0.04	0.13	-0.04	0.10	0.16	.35**	.57**	-0.08				
10	Calories Consumed	0.21†	0.22†	-0.04	0.19	0.11	-0.04	0.22	0.05	0.11			
11	Fat Consumed	0.23†	0.25†	-0.08	0.17	0.09	-0.10	0.20	0.04	0.06	.97**		
12	Sugar Consumed	.31*	0.09	0.04	0.19	0.11	0.04	0.24†	0.00	0.09	.88**	.80**	
13	Sodium Consumed	0.07	.30*	-0.09	0.17	0.09	-0.03	0.19	0.08	0.14	.91**	.87**	.61**

Note. *p < .05, **p < .01, ***p<.001, †p<.10 BMI = Body Mass Index, Hunger = self-reported hunger at time of study, Daily Hassles = score from the Daily Hassles assessment, Negative Affect = post PANAS negative affect score, Nutritional Knowledge = total nutritional knowledge score, Perceived Stress = self-perceived stress rating after watching film clip, Calories Consumed = total amount of calories consumed, Fat consumed = total amount of fat in grams consumed, Sugar Consumed = total amount of sugar in grams consumed, and Sodium Consumed = total amount of sodium in grams consumed.

Table 5

Hierarchical Multiple Regression Analysis Predicting Total Calories Consumed Using Negative Affect and General Nutritional Knowledge

Predictor	β	R	R^2	Δ
Step 1: Covariates		0.32	0.11	0.10
BMI	0.23†			
Hunger	0.24†			
Daily Hassles	-.17			
Step 2: Negative Affect		0.42	0.17	0.06
Negative Affect	0.26*			
Step 3: General Nutritional Knowledge		0.42	0.17	0.01
General Nutritional Knowledge	0.1†			

Note. *p<.05, **p<.01, ***p<.001, † p<.10

Table 6

Hierarchical Multiple Regression Analysis Predicting Total Calories Consumed Using Negative Affect and Participants Label Status

Predictor	β	R	R^2	Δ
Step 1: Covariates		0.32	0.10	0.10
BMI	0.21†			
Hunger	0.23†			
Daily Hassles	-.16			
Step 2: Negative Affect		0.41	0.17	0.06
Negative Affect	0.28*			
Step 3: Label Status		0.41	0.17	0.09
Label Status	0.06†			

Note. *$p<.05$, **$p<.01$, ***$p<.001$ † $p<.10$

Table 7

Summary of Total Calories Consumed For Label and Non-Label Groups for both High Nutritional Knowledge and Low Nutritional Knowledge

		Total Calories Consumed	
Variable		Mean	Std. Deviation
Low GNK			
	Label	196.18	115.03
	Non-Label	182.1	132.68
High GNK			
	Label	171.64	132.13
	Non-Label	195.45	123.9

Note. Low GNK= Low General Nutritional Knowledge, High GNK= High General Nutritional Knowledge.

