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How Do Restaurant Menu Calorie Labeling Requirements and Exercise Impact Consumer Food Decision Making?

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HOW DO RESTAURANT MENU CALORIE LABELING REQUIREMENTS AND EXERCISE IMPACT CONSUMER FOOD DECISION MAKING?

By

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The percentage of the U.S. population that is obese has increased markedly over the past fifty years. Obesity is driven in part by imbalances in energy consumption and expenditures. There are two main behavioral factors that influence that balance: food consumption and exercise. In this thesis, I report the results of two experiments that encompass both food choice and exercise.

The consumption of food prepared away from home is growing rapidly. Since individuals do not control the ingredients in foods prepared away from home, these foods are frequently less healthy than home-cooked foods. The role of calorie labeling for foods prepared away from home is therefore crucial in enabling individuals to know the nutritional value of their foods. The first experiment was a hypothetical sandwich choices experiment, where various calorie labeling formats have been tested to determine whether there is a more effective alternative. We discovered that calorie labeling formats that demonstrate how many calories can be saved from choosing a certain ingredient was the most effective. We also found that there is a negative correlation between calories ordered and subjects' frequency of utilizing other food labels.

The second experiment was a food and exercise choice study where participants' snack choice was recorded under two different conditions: before and after workout. We found that the timing of when the choice is made influences individuals' food choice.

People are more likely to choose a lower calorie snack before the workout, and more likely to pick a higher calorie snack after the workout, even though snacks were received after the workout in both cases. Age, gender and BMI were other variables that also influenced snack choices.

I would like to dedicate this thesis to my late father, Ravshan Habibovich Rakhmatullaev. This one is for you Papa.

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TABLE OF CONTENTS

CHAPTER 1: THESIS INTRODUCTION

1.1 **Statement of the Issues**

In the United States the most recent data estimates that 39.6 percent of adults are obese and among youth under 19 years of age, the obesity rate is 18.5 percent (Hales et al., 2018). Over the past few decades, the obesity rate has been steadily increasing, creating a greater need for healthcare. The increasing demand for healthcare is linked to obesity-related health complications. For instance, obesity can lead to certain types of diabetes, cancer and heart disease (U.S. Department of Health and Human Services, 2013). Cawley and Meyerhoefer (2011) report that medical expenditures among obese individuals are about 150 percent higher than among healthy weight individuals.

Along with health risks, obesity can cause economic and financial burdens, such as increased insurance premiums and missed workdays, and is associated with lower income jobs (Trogdon et al., 2008). A study conducted by Cawley (2004) compared the relationship between wages and weight of various individuals by using data from multiple national surveys which included individuals' weight, wage rate, occupation, residence area and which racial group the individual belonged to: white, black or Hispanic. Cawley (2004) found that members of any of the three racial groups who were in the normal weight range had a better chance of getting a higher income job than their obese counterparts and identified a negative correlation between weight and education level, a finding corroborated by Liu et al. (2014). Correlation among income, education, and weight status means that a larger percentage of the obese population typically resides in areas with limited access to fresh, healthy food—these areas are frequently referred to as food deserts—and that lack infrastructure such as bike paths and recreational centers

(Jackson et al., 2005). Instead convenience stores and fast food restaurants offering foods that predominantly have low nutritional value frequently dominate these areas.

While obesity is influenced by numerous forces, some of which, like genetics, are beyond individuals' control, there are two important behavioral factors that increase the risk that people become obese: food consumption and exercise. As explained by Qi and Cho (2008), the shift towards an imbalance between an increased amount of energy intake and decreased time dedicated to physical activity has been one of the main reasons that the obesity rate in the United States has been increasing in the past decades.

The reason behind such an imbalance lies in two factors: first, sedentary lifestyles that people have adopted with the ever-growing popularity of TVs, computers, smartphones and convenient transportation that requires minimal physical activity. The second reason is the dietary shift toward foods that are high in carbohydrates, sugar and saturated fats and increases in the frequency of snacking, frequently while engaging in a passive pastime such as watching television (Qi and Cho, 2008). Obesity is partially the reason why the Nutrition Labeling and Education Act (NLEA) was enacted in 1994. This law was specifically put in place to provide consumers with reliable nutrition information in order to help them make healthy food choices that could positively affect overall wellbeing (Cowley and Variyam, 2008). Additionally, a number of studies determined that consumers who are familiar with the impact that poor diets have on health are more likely to utilize nutrition facts labels and make better food choices that result in a reduced risk of acquiring diet-related diseases (Arsenault, 2010).

1.2 **Objectives of the Thesis**

The first objective of this thesis lies in two parts. The first is to examine whether and how the current format of proposed menu labeling policy FDA-2011-f-0172 which was introduced as a part of the Affordable Care Act and carried out by the Food and Drug Administration (FDA) impacts consumers' food choice in a build-your-own sandwich setting (FDA, 2014). The second part is to evaluate whether other formats of calorie labeling can make the policy more effective. The policy requires restaurants and other retail food businesses with 20 or more locations to display calorie information for food and beverage items as well as suggested daily calorie intake on the menu boards (FDA, 2014). It is designed to provide consumers with nutritional information so that they can make fully informed dietary decisions when purchasing prepared meals at chain restaurants and other retail food businesses.

For the purpose of this thesis, an online experiment was conducted through Amazon Mechanical Turk (MTurk), which is an online marketplace that links employers who need various tasks that require a certain level of human intelligence with workers—individuals who complete these tasks for monetary compensation (Casler et al. 2013). This particular experiment was designed to imitate a realistic meal decision-making scenario, where the subjects need to pick out ingredients to construct a sandwich under four different conditions, which will be discussed in further detail in the experimental methodology chapter. The motivation for conducting an online survey through Amazon Mechanical Turk is to capture a larger and more diverse segment of the population than would be obtained by conducting surveys on campus where the majority of participants would be college students. One of the main objectives of the study is to determine whether the policy needs to be reformulated in order to increase its impact. Another purpose of this research is to determine how subjects who come from different demographic backgrounds and with varying BMIs respond to calorie labels.

The second objective of this thesis is to determine whether the timing of snack choice—occurring either before or after exercise—among exercisers at a campus recreational center influences subjects' snack choice. This experiment was conducted at the University of Nebraska-Lincoln campus recreational center. Additionally, subjects' BMI, gender, age, and exercise type are assessed and compared with the choice of a snack in order to see what influences subjects' choice in each condition.

CHAPTER 2: CALORIE LABELING EXPERIMENT

2.1 **Introduction**

Since the NLEA was implemented in 1994, consumers have had full access to nutritional information about the packaged food components of the meals they prepare at home. However, when it comes to food away from home (FAFH), establishments have historically had full control over what information to disclose. After years of delay, a menu-labeling requirement that was introduced as a part of the Affordable Care Act went into effect on May 7, 2018. The law requires that sit-down, drive-through and take-out restaurants, vending machines, salads and hot food bars at grocery stores and restaurants, shops and delicatessens serving custom sandwiches and other food, coffee shops, and ice-cream stores with 20 or more locations list calorie information for foods and beverages, as well as have information about other important nutrients available on premise (FDA, 2018). This law makes it easier for consumers to learn about the nutritional quality of foods that they consider consuming.

However, studies on consumers' food choices from places like New York City that introduced early versions of restaurant nutritional labeling laws suggest that nutrition information will have minor effects on the nutritional value of foods consumed (Elbel et al., 2009, Cantor et al., 2015). The main purpose of this research is to determine whether alternative approaches to presenting this information to consumers would be more effective in promoting healthy food choices.

2.2 **Literature Review**

Compared to fifty years ago, the amount of money spent on FAFH has doubled (Mancino et al., 2009; USDA, 2016). In 2014, U.S. households allocated around 50.1

percent of their food budget towards FAFH on average (USDA, 2016), which is up from the 42 percent spent on FAFH in 2007 (Mancino et al., 2009). Such a drastic increase in consumption of FAFH brings about greater risks of obesity among the U.S. population. According to Mancino et al. (2009) food consumed away from home not only increases the number of calories consumed but also negatively influences intake of other important dietary nutrients. FAFH is high in sodium, added sweeteners and saturated fat, and low in whole grains, calcium and vegetables on average (Mancino et al., 2009). By comparing total caloric intake of meals eaten away from home by obese and normal weight individuals, they also concluded that increased caloric density of meals eaten away from home is driven primarily by food choices of obese individuals. On average, a meal away from home would add as many as 240 extra calories to obese individuals' daily caloric intake as opposed to fewer than 90 extra calories for normal weight individuals. This is due to the fact that obese individuals are less likely to reduce or adjust their caloric intake on their next meals throughout the day after consuming a high calorie meal away from home (Mancino et al., 2009).

Lin and Guthrie (2012) discovered that consumers who ate FAFH on a regular basis were lacking crucial dietary elements such as fiber and calcium in their diets as a whole. They found that fast-food restaurant meals provide on average 13.5 percent of total daily recommended saturated fat, while sit-down restaurants provide 11.9 percent, and home-prepared meals contain only 10.7 percent. In addition, they also found that the cholesterol density of foods offered at fast-food and full-service restaurants was considerably higher—about 144 mg and 206 mg per meal respectively—than homemade meals, which had an average cholesterol density of 126 mg.

Both Mancino et al. (2009) and Lin and Guthrie (2012) found that on average individuals consume more when dining away from home. Mancino et al. (2009) estimated that individuals consume around 480 more calories per day when eating FAFH for all meals as opposed to consuming all home-cooked meals. This is equal to an additional 2 pounds a year for every FAFH meal consumed per week.

With the increasing popularity of FAFH and the negative impacts associated with higher calorie and lower nutrient meals, Mancino et al. (2009) suggested that consumers could benefit substantially if certain calorie and nutrition labeling requirements were instituted among restaurants and retail food establishments. However, several studies have found evidence that calorie labeling does not guide consumers towards ordering meals with fewer calories (Elbel et al., 2009; Finkelstein et al., 2011). Despite such findings, there are a number studies where consumers reported finding calorie information useful and relevant when making their meal decisions at restaurants (Dumanovsky et al., 2011; Krieger et al., 2013; Cantor et al., 2015). In addition, there is evidence that certain calorie labeling formats such as, for instance, highlighting low calorie options or traffic light calorie labeling can significantly influence consumers' decision making (Liu et al., 2012; Hammond et al., 2013; Policastro et al., 2015).

Therefore, one of the main goals of this research is to determine and test whether various formats of calorie information that are not currently utilized can be more effective in impacting consumers' decision making about FAFH consumption. For the purposes of this thesis, different tactics such as displaying the relative amount of calories saved or added in comparison to a baseline ingredient will be utilized. These tactics will be used to test whether changing the way in which calories of ingredients are presented influences consumers' decision-making.

One of the ways in which individuals can benefit from labeling requirements is by being able to assess the nutritional quality of the meals purchased at restaurants. Obese individuals specifically face a higher risk of gaining weight from consuming meals away from home (Mancino et al. 2009). Hence, overweight and obese individuals can significantly benefit from nutrition and calorie labeling policies that aid in making healthier food choices when consuming food at restaurants and other FAFH establishments. In addition, consumers on a diet may find it helpful to have nutrition and calorie information available at food retail locations in order to be able to accurately account for the calories consumed and their preferences when dining away from home. Calorie labeling requirements may encourage businesses to restructure their menus and offer healthier choices to attract a different segment of consumers who are more health conscious and open up a new niche for themselves (Variyam, 2005; Bleich et al., 2015). Therefore, multiple groups of consumers may benefit from nutrition labeling requirements, as restaurants may begin to replace higher calorie meals with similar lower calorie options that will be accompanied by adequate nutritional information (Namba et al., 2013; Bleich et al., 2015).

There has been an extensive literature dedicated to nutrition labeling. This includes research on policies that had been put in place before the passage of the menu labeling policy, such as the Nutrition Labeling and Education Act (NLEA), which was implemented in 1994 and required most packaged food products to carry a nutrition facts panel. Prior to the passage of the Affordable Care Act, a few local governments—such as

New York City and King County, Washington—passed legislation requiring nutritional labeling in restaurants. A few studies have been conducted both in the field and in the lab to test the impact of calorie labeling in FAFH environments.

For instance, a field study conducted by Elbel et al. (2009) in New York City, right before and shortly after the calorie menu-labeling policy was implemented, took place at fast-food establishments in low income, minority neighborhoods. The results were compared to a control group of fast-food restaurants located in neighborhoods with similar characteristics in Newark, New Jersey where the policy had not been implemented. In both groups, customers had to answer a short list of questions and submit their receipts to the researchers for a participation reward.

Elbel et al. (2009) found no significant change in calories purchased in New York City after the policy was implemented; however, 27.7 percent of customers stated that they had utilized the calorie information when purchasing their meals. Cantor et al. (2015) conducted follow-up research five years later with the same experiment structure: collecting customer receipts and survey responses. The experiment took place during three separate periods of time from 2013 to 2014 and in the same fast-food restaurants in New York City and Newark. Cantor et al. (2015) compared the data from 2013-2014 to 2008 and found that customers still reported seeing and using the calorie information when making their meal choices in 2013-2014. However, the number of customer seeing the labeling information decreased over time. In 2008 during the first trial of the experiment, 51 percent of customers in the post-labeling group reported seeing the calorie information. During the 2013-2014 study, that number decreased over the course of three periods from 45 percent in the second trial, to 41 percent in in the third trial and to 37 percent in the last period of data collection. On the other hand, the percentage of customers who reported utilizing the calorie information to order fewer calories stayed relatively stable over the 2013-2014 period. However, when compared to 2008 data, the percentages decreased for both indicators, from 13 percent to 11 percent for using the labels and from 12 percent to 9 percent for using the labels to order fewer calories.

The results obtained by Elbel et al. (2009) and Cantor et al. (2015) are consistent with the findings of another study conducted in King County, Washington by Finkelstein et al. (2011). Finkelstein et al. (2011) collected transaction data from locations of a Mexican fast-food chain restaurant within and outside of King County before and after a calorie posting law went into effect in King County only. Finkelstein et al. (2011) examined calories ordered before and after the policy went into effect. The results demonstrated that there was no significant reduction in calories purchased after the law was enacted. While customers at restaurant locations in King County ordered 180 fewer calories when compared to non-King County locations, this was true for both pre and post labeling policy periods. Finkelstein et al. (2011) hypothesized that these results may be due to the fact that residents of King County were already making healthier meal choices and were aware of nutritional quality prior to the labeling law. However, Finkelstein et al. (2011) also note that this explanation may be improbable because consumers can seldom accurately estimate calorie counts and do not tend to utilize online informational resources provided by some fast-food restaurants. Finkelstein et al. (2011) concluded that even though some consumers may find calorie information useful, it has little potential to be instrumental in food decision-making without additional supporting resources.

Apart from the studies conducted in the U.S. there have been a number of studies conducted in other countries, such as Canada, that have similar labeling requirements. A study by Hammond et al. (2013) focused on how different types of menu labeling can impact meal ordering and how much of the ordered meals individuals actually consume. The experiment took place in the Waterloo Region, Ontario, with 635 participants who ranged from 18 to 65 years of age. The true purpose of the study was masked from the participants, which instead was presented as research related to the local lifestyle in order to prevent self-selection bias. The subjects were told that they would be rewarded with $20 for participating in a lifestyle survey and in addition would get a meal from Subway since the experiment took place during a time that many eat their evening meal, at 6 pm on weeknights. The participants were not allowed to take leftovers home, which allowed research assistants to weigh the leftover food and determine how much the participants actually consumed. In addition, participants were asked to complete another survey after finishing their meal in which they reported how they utilized the nutrition information from Subway menus and whether it had any impact on their meal decision-making.

Hammond et al. (2013) tested four different conditions: 1) no calorie information, 2) calories information only, 3) calorie information with traffic light color coding and 4) multi-traffic light with color coding of primary nutrients such as calories, fat, sodium and sugar. The traffic light symbols used were green, classifying an item as healthy, yellow, or moderately healthy, and red, which indicated an unhealthy item. The subjects were placed in one of the four conditions randomly and were given the appropriate menu for each condition. Hammond et al. (2013) found that subjects reported being most influenced by the information in the Calorie Traffic Light condition; however, the fewest number of calories ordered and consumed were recorded in the Calorie Only condition.

In this study, Hammond et al. (2013) tested various menu-labeling techniques and tried to determine whether more information had a larger impact on consumers when choosing their meals. They found that more information on menus had very little impact on consumer meal ordering and on calories consumed. Despite this finding, Hammond et al. (2013) also concluded that displaying even some basic nutrition information could be useful to some consumers when making their meal decisions as well as aiding in the ability to recall and acknowledge how many calories they ordered. As discussed earlier in the chapter, the issue of overeating and not being able to adjust their calories after eating out is one of the biggest issues when it comes to eating FAFH, especially for overweight consumers (Mancino et al., 2009). Hammond et al. (2013) also discovered that both the number of calories ordered and consumed were lower in conditions where at least calorie information was available. Actual calories consumed were lower by about 11 percent in all conditions in which at least calorie information was available compared to the control condition.

A similar, laboratory study was conducted by Roberto et al. (2010), though this research included a follow-up survey the next day. This approach was taken to determine whether displaying calories only might leave consumers under the impression that they had consumed fewer calories when eating a FAFH meal and with a belief that they have an “allowance” to eat more later in the day. The first part of the study took place around 5:30 PM and all the participants were asked to not consume any food after 2:30 PM in order to feel hungry enough to make reasonable meal selections.

The participants were assigned to one of the three following calorie labeling menu conditions: 1. No calorie information, 2. calorie information, and 3. calorie information with a suggested daily caloric intake statement, “The recommended daily caloric intake for an average adult is 2000 calories.” The menu comprised food items typically found at fast food restaurants such as sandwiches, French fries, pizza, and cheesecake. Participants were asked to pick out anything they wanted to eat, mimicking a restaurant visit, but were told that they could not take anything home. The food was weighed before it was given out and the leftovers were weighed afterwards in order to calculate the actual calories consumed. During the second part of the experiment, participants were asked to return the following day to perform a dietary recall of the food that they consumed after the study meal.

Roberto et al. (2010) found that subjects in the calorie only condition did indeed consume almost as much during a subsequent meal later in the day as the participants in the control condition. However, there was no significant difference in the calories ordered and consumed during the study meal between the calorie only and calorie plus suggested daily caloric intake condition. In the calorie only condition, participants ordered 1862 and consumed 1334 calories on average, while in the calorie plus suggested daily caloric intake statement condition 1860 calories were ordered and 1256 consumed on average. In the control condition, 2189 calories were ordered and 1458 consumed. After the participants recalled the food they consumed following the study meal, the results illustrated that even though in the two calorie information conditions combined participants consumed about 14 percent less food than in the control condition, this did not necessarily translate into a lower intake of calories for the entire day.

There was no significant difference in the total calories consumed during and after the study meal between the control condition and the calorie only condition. During and after the study meal, participants in the control condition consumed 1630 calories and in the calorie-only condition 1624 calories were consumed. In the calories plus daily suggested calorie intake condition participants consumed significantly fewer calories: 1379. Roberto et al. (2010) pointed out that a decrease of this magnitude could lead consumers to healthier FAFH consumption and have a positive effect on health. The evidence presented by Roberto et al. (2010) demonstrates that calorie labeling can have an effect on consumption beyond the point of purchase, and the way in which this information is presented is of great importance.

A study conducted by Policastro et al. (2015) compared and analyzed whether modifying and manipulating sandwich ordering forms would motivate consumers to change their food choices. This was a field study that took place at a university dining hall sandwich take-out counter one night per week, over a course of eight weeks. College students placed 9765 sandwich orders. Policastro et al. (2015) tested two conditions: the control condition in which regular sandwich ordering forms were used and the test condition with a modified version of the ordering form. In the test condition, healthier toppings were made more salient by placing a star next to them, increasing the font size and placing them at the top of each category.

Apart from testing if consumers would pick healthier toppings on the modified forms more often than on regular order forms, Policastro et al. (2015) also looked at the possibility that consumers might compensate for a healthier choice in one category by selecting a less healthy option in another category. The prediction was that consumers would pick healthier toppings in the experimental group compared to the control group. For the purposes of this experiment, Policastro et al. (2015) designated healthy toppings as toppings with higher fiber content (if applicable), lower in fat, sodium and containing a reduced number of calories. The consumers did not know that they were taking part in this experiment and merely placed their orders like they normally would and the sandwich counter staff saved the order forms for further examination by the researchers.

Policastro et al. (2015) performed a within and between subject analysis in this experiment by comparing the choices of toppings within each category and by comparing the order forms collected in both conditions. The results of this experiment confirmed the hypothesis: the diners did pick healthy sandwich toppings more frequently than unhealthy toppings, specifically in bread, meat and condiment sections. However, there was no significant influence on the number of calories, fat and sodium consumed. As proposed by Policastro et al. (2015), this may be due to the rationale that if consumers pick a healthy sandwich for the most part, they may indulge in one or two less-healthy toppings. Another reason why Policastro et al. (2015) believe there was no significant change in the consumption of calories, fat and sodium is due to the fact that the toppings offered did not differ much in terms of nutritional content. For instance, most toppings differed by at most five grams of fat and 100 calories.

Liu et al. (2012) conducted a comparable study to Policastro et al. (2015) by testing various calorie representation formats. However, Liu et al. (2012) gathered data from a pool of online survey respondents, which is similar to the experiment design utilized in this thesis. Liu et al. (2012) conducted an online survey recruiting 456 respondents to make a hypothetical meal choice. Participants were randomly assigned to one of the four menu conditions: 1. Menu without calories; 2. Menu with calories and suggested daily caloric intake statement "The recommended daily caloric intake for an average adult is 2000 calories" listed; 3. Menu with calories listed from low to high with a suggested daily caloric intake statement; 4. Menu with calories and daily caloric intake statement listed along with healthy options color-coded green if entrees were <750 calories, appetizers, sides, desserts <250, and beverages zero calories and red otherwise.

The food items listed on the hypothetical menus were obtained from Chili's Grill and Bar and beverage items were obtained from Applebee's. These restaurants' menu items were used because both are well recognized chain restaurants, the calorie information for most of their dishes were available online and their food items represent both ends of the spectrum offering high- and low-calorie options. All the meal and beverage options were listed along with a price column on the menu under all four conditions to resemble a real-life meal-ordering scenario. After making their meal selections, participants had to estimate the number of calories they ordered and answer a series of questions on menu labeling and general demographics.

The results of the experiment illustrate that compared to the no-calorie condition, the rank-ordered and color-coded menu conditions led participants to order between 150 and 300 fewer calories. Even in the calories-only condition, participants ordered about 84 fewer calories when compared to no-calorie condition. Participants' estimates of ordered calories were also compared among the conditions, and the results resembled that of the actual calories ordered. That is, participants in all three conditions where some kind of information was given were able to predict ordered calories more accurately. However, again, under the color-coded menu condition, participants were most accurate at predicting calories ordered.

As for the results regarding the menu labeling opinions, nearly 80 percent of participants were in favor of restaurants displaying calorie information on menus, and 75 percent of participants were also in favor of restaurants indicating healthier meal options. Additionally, 35 percent of participants who were assigned to a condition with some calorie information indicated that it influenced their meal choice. Based on the results of their research, Liu et al. (2012) suggested that presenting calories in a low to high order and adding color coding on menus would be more effective compared to solely displaying calories on menus.

The results observed by Liu et al. (2012) are consistent with findings from a study conducted by Morley et al. (2013). Morley et al. (2013) studied consumers in Australia, where a similar calorie-labeling provision has been proposed in a number of states. Morley et al. (2013) administered an online survey where participants had to make a hypothetical meal selection from menus with common fast food items offered. The participants were adults, who dined at fast food restaurants at least once a month and resided in Victoria, Australia. They were assigned to one of the five menu conditions: 1) no labeling menu, 2) Kilojoule (kj) labeled menu, 3) kj and percent daily intake (DI%), 4) kj and traffic light menu labeling, and 5) kj, traffic light and DI% labeled menu. For the traffic light labeling, Morley et al. (2013) utilized the UK Food Standards Agency criteria to label items “red” for least healthy choices; “amber” for OK choices and “green” for healthier choices (UK Food Standards Agency, 2007).

After being assigned to a particular menu, the subjects were asked make a dinner meal selection and were able to pick as many as three items from the main dishes and sides, and up to two items from desserts and drinks, and overall had to pick at least one item. Apart from making a meal selection, participants were also asked to indicate what information influenced their dinner selection i.e.: price, kj, percent daily intake, or color code labels. In addition, participants were also asked if they utilized the nutritional labeling information on items purchased at grocery stores.

The results of this experiment indicate that participants who were assigned to conditions with kj or kj plus traffic light labeling selected meals with about 11 percent less mean energy content or a reduction of about 120 calories per condition. In the condition kj plus DI%, they also recorded a slight decrease in the energy content of the hypothetical meal chosen compared to the control condition. However, the kj of meals selected in experimental conditions did not differ significantly from the control condition.

Morley et al. (2013) attributed this outcome to the fact that menu labeling can positively affect consumers when making a choice of FAFH, although it is important to understand that an overabundance of information can be hard to grasp all at once. Hence, the way in which nutritional information is presented is crucial for consumers. If it is difficult to interpret, it may confuse consumers and lead them not to use any of the provided information when choosing their meals. In addition, 37 percent of participants (out of 1035 participants) in all conditions where at least some kind of nutrition information or labeling was displayed stated that they utilized parts of the information provided, which is similar to the result reported by Liu et al. (2012).

Long et al. (2015), through a review of different studies on menu labeling, concluded that further research should be conducted to determine whether various formats of calorie labeling indeed have a different impact on consumer decision-making of FAFH. Past studies provide a solid groundwork for our study, which focuses on food choice in a sandwich-ordering task, in which consumers select from multiple categories of ingredients. Consumers who incorporate FAFH as a part of their weekly or even daily routines may benefit from the availability of nutrition information, which might help them avoid becoming obese and experiencing other obesity-related health related issues.

2.3 **Experimental Methodology**

In this research we tested four calorie labeling conditions. The four conditions were: 1) Control condition, in which ingredients were presented without any calorie information; 2) a condition with calories listed alongside ingredients; 3) a condition in which the highest calorie ingredient within each category was listed with full calorie information and the remaining ingredients were listed with the number of calories that could be saved if chosen instead of the highest calorie item; and 4) a condition in which the lowest calorie ingredient within each category was listed with full calorie information and the remaining ingredients were listed with the number of calories that would be added if chosen instead of the lowest calorie item. For ease of reference the conditions will be referred to as follows: 1) Control, 2) Full Calorie, 3) Calorie Minus and 4) Calorie Plus. The reason behind testing the Calorie Minus and Calorie Plus conditions is mainly due to the fact that in some of the past studies (Liu et al., 2012, Morley et al., 2013) participants picked fewer calories in conditions where additional nutrition and calorie related information was displayed.