Figures

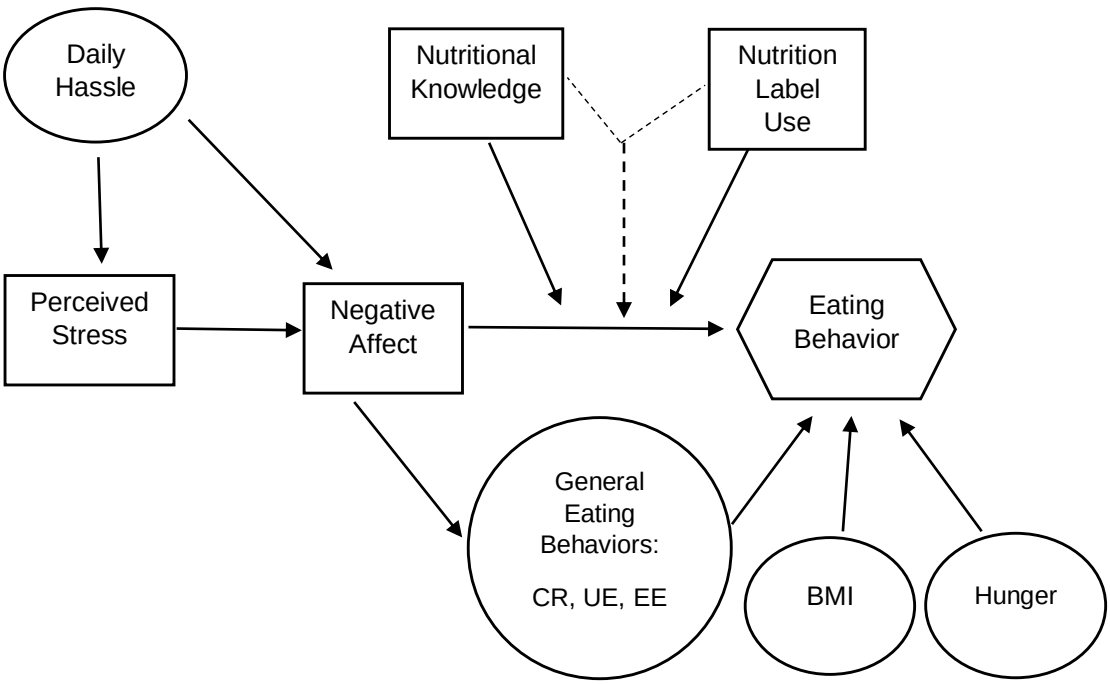

Figure 1. A theoretical model. Circles denote covariates, rectangles denote predictor variables, and the hexagon denotes outcome variable. Solid arrows indicate a relationship with a variable. Dashed lines indicate an interaction between variables. Perceived stress = perceived stress following film clip. CR = Cognitive Restraint. UE = Uncontrolled Eating. EE = Emotional Eating. Eating Behavior = total calories consumed and grams of total fat, sugar, and sodium consumed. BMI = Body Mass Index. Hunger = perceived hunger at the time of the study.

Appendix A

Measures

Demographic Questionnaire

We would like to know some general background information about you as an individual. Please complete the following questions and mark your answers as indicated. Also, keep in mind that your answers are kept strictly confidential and do not require your name or contact information.

Age _____

Gender

☐ Male ☐ Female

Race

☐ White/Caucasian ☐ Black/African American ☐ Asian

☐ Pacific Islander ☐ American Indian/Native American ☐ Mixed/Other

If you chose mixed/other above, with which race do you identify most?

☐ White/Caucasian ☐ Black/African American ☐ Asian

☐ Pacific Islander ☐ American Indian/Native American ☐ Mixed/Other

Medical History

Have you ever been diagnosed with an Eating Disorder? ☐ Yes ☐ No

Have you ever been diagnosed with any food allergies? ☐ Yes ☐ No

Have you ever been diagnosed with diabetes? Yes ☐ No ☐

Have you been sick in the last 24 hours? ☐ Yes ☐ No

Have you experienced a fever in the last 24 hours? ☐ Yes ☐ No

Health Questions

How often do you exercise? Everyday ☐ 5-6 times/week ☐ 2-3 times/week ☐ 1 per week Never

On average, how many minutes per week do you spend exercising? _____

Are you more likely to engage in:

☐ Aerobics or ☐ Weight Lifting

Have you eaten today? ☐ Yes ☐ No

How long ago was your last snack/meal? _____ Hours _____ Minutes

Physiological State Questionnaire

Please rate the following. Choose a number.

How hungry do you currently feel?

Not hungry	1	2	3	4	5 Extremely Hungry

How tired do you currently feel?

Not tired	1	2	3	4	5 Extremely tired

How thirsty do you currently feel?

Not thirsty	1	2	3	4	5 Extremely thirsty

How full do you currently feel?

Not full	1	2	3	4	5 Extremely Full

Food Rating Scale

Please answer the following items regarding the food below.