The ingredients utilized in this hypothetical sandwich choice experiment represent that of a typical sandwich shop with the following categories: bread, spread/dressing, cheese, meat/protein, and vegetables (see Table 2.1). To be able to test all four conditions and obtain a diverse sample of responses, we conducted a hypothetical sandwich choice experiment through Amazon Mechanical Turk. As suggested by Casler et al. (2013) the anonymity of online data collection makes such surveys more advantageous relative to in-person experiments since participants are less likely to lie as their identities would not be revealed. Additionally, studies conducted by Liu et al. (2012) and Morley et al. (2013) serve as suitable examples of the use of an online hypothetical choice experiment to assess various formats of menu labeling.

A total of 689 participants filled out the survey through MTurk between April 24th and May 3rd of 2018. Apart from picking a hypothetical sandwich, participants also completed a survey consisting of questions about demographic variables, food habits and preferences, diet, basic nutrition concepts and risk and loss aversion questions. The participants were individuals from the U.S., at least 19 years of age, and from different educational and professional backgrounds. The suggested completion time of the survey was between 5-10 minutes. All of the participants who successfully completed the survey and the food choice exercise were paid $3.00 through MTurk. The amount of the reimbursement is comparable to that suggested by Buhrmester et al. (2011) which is about $0.30 per minute.

This hypothetical sandwich choice experiment comprised a between-subject analysis of different calorie labeling formats. Each participant was randomly assigned to only one of the four conditions, where they were able to pick at most one ingredient per category (though they could choose not to add an ingredient from any category). This stipulation was included to reflect limitations placed on shoppers in many real-life sandwich restaurants if the shopper does not want to incur charges for extra ingredients. All participants also completed an identical demographic survey. All four layouts of the conditions for the sandwich choice exercise and full list of demographic questions can be found in the Appendix and Tables and Figures section for further reference.

2.4 **Data and Modeling**

Table 2.2 illustrates the data characteristics of this experiment. The average age of participants in this study was between 36 and 37 years; the median age was 34, which is slightly less than the U.S. Census Bureau (2018) data from 2017 annual estimates reporting the median age of the U.S. population to be 38 years old. As for the ethnicity, 75 percent of participants identified themselves as white (does not include Hispanic and Non-Hispanic whites) which is representative of the general U.S. population according to U.S. Census Bureau (2018) estimates. There was about an equal number of female and male subjects, which is also representative of the current population sample as reported by the U.S. Census Bureau (2018). The mean BMI was 27.35, which is considered to be an overweight point in the index according to the U.S. Department of Health and Human Services (2013). In the past, studies have found that BMI calculated from subjects' self-reported data is likely to be lower than BMI calculated from objectively measured data (Cawley and Meyerhoefer, 2011).

Additionally, as indicated by Liu et al. (2014) and Levy et at. (2012) individuals from low income households that lack post-secondary education are more likely to be overweight or obese. According to our data, 44.16 percent of participants reported having household income below $40,000, which indicates that our sample consisted of a larger number of individuals from lower income households. When comparing to the U.S.

Census Bureau (2018) data, only about 27 percent of the population earns less than $40,000 per household, per year. In terms of education, 55.40 percent of our participants reported completing a two-year Associates degree or less, while the number for the U.S. Census Bureau (2018) sampled population is much higher, at 70 percent. Furthermore, participants also reported their use of nutrition labels in retail food settings. Only around six percent indicated that they never use Nutritional Facts Panels and 66 percent indicted using it at least sometimes or most of the time.

A linear regression model was utilized for this experiment to analyze the data and test the relationship between the dependent variable—calories ordered—and independent variables such as condition, gender, age, BMI, education and others. Similarly, Finkelstein et al. (2011) and Thorndike et al (2014) used linear regression models to assess the calories purchased per order under conditions tested.

The calories ordered per subject per condition can be expressed as the following function:

$$calordered_i = \beta_0 + \beta_1 condition_i + \beta_2 Gender_i + \beta_3 Age_i + \beta_4 BMI_i + \beta_5 Calestimation_i + \beta_6 Education_i + \beta_7 NFP_i + \beta_8 Income_i + \varepsilon_i$$

Here, β_0 denotes the steady state, the *calordered* represents the number of calories ordered by subject i; *condition* denotes which one of the four conditions that subject i was placed into; *Gender, Age, BMI, Education* and *Income* are variables that denote the responses provided by the subjects to respective demographical questions; *Calestimation* represents subjects' estimation of calories in their hypothetical sandwiches and *NFP* represents the responses to the question of whether the subjects utilize the Nutrition Facts

Panel when purchasing groceries. The μ_i is the error term, controlling for the unknown variables.

These variables have been used in this model to identify a relationship and determine whether one of these variables affected the amount of hypothetical calories ordered. As has been tested and identified in past by Liu et al. (2014), Trogdon et al., (2008) and Finkelstein et al. (2011) factors like education, income and weight status have an impact on how and what people eat.

2.5 **Discussion of the Results**

The results of this experiment are reported in Table 2.3. Results are comparable to the findings of some of the studies conducted previously. In conditions where all of the ingredients have been listed as potential calories added or subtracted, i.e. with calorie information presented alternatively, the results exhibited lower number of calories ordered. However, only the Calorie Minus condition yielded a statistically significant difference in the hypothetical calories ordered, the value of the coefficient was -30.47, at a $p<0.05\%$ significance level. The negative sign of the coefficient indicates a negative relationship; that is, fewer calories were picked in the Calorie Minus condition. These results are similar to that of Liu et al. (2012) and Morley et al. (2013) who argued that when calorie information is presented in an alternative style, it could be more effective in encouraging people to make healthier and informed choices.

In one of the regression analyses, the relationship between responses to the question whether participants ever utilize other nutrition related labels, such as the Nutrition Facts Panel and hypothetical calories picked was tested. The results illustrate that the participants who sometimes, rarely, and never utilize other nutrition-related information (relative to “always use other nutrition-related information”), are significantly more likely to pick higher calorie ingredients, the value of the coefficients were 31.23 ($p<0.05$), 42.81 ($p<0.01$), and 84.46 ($p<0.001$) respectively. The positive sign of the coefficient indicates a positive relationship; hence more calories were picked when participants responded with “Sometimes”, “Rarely” and “Never” to the question if they utilized the information provided in the Nutrition Facts Panel.

Income yielded somewhat unexpected results. Participants who categorized themselves in the following household income brackets: $20,000 - $39,000, $40,000 - $59,000, $60,000 - $79,999, $80,000 - $99,999 and $140,000 - $159,999 ordered more calories. The results were statistically significant at the 0.05% level for all of these categories. This partially contradicts the findings reported by Liu et al. (2014) and Levy et at. (2012), which suggested that lower income households are more likely to choose high calorie diets. In our study, the fewest number of extra calories picked was by individuals with household income between $20,000 - $39,999, with a coefficient value of 38.51. The highest number of extra calories was chosen by individuals with a household income $140,000 - $159,999 the coefficient value was 67.50. However, participants in the following income brackets: less than $20,000, $100,000 - $119,999, $120,000 - $139,999, $160,000 - $179,999, $180,000 - $199,999 and greater than $200,000 ordered either slightly more or slightly less calories, although these results were not significant.

Next, the participants’ own estimates of the number of calories ordered were tested in relation to the actual calories ordered. A variable Calorie Estimation was created and tested in a linear regression in relation to actual calories ordered. The results exhibit that participants tend to overestimate the number of calories ordered, which could be a good sign. If individuals overestimate the number of calories that they are about to consume, then they are less likely to overeat. Conversely, Finkelstein et al. (2011) discovered that people are likely to underestimate the number of calories ordered or consumed. A regression analysis was performed in order to test the relationship between the calorie estimation variable and the conditions to determine if there was a statistically significant outcome. As a result, participants overestimated the number of calories ordered to a greater extent under the Calorie Plus condition and the results were statistically significant at 0.05% level relative to all other conditions. However, these results can be attributed to the fact that in this study, in at least 3 out of 4 conditions tested, participants had some kind of calorie information available. (fix this, maybe take out)

2.6 **Limitations and Implications for Future Research and Policy**

The main limitation of this study is the fact that the sandwich choices were hypothetical; hence, there is no way to be certain that the choices made in the experiment would reflect participants' choices in a real-life choice setting. Another limitation of this study is that only one type of meal was tested and the results may differ from sandwiches to full meals. Therefore, it would be interesting to see if consumers would still overestimate the calories of the food they pick when faced with real life choices under the same conditions. Additionally, it would also be useful to see how likely subjects are to exchange high calorie ingredients they enjoy for lower calorie ingredients they may not enjoy as much when shown the number of calories that can be potentially saved in a real-life setting.

Despite the sandwich choices being hypothetical, the design of the experiment still allowed us to test various calorie labeling formats to determine if there could be a more efficient way of displaying calorie information to help consumers make informed decisions. The results obtained from this study illustrate that displaying potential calories saved from picking various ingredients or foods in a meal can be a more effective method that can help consumers make healthy and informed decisions. However, further research is needed to validate the findings of this study. These results could potentially lead towards development of a feature in mobile applications that many chain restaurants already offer to their consumers that would complete a similar task of displaying calories gained or saved from picking certain ingredients or foods.

Apart from testing various calorie-labeling techniques in this research, there was an extensive amount of data gained on subjects' general diet habits and food labeling knowledge and usage. From these responses, it was apparent that participants who do not or occasionally utilize other informational food labels are more likely to order more calories, which could potentially translate to overconsumption of calories. Hence, it is crucial to keep informing and designing educational campaigns to teach the general public, regardless of their household income status, about the importance of utilizing the information that is available about the food that they consume. Consumers should learn and be able to utilize all of the insights that are available to improve their eating habits and diets in order to avoid developing preventable diseases that can lead to negative outcomes.

The main takeaway point of this study is that in accordance with the results from previous studies, there are more impactful calorie labeling strategies that can be implemented to help consumers in making healthier meal decisions. However, not everybody is willing or able to utilize this information for their own benefit, and this is another issue that needs to be addressed. This study is a stepping-stone towards designing a universal calorie labeling technique that could be even more efficient and impactful.

CHAPTER 3: FOOD CHOICE EXPERIMENT

3.1 **Introduction**

Exercise plays a crucial part in maintaining a healthy lifestyle, which goes hand in hand with food consumption. In order to be able to maintain a healthy and sufficient energy balance, it is important after exercise to compensate the body with an appropriate food intake. Despite a strong relationship between exercise and food intake, the regulation of energy balance has not been clearly defined (King et al., 1994). A variety of stimuli trigger people to consume certain foods at certain meals, including pre or post physical exercise. However, little is still known about these stimuli, and whether they can be generalized to explain why and how individuals behave in certain ways towards food. A majority of the past studies concentrate on comparing peoples' appetite pre- and post-workout by manipulating workout types and intensity and the food available to them. In the case of this study, the main objective is to observe subjects' exercise behavior and choice between a high and a low-calorie snack and to determine how they change when the timing of the snack choice is manipulated.

3.2 **Literature Review**

King et al. (1994) suggest that there are various ways in which physical exercise can influence people's dietary behavior. For example, physical activity may contribute to a reduced desire to consume food, which is also known as exercise induced anorexia, that leads to a negative energy balance. Conversely, engaging in physical activity may trigger the appetite and boost the amount of food consumed to replenish the energy that was utilized, which leads to a neutral energy balance. Finally, positive energy balance is a result of overconsumption of food due to an increased longing for additional energy intake that is triggered by physical exercise.

In two studies conducted by King et al. (1994), an all-male subject pool had to perform a specific exercise for a set time each day throughout a three-day experiment session. There were three conditions, which were carried out one day at a time, in both experiments; all subjects participated in all three conditions. In the first study participants had to perform a high intensity exercise, cycling at a high speed for a short period of time, and a low intensity exercise, cycling at a lower power for a long period of time, as well as the control condition in which subjects sat calmly for 45 minutes. The control condition was the same in both studies. In the second study subjects had to perform only a high intensity exercise for both short and long periods of time. After completing the exercises, participants were told that they could eat the meal provided by the laboratory at their convenience and when they felt hungry. The meals were weighed before and after the exercise to determine how much the participants consumed. Additionally, subjects also had to record what they were eating outside of the lab sessions. In order to assess subjects' degree of hunger, they had to indicate their level of hunger before, during, and after the exercise and rest conditions.

The results from both experiments were as follows: high intensity exercise was the most effective in putting off the desire for energy intake compared to low intensity exercise and rest. Specifically, the participants' desire to eat was suppressed the most when they performed a high intensity workout; however, the amount of actual food consumed did not change. As interpreted by King et al. (1994), if all participants were required to eat something right after the workout, participants would eat the least after the high intensity workout because their feeling of hunger would be decreased. Additionally, since King et al. (1994) also measured the participants' food intake during other meals throughout the day, it was determined the amount of food consumed post exercise or rest did not significantly differ across other meals during the day or after other conditions. This illustrates that the appetite was indeed suppressed since the same amount of food was consumed as usual, however, it was consumed later and all that was consumed accounted for energy expended during the high intensity workout. Hence, the energy intake was equal to the energy spent and, therefore, no overcompensation occurred.

Pomerleau et al. (2004) looked at how various exercise intensities impact women and their food intake. As in the King et al. (1994) experiment, relatively healthy and active women participated in a three-day experimental session, with varying conditions on each day that were randomly picked: no exercise (control), low intensity exercise (walking on a treadmill), and high intensity exercise (walking and running on a treadmill). Similarly, subjects ate food provided by the experimenters before, during and after each daily session. The subjects also filled out a Three Factor Eating Questionnaire (TFEQ) and any food that they did not consume was weighed to determine their hunger and energy compensation levels. The results of this experiment demonstrate that women tend to decrease their relative energy intake more after low intensity exercises than after high intensity exercises compared to no exercise at all. Pomerleau et al. (2004) suggest that women's appetite may be affected differently by exercise intensity than men's. Pomerleau et al. (2004) suggested that women become more drawn towards food after higher intensity exercises. Hence, lower intensity exercise might result in a negative energy balance for women and as a result weight loss.

In a similar study, McNeil et al. (2014) looked at how aerobic and resistance exercises impact the desire and preference for different foods with varying nutritional and taste qualities. McNeil et al. (2014) had a similar experiment structure that of King et al. (1994) and Pomerleau et al. (2004) of relatively healthy male and female participants who over a course of three days took part in all three activity conditions: aerobic exercise, resistance exercise and an inactive period. Participants had to complete a food preference questionnaire before and after the lunch that they were provided after the exercise activity. In this questionnaire they had to rate different foods and indicated whether they had a desire or preference for specific food items. Participants' initial appetite was measured during the breakfast that the subjects were served before taking part in the exercise section of the experiment. The results of this experiment demonstrate that the desire for high fat foods decreased after both exercise conditions compared to the control condition, and that the actual preference for low fat food increased solely after the resistance exercise. However, despite such variations in desire and preference, the actual energy intake did not significantly differ across all three conditions. There was also no significant difference in results across the genders, contrary to the results demonstrated by Pomerleau et al. (2004).

Douglas et al. (2015) looked at whether high intensity exercise would trigger appetite. The design of this study was similar to the McNeil et al. (2014) and King et al. (1994) studies. Subjects participated in a two-day experimental session. One day involved physical exercise, while the other was a sedentary control condition. During both days participants completed food preference questionnaires and their appetites were measured after each meal offered throughout research. Douglas et al. (2015) also found that the participants' appetites had not increased over the course of a two-day experiment, and in fact, they recorded a short-term exercise-induced decrease in appetite. These results are in line with the findings presented by King et al. (1994). The results observed by McNeil et al. (2014), King et al. (1994) and Douglas et al. (2015) suggest that after completing high intensity exercises, an individual's appetite does not increase and sometimes, in the short-run, is actually suppressed. In most of these studies only one type of exercise was tested and most of them had a small, limited sample size consisting of only young and relatively healthy individuals. As suggested by King et al. (1994) other types of exercise that are more intense, compared to cycling, could have a different impact on appetite levels.

In contrast to the evidence presented from laboratory experiments where subjects had to physically complete exercises, a study conducted by Werle et al. (2010) looked at whether merely thinking about exercise can impact appetite. Werle at al. (2010) surveyed customers at a mall food court, and randomly placed them in one of three conditions. The first was a control condition, in which subjects answered questions related to shopping habits; the second was a fun activity, in which subjects were given a scenario where they had to imagine engaging into listening to music and walking, and were asked a series of questions regarding music and walking; and the third was an exercise activity, in which subjects were given a scenario where they imagined engaging in a physical activity and were asked to answer a series of questions regarding that and their exercise habits in general. After they have completed the survey, participants were told they could serve themselves as much of the two available bulk snacks as they wished. In order to measure the participants' hunger levels, apart from weighing the bags with snacks, subjects also had to answer a few hunger level-related questions.

Werle at al. (2010) suggests that individuals tend to be biased by the belief that their energy consumption is offset by the physical activity that they engage in. However, peoples' ability to accurately estimate calories burned and consumed is also not always accurate, hence, they tend to over-consume, which leads to a positive energy balance. The results of this experiment illustrate that individuals can fall under the bias of overcompensating themselves for the task that they have merely thought about, and did not physically perform. In this study, subjects who were reading scenarios about both the exercise activity and the fun activity got more snacks than the individuals in the control group. Additionally, participants in the two exercise conditions were less accurate at estimating how many calories they served themselves in snacks than the individuals in the control group. The outcomes of this study indicate that over consumption can occur because individuals are both biased when it comes to estimating the energy spent through physical exercise and estimating calories accurately while trying to compensate for the energy lost.

Another factor that could contribute to preference of high calorie over low calorie foods is the inclination towards delayed discounting and impulsive behavior. In their meta-analysis, Emery and Levine (2017) discussed the relationship between impulsivity, inability to delay rewards and obesity, and according to their analysis, individuals that are highly impulsive tend to have higher BMIs. Impulsivity in energy intake occurs because individuals are unable to limit their consumption of highly palatable foods. This is also related to the idea that food and drugs have a similar ability to increase dopamine levels in the brain associated with rewards (Alonso-Alonso et al., 2015, Appelhans et al., 2011). Furthermore, as summarized by Emery and Levine (2017) when the release of dopamine occurs through frequent consumption of highly palatable foods, the brain will become less sensitive to the reward. This will require rewarding oneself more often and with greater quantities to reach the same level of dopamine increase, which can lead to overconsumption. As suggested by Alonso-Alonso et al. (2015) the reason why every person's brain does not react the same way towards all food is because of factors like varying genetic make-up, culture, and environmental settings. Conversely, Leng at al. (2017) suggest that the experience of stress can push individuals towards non-homeostatic energy intake.

Appelhans et al. (2011) demonstrated through a study conducted among obese women that individuals who are impulsive in making decisions are more prone to overeating. However, a study by Ely et al. (2015) suggested that it is not the case for normal weight individuals, at least in the short term. Additionally, a recent study of a group of overweight men conducted by da Silva Gomes et al. (2018) tested whether perception of effort put into a physical exercise and the level of enjoyment is related to post-exercise energy intake. According to da Silva Gomes et al. (2018), only the enjoyment level of the physical activity was related to subsequent energy intake. A negative correlation has been discovered between the exercise enjoyment level and energy intake, which means that the more subjects enjoyed their physical activity the less amount of food they consumed subsequently.

There are a variety of factors that trigger peoples' appetite and reasons they consume certain foods at certain times. As suggested by Leng at al. (2017), peoples' determinants of energy intake vary anywhere from how they value specific dietary components like taste, cognitive aspects such as stress, overall attitudes towards health, and physiological systems that tell the brain what and when to eat, which also affects humans' dietary habits and how much enjoyment they experience from eating certain foods. Culture is also one of the key factors that influences food consumption patterns, sometimes to a point where in certain cultures this behavior establishes a habit that leads to excess energy intake, also known as 'passive overconsumption' (Blundell et al., 2015).

Martins et al. (2008) argue that social and environmental factors can be even more impactful than physiological factors. Martins et al. (2008) also mentions that the difference in peoples' energy intake after exercising can be attributed to their gender, BMI and eating habits during other meals. That is, people who are already more restrained in their eating habits—i.e. normal weight individuals—are more likely to achieve a negative energy balance in the short term after exercising than people who are not restrained in their eating habits. Hence, for normal weight individuals, exercise is regarded as a system that helps control energy intake instead of impulsively suppressing appetite (Martins et al, 2008). Additionally, Blundell et al. (2015) find that various exercise styles, durations, strengths and intensities can have an individual impact on people. Hence, peoples' energy compensation patterns would be challenging to generalize and anticipate. Exercise and appetite are two links to the same issue of obesity and energy balance. With such a vast array of hypotheses present in the current literature regarding the impact of physical exercise on health and food choice, it is important to understand how precisely factors like gender, BMI, age and different types of exercises affect food choice.

3.3 **Experimental Methodology**

The main purpose of this study was to determine if the timing of the choice of a snack to be received after exercising influenced exercisers food choice among recreational center members at the University of Nebraska-Lincoln. This study was conducted at the University of Nebraska – Lincoln East Campus Recreational Center during the 2018 spring semester. The experiment took place on randomly picked weekdays from 3PM to 6PM, which according to the University of Nebraska – Lincoln East Campus Recreational Center staff was typically the busiest period of the day.

The majority of the subjects were university students. Subjects were recruited to participate when they were entering the recreational center. All participants had to be at least 19 years of age, which is the age of majority in Nebraska, and had to agree to and sign the written informed consent form provided prior to the experiment. The potential participants were asked to participate in research calibrating accelerometers to various physical activities, and as a reward they could choose either an apple or a brownie. The interest in the participants' food choices was not highlighted to prevent participants from making healthier choices because they felt that their choices were being scrutinized. After the participants signed the written consent form, their height and weight were measured on a digital column scale. Additionally, the subjects were fitted with a wristband holding an accelerometer that measured acceleration for the duration of their workout. They were encouraged to proceed with their planned workout.

The food used in this experiment was purchased and prepared by the University of Nebraska – Lincoln Nutrition and Health Sciences (NHS) department kitchen staff under the supervision of Dr. Ajai Ammachathram. The apple variety used in this experiment was Fuji, which has an average calorie content of 83 kcal per apple; the brownies were prepared by the NHS kitchen staff from a prepackaged Ghirardelli brownie mix with a calorie count of 140 kcal per piece. Figure 3.1 displays a picture of the presentation of the food items.

There were two conditions tested in this experiment: 1. Subjects had to make a choice of either apple or brownie as their reward before they headed to their workout (referred to as the "before" condition) and 2. subjects had to pick either an apple or a brownie after they returned from their workout (the "after" condition). The main reason for testing both conditions is that even though subjects would receive their snacks at the same time, regardless of the condition, the reasoning for picking one or the other may still be different. For instance, subjects who had to pick before might have thought that they should go with a healthier snack as not to compromise their workout, while participants who had to pick their snack after the workout might have thought that they deserve a treat i.e. a less healthy snack after their all of the time spent working out. In addition, subjects were also asked a series of demographical and workout-related questions such as their birthdate, whether they ate or drank anything during the workout, if they had any allergies and what kind of exercises they completed during their workout.

3.4 **Data and Modeling**

A majority of our participants in this study were college-aged members of the University of Nebraska - Lincoln recreational center, the mean age was 22 years old. There were 299 participants total in this study. As for the gender, 45 percent of the participants were female and 55 percent were male. The mean BMI in this study was 24.71; in similar studies the BMIs varied depending on the population observed, for instance Appelhans et al. (2011) looked at behaviors of obese women while McNeil et al. (2014) observed healthy weight individuals.

A multinomial logistic regression model was utilized for this experiment to test and analyze the data. A multinomial logistic model enables analysis of a dependent variable that can take more than two categorical outcomes. In our case, the dependent variable had three potential outcomes: apple, brownie and neither.

The snack choice per participant per condition can be illustrated by the following function:

$$foodchoice_i = \beta_0 + \beta_1 condition_i + \beta_2 gender_i + \beta_3 age_i + \beta_4 bmi_i + \beta_5 tot\_minute_i + \beta_6 eatordrink_i + \beta_7 activity_i + \varepsilon_i$$

Here, the *foodchoice* variable represents the snack choice made by the i subjects from the three available choices: apple, brownie or neither. C*ondition* denotes which one of the two conditions the subject i was placed into, while *gender, age,* and *bmi,* are variables that were measured, calculated and recorded to respective demographical questions. The variable *tot_minute* represents the time spent exercising. The last two variables denote the responses provided by the subjects to the questions of whether they ate or drank anything during their workout (*eatordrink*) and the kind of workout they performed (*activity*).

The value and the sign of the estimated coefficients illustrate the way in which the tested independent variable affects the dependent variable. Hence, if an estimated coefficient for a variable is positive for one of the non-omitted choices (apple, brownie), it indicates a higher likelihood, or odds, of that snack choice being made relative to the omitted option (neither).

These variables have been chosen as previously, Blundell et al. (2015) suggested that aspects such as exercise duration and type of workout activity can impact individuals' appetite and food choices. Additionally, Matins et al. (2008) pointed out that factors like gender and age play an important role in post-exercise eating habits.

3.5 **Discussion of the Results**

The results of this experiment are reported in Table 3.2. The main variable that has been directly manipulated in this study, namely the conditions that the subjects were randomly assigned to, impacted the snack choices significantly (see Figure 3.2). The main variation between the two conditions was the difference in the timing of when the snack choice was made. According to the results, participants were more likely to pick apples when they were making a choice before the workout than when making a choice after the workout. By exponentiating the coefficients from the regression results we determined that **the odds of apples being picked** after the workout (relative to "neither") were 0.434, which is significant at the 5% level. As for the brownies, the odds of being picked after workout were 0.992 after the workout. These outcomes imply that more participants chose to select neither snack option when they made their snack choices after the workout than when they made snack choices before the workout.

Age, gender and BMI were marginally significant ($p \leq 0.1$). The results indicate that males, older participants, and individuals with lower BMIs were more likely to pick brownies. The odds ratios for these variables were 2.230, 1.102 and 0.903 respectively. Other variables tested such as duration of the workout, activity type, whether participants had anything to eat or drink during the workout did not produce statistically significant results.

These outcomes are similar to some findings by Matins et al. (2008) who also suggested that peoples' BMI and gender can impact their ability to control appetite and affect food choices after engaging in physical exercise. On the other hand, Pomerleau et al. (2004) stated that, at least for women, the higher is the intensity of the workout, the more likely it will lead to higher calorie consumption. Even though in our experiment, participants self reported the activity type and the intensity of the workout was not measured, still, women tend to pick the lower calorie snack (the apple). The activity type did not create a statistically significant difference in this result. Similarly, the findings of McNeil et al. (2014), King et al. (1994) and Douglas et al. (2015) suggest that high intensity workouts performed for extended periods of time suppress energy consumption; however, in our study, the duration of the activity also did not demonstrate a statistically significant difference in the choice of snacks among participants.

3.6 **Limitations and Implications for Future Research**

The main limitation of this study is that the sample mostly consisted of University of Nebraska – Lincoln college students. The average BMI of participants falls in the normal weight range and all participants had come to the recreation center to exercise of their own accord. Additionally, we did not measure the intensity of the workouts and variables such as activity type and whether subjects ate or drank anything during the workout were self-reported. Therefore, it would be interesting to test the same conditions and to see the snack choices individuals with different physical and physiological backgrounds would make while preforming same physical exercises. Also, since in most similar studies, except Werle at al. (2010), the experiments took place with subjects performing physical activities, it would be interesting to conduct the same study in a different setting. For instance, it would be interesting to recruit subjects at a library to compare how individuals' preference may change when cognitive activities are performed instead of physical activities. Additionally, it would also be useful to test if the results of our experiment would translate into additional conditions where the subject would have to pick twice: both before and after the workout, and if they were told that their initial choice was "forgotten." Since, we were only able to record subjects' choices once per session, determining whether the subjects change their choice during a single experiment session may or may not yield different results.

The main goal of this study was to determine how the timing of snack choice and other variables affect participants' snack choices. In previous studies, researchers measured hunger levels of the subjects before and after physical exercise. However, specifically the behavior towards the same snack choices before and after self-initiated physical exercise has not been measured previously. In addition in past studies subjects knew that their appetite and behavior towards food was recorded and measured. In this study, the main purpose of the experiment was masked to avoid self-selection bias. Hence, there is a strong possibility that the subjects made a choice based on their direct preferences. Nevertheless, this study could serve an alternative avenue for future research to look into and examine further how individuals' behavior towards food changes depending on the time and environment and the triggers that skew peoples' decisions from one choice to another.

CHAPTER 4: DISCUSSION AND CONCLUSION

The culture of food consumption is shifting towards meals prepared and eaten away from home, especially for young professionals due to their fast paced lifestyles and myriad of food establishments that offer all types of cuisines. The current generation will pass their eating habits on to their offspring, which will make the importance of food labeling even more crucial in maintaining healthy and viable lifestyles in the near future. From the results deduced from this study, it is apparent that most consumers are aware of the existence of food labels; however, some of them choose not to utilize that information. The main takeaway of the hypothetical sandwich choice experiment is that it may take some restructuring of the presentation of calorie information and educational campaigns in order to truly create calorie labeling that is effective. An increasing number of young adults are currently under risk of obesity. This means that more attention should be directed towards fostering healthy eating habits and teaching kids how to interpret the information that is provided to them so they can make healthier food choices.

Of course, apart from external factors such as outside information, there is more to individuals' energy consumption behavior. Even factors like time, place and overall environment can influence peoples' eating habits and preferences. As has been discussed previously, gender, age, things like cultural background and types of physical activity can directly impact appetite and energy intake. However, the understanding of how individualized or universal these triggers are is still very vague, hence, more attention should be paid to these behavioral cues. From the food choice and exercise study, the main outcome is that individuals' food choices can differ significantly depending on the time of when the choice is being made: before or after a physical exercise. Although we cannot conclude why more males chose brownies than females or why both older subjects chose more brownies after the workout and subjects with lower BMIs, we find marginally significant results for these variables as well.

Tables and Figures

Table 2.1 Sandwich ingredient list and calorie labeling formats

Meat/Protein (4 oz.)	Full Calorie	Calorie Minus	Calorie Plus
Ham	178 cal.	- 76 cal.	+ 88 cal.
Roast Turkey	180 cal.	- 74 cal.	+ 90 cal.
Salami	230 cal.	- 24 cal.	+ 140 cal.
Roast Beef	207 cal.	- 47 cal.	+ 117 cal.
Bacon	254 cal.	254 cal.	+ 164 cal.
Tofu	90 cal.	- 164 cal.	90 cal.
Prosciutto	140 cal.	- 114 cal.	+ 50 cal.
I would not choose any of these proteins			
Cheese (1 oz.)			
Cheddar	115 cal.	115 cal.	+ 79 cal.
Provolone	98 cal.	- 17 cal.	+ 62 cal.
Swiss	111 cal.	- 4 cal.	+ 75 cal.
Colby	112 cal.	- 3 cal.	+ 76 cal.
Mozzarella	85 cal.	- 30 cal.	+ 49 cal.
American	104 cal.	- 11 cal.	+ 68 cal.
Light American	36 cal.	- 79 cal.	36 cal.
I would not add any of these cheeses			
Spread/Dressing (2 Tbsp.)			
Dijon Mustard	10 cal.	- 178 cal.	+ 4 cal.
Mayonnaise	188 cal.	188 cal.	+ 182 cal.
Light Mayonnaise	71 cal.	- 117 cal.	+ 65 ca.
Yellow Mustard	6 cal.	- 182 cal.	6 cal.
Balsamic Vinegar	14 cal.	- 172 cal.	+ 8 cal.
Olive Oil	119 cal.	- 69 cal.	+ 113 cal.
Italian Dressing	35 cal.	- 153 cal.	+ 29 cal.
I would not choose any of these dressings			
Bread (100 grams)			
Multi-grain	265 cal.	- 141 cal.	+ 43 cal.
Sourdough	319 cal.	- 87 cal.	+ 97 cal.
Marble Rye	233 cal.	- 173 cal.	+ 11 cal.
Ciabatta	263 cal.	- 143 cal.	+ 41 cal.

Croissant	406 cal.	406 cal.	+ 184 cal.
Bagel	250 cal.	- 156 cal.	+ 28 cal.
Gluten-free bread	222 cal.	- 184 cal.	222 cal.
I would not choose any of these breads			
Vegetables (1 oz.)			
Lettuce	4 cal.	- 43 cal.	+ 1 cal.
Cucumber	3 cal.	- 44 cal.	3 cal.
Spinach	7 cal.	- 40 cal.	+ 4 cal.
Red Pepper	8 cal.	- 39 cal.	+ 5 cal.
Red Onion	11 cal.	- 36 cal.	+ 8 cal.
Tomato	5 cal.	- 42 cal.	+ 2 cal.
Avocado	47 cal.	47 cal.	+ 44 cal.
I would not add any of these vegetables			

Note: No-calorie information condition is not presented in this table.

Table 2.2 Subjects' sandwich choice and demographic characteristics

Variables	**Mean**
Condition	
Control	24.93
Calorie Plus	25.22
Calorie Minus	25.07
Full Calorie	24.78
Calories ordered	629.33 (130.08)
Calorie estimation	460.60 (216.28)
Gender	
Female	51.17
Age	36.76 (10.95)
BMI	27.35 (6.99)
Nutrition Facts Panel Utilization	
Most of the time	29.01
Never	5.83
Never Seen	0.00
Rarely	17.06
Sometimes	37.32
Always	10.50
Education	
4 year (Bachelors) degree	34.99
2 year (Associates) degree	12.83
Graduate or Professional degree	9.61
High school graduate/GED	13.56
Less than High School	0.58
Some college	28.43

Income	
Less than $20,000	15.01
$20,000 - 39,999	29.15
$40,000 - 59,999	21.14
$60,000 - 79,999	15.31
$80,000 - 99,999	8.60
$100,00 - 119,999	3.94
$120,000 - 139,999	1.75
$140,000 -159,999	2.04
$160,000 - 179,000	0.44
$180,000 - 199,000	0.73
Greater than $200,000	0.29

Observations: 686

Table 2.3 Variable estimates of linear regression model for Sandwich Choice

Variable	Estimate	T – Value	P - Value
Intercept	**498.04*** (72.32)**	6.89	>0.01
Calorie Plus	-14.11 (14.25)	-0.99	0.32
Calorie Minus	**-30.47** (14.18)**	-2.15	0.03
Full Calorie	1.70 (14.29)	0.119	0.91
Gender Male	3.13 (10.23)	0.31	0.76
Age	-0.25 (0.48)	-0.52	0.61
BMI	0.43 (0.72)	0.60	0.55
Calorie Estimation	**0.11*** (0.02)**	4.76	>0.01
Education High school graduate/GED	38.97 (65.60)	0.59	0.55
Education Some college	25.87 (64.82)	0.40	0.69
Education 2 year (Associates) degree	21.21 (65.62)	0.32	0.75
Education 4 year (Bachelors) degree	30.85 (64.92)	0.48	0.63
Education Graduate or Professional degree	17.68 (66.03)	0.27	0.79
Nutrition Facts Panel Sometimes	**31.55* (12.37)**	2.55	0.01
Nutrition Facts Panel Rarely	**45.17** (15.44)**	2.93	>0.01
Nutrition Facts Panel Always	16.63 (18.00)	0.92	0.36
Nutrition Facts Panel Never	**84.71*** (22.43)**	3.78	0.00
Income $20,000-$39,999	**37.10* (15.61)**	2.38	0.02
Income $40,000-$59,999	**42.85* (16.86)**	2.54	0.01
Income $60,000-$79,999	**46.44* (18.26)**	2.54	0.01

Income $80,000-$99,999	**45.55*** **(21.49)**	2.12	0.03
Income $100,000-$119,999	12.21 (28.06)	0.44	0.66
Income $120,000-$139,999	25.38 (39.65)	0.64	0.52
Income $140,000-$159,999	**66.49*** **(37.57)**	1.77	0.08
Income $160,000-$179,999	21.32 (92.74)	0.23	0.82
Income $180,000-$199,999	-1.07 (59.40)	-0.02	0.99
Income Greater than $200,000	-58.84 (91.67)	-0.64	0.52

Note: *p<0.1; **p<0.05; ***p<0.01

Table 3.1 Participant snack choice and demographic characteristics

Variables	Mean Pooled	Mean - Before	Mean - After
Food Choice			
Apple	63.55	72.12	52.98
Brownie	17.39	13.33	22.39
Neither	19.06	14.55	24.63
Workout Activity			
Cardio	23.08	24.24	21.65
Weights	31.77	33.94	29.10
Mixed	45.15	41.82	49.25
Eat or Drink During the Workout			
Nothing	14.05	11.52	17.16
Water	81.60	83.03	79.85
BCAA	4.35	5.45	2.99
Demographic and Other Variables			
Age (in years)	22.1 (3.39)	21.93 (2.86)	22.32 (3.95)
BMI	24.71 (3.57)	24.72 (3.47)	24.70 (3.71)
Duration of the workout in minutes	65.97 (21.91)	68.19 (24.01)	63.23 (18.74)
Gender			
Female	45.82	43.64	48.51
N	299	165	134

Table 3.2 Exponentiated variable estimates of multinomial logistic regression model for Exercise and Snack and Choice

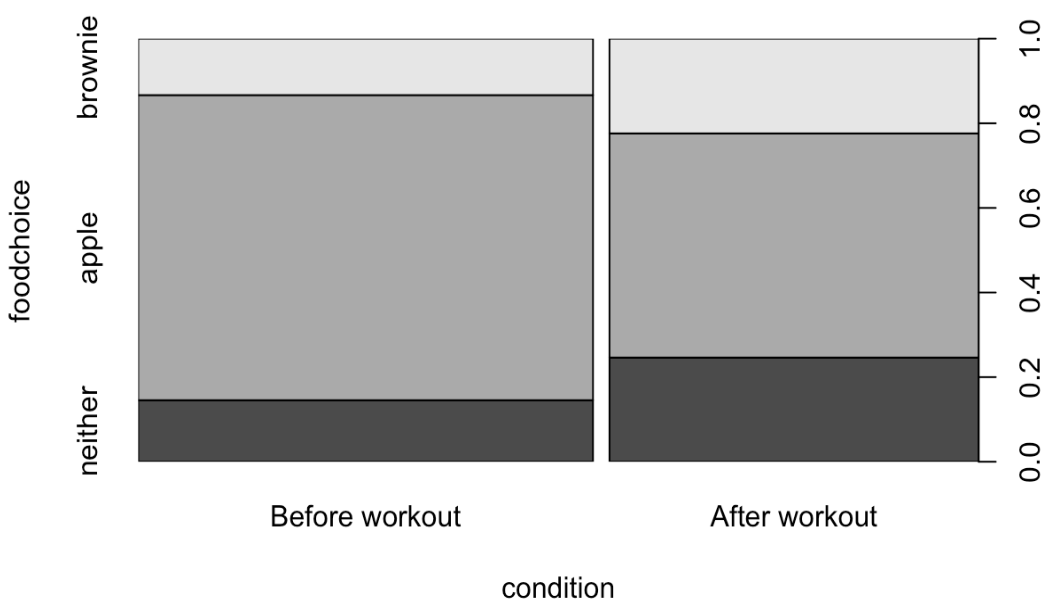
Independent Variables	Dependent Variables	
	Apple	**Brownie**
Condition: after workout	**0.417***** (0.313)	0.930 (0.403)
Gender: male	0.917 (0.334)	**2.367*** (0.447)
Age	1.018 (0.053)	**1.106*** (0.058)
BMI	0.979 (0.043)	**0.898*** (0.062)
Duration of the workout	0.997 (0.007)	0.988 (0.010)
Activity type: weights	1.053 (0.436)	0.919 (0.548)
Activity type: mixed	1.279 (0.401)	1.217 (0.523)
Eat or drink during the workout: water	0.574 (1.152)	0.989 (1.544)
Eat or drink during the workout: BCAA	1.948 (1.622)	1.094 (2.075)

Observations: 299

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Figure 3.1 Snack choice presentation Exercise and Snack Choice Experiment

Figure 3.2
Snack choice by condition



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Appendix A: Sandwich Choice

Q113

Food Preferences Survey Investigator: Christopher Gustafson
Email: cgustafson6@unl.edu
Institution: University of Nebraska-Lincoln
Purpose: To understand people's food preferences and dietary habits.
Expected Time: <10 minutes
HIT Payment: $3.00
Criteria: Participants must be at least 19 years old and live in the United States.

You may stop at any time and return the HIT without penalty, but note that for technical reasons we can only provide payment for fully completed HITs. If you have any suggestions or comments please contact the investigator directly (see contact information above).

Privacy: We are not collecting identifying information, so none of your answers will link back to you.

This survey is about food preferences. During this survey, you will be asked to complete a food choice exercise, and then will be presented with questions about food consumption preferences and habits, as well as a few demographic questions. We expect the survey will take 5-10 minutes to complete. We thank you for your participation in this research.

Q62 Imagine you want to eat a sandwich, and you have the following list of ingredients available to build the sandwich. Please select the ingredients that you want to add to your sandwich. You may only choose one ingredient per food category. Simply click on the box next to the ingredient to select an ingredient. The number of calories that each ingredient will add to the sandwich is presented in parentheses behind the ingredient. The categories you will select from are:
1. Meat/Protein
2. Cheese
3. Spread/Dressing
4. Bread
5. Vegetables

Q63 Meat/Protein (4 oz.)

- ○ Ham (178 cal.) (1)
- ○ Roast Turkey (180 cal.) (2)
- ○ Salami (230 cal.) (5)
- ○ Roast Beef (207 cal.) (6)
- ○ Bacon (254 cal.) (7)
- ○ Tofu (90 cal.) (9)
- ○ Prosciutto (140 cal.) (11)
- ○ I would not choose any of these proteins (10)

Q64 Cheese (1 oz.)

- ○ Cheddar (115 cal.) (1)
- ○ Provolone (98 cal.) (2)
- ○ Swiss (111 cal.) (3)
- ○ Colby (112 cal.) (4)
- ○ Mozzarella (85 cal.) (5)
- ○ American (104 cal.) (7)
- ○ Light American (36 cal.) (9)
- ○ I would not add any of these cheeses (8)

Q65 Spread/Dressing (2 Tbsp.)

- ○ Dijon Mustard (10 cal.) (1)
- ○ Mayonnaise (188 cal.) (2)
- ○ Light Mayonnaise (71 cal.) (3)
- ○ Yellow Mustard (6 cal.) (5)
- ○ Balsamic Vinegar (14 cal.) (6)
- ○ Olive Oil (119 cal.) (8)
- ○ Italian Dressing (35 cal.) (9)
- ○ I would not choose any of these dressings (10)

Q66 Bread (100 grams)

- ○ Multi-grain (265 cal.) (1)
- ○ Sourdough (319 cal.) (2)
- ○ Marble Rye (233 cal.) (3)
- ○ Ciabatta (263 cal.) (4)
- ○ Croissant (406 cal.) (5)
- ○ Bagel (250 cal.) (6)
- ○ Gluten-free bread (222 cal.) (7)
- ○ I would not choose any of these breads (8)

Q68 Vegetables (1 oz.)

- ◯ Lettuce (4 cal.) (1)
- ◯ Cucumber (3 cal.) (2)
- ◯ Spinach (7 cal.) (3)
- ◯ Red Pepper (8 cal.) (4)
- ◯ Red Onion (11 cal.) (5)
- ◯ Tomato (5 cal.) (6)
- ◯ Avocado (47 cal.) (7)
- ◯ I would not add any of these vegetables (8)

Q135 How many calories do you think the sandwich you chose had?

____

Q1 What is your gender?

- ◯ Male (1)
- ◯ Female (2)

Q2 What is the month of your birth?

▼ January (1) ... December (12)

Q105 What is the year of your birth? (E.g., 1987)

____

Q110 What state do you reside in?

____

Q107 What is your ethnicity? (Choose all that apply.)

- ◯ Hispanic (1)
- ◯ White (2)
- ◯ Black or African American (3)
- ◯ American Indian or Alaska Native (4)
- ◯ Asian (5)
- ◯ Native Hawaiian or other Pacific Islander (6)
- ◯ Other (7)
- ◯ Do not know (8)

Q106 If other, please enter