M&M's

1. **The color of the food is appealing to me.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

2. **The food smells appetizing.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

3. **This is one of my favorite foods.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

4. **I rarely consume this food.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

5. **I enjoy eating this food.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

Potato Chips

1. **The color of the food is appealing to me.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

2. **The food smells appetizing.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

3. **This is one of my favorite foods.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

4. **I rarely consume this food.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

5. **I enjoy eating this food.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

Crackers

1. **The color of the food is appealing to me.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

2. **The food smells appetizing.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

3. **This is one of my favorite foods.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

4. **I rarely consume this food.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

5. **I enjoy eating this food.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

Grapes

1. **The color of the food is appealing to me.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

2. **The food smells appetizing.**

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

3. This is one of my favorite foods.

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

4. I rarely consume this food.

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

5. I enjoy eating this food.

Highly Disagree 1 2 3 4 5 6 7 Highly Agree

Appendix B

Nutrition Label Information

Nutrition Facts: Triscuit

Serving Size: 6 Crakers
Calories: 120
Total Fat: 3.5 g
Saturated Fat: 0.5 g
Trans Fat: 0 g
Sodium: 160 mg
Sugars: 0g
Protien: 3g
Carbohydrate: 20 g
Dietary Fiber: 3g
Potassium: 115 mg

Nutrition Facts: M&M's

Serving Size: ¼ cup
Calories: 210
Total Fat: 9 g
Trans Fat: 0 g
Saturated Fat: 6 g
Sodium: 25 mg
Sugars: 27 g
Protien: 2g
Carbohydrate: 30 g
Dietary Fiber: 1g
Potassium: - mg

Nutrition Facts: Potato Chips

Serving Size: 15 Chips
Calories: 160
Total Fat: 10 g
Trans Fat: 0 g
Saturated Fat: 1.5 g
Sodium: 170 mg
Sugars: < 1g
Protien: 2g
Carbohydrate: 15 g
Dietary Fiber: 1g
Potassium: 350 mg

Nutrition Facts: Grapes

Serving Size: 1 cup
Calories: 62
Total Fat: 0.3 g
Trans Fat: 0 g
Saturated Fat: 0.1 g
Sodium: 2 mg
Sugars: 15 g
Protien: 0.6 g
Carbohydrate: 16 g
Dietary Fiber: 0.8 g
Potassium: 176 mg

Appendix C

Debriefing Document

The real purpose of this study is to assess how nutritional knowledge may influence healthy and unhealthy eating behaviors in the context of personal negative mood. Further the study aims to determine if the presence of nutritional information, specifically nutritional labels, enhances this effect. It is extremely important to keep the purpose of this study to yourself, as this knowledge to potential participants could hinder the results of the study.

Additionally, if you are feeling upset or sad after participation in this study, The Counseling and Support Services Office can be contacted at (313) 593-5430 or you can visit them on the 2nd floor of the University Center at room 2157. Inform them if your concern is urgent and you will be seen immediately.

To learn more about the relationship between eating behavior, negative affect, and nutritional knowledge, please reference the following journal articles:

Graham, D. J. & Laska, M. N. (2012). Nutrition label use partially mediates the relationship between attitude toward healthy eating and overall dietary quality among college students. *Journal of the Academy of Nutrition and Dietetics, 112,* 414-418. doi:10.1016/j.jada.2011.08.047

Gibson, E. L. (2012). The psychobiology of comfort eating: Implications for neuropharmacological interventions. *Behavioural Pharmacology*, *23,* 442-460.

Parmenter, W., & Waller, J. (2000). Nutrtional knowledge and food intake. *Appetite, 34,* 269-275.

Van Strien, T., Herman, P. C., & Verheijden, M. W. (2009). Eating style, overeating, and overweight in a representative Dutch sample. Does external eating play a role? *Appetite, 52,* 380-387. doi:10.1016/j.appet.2008.11.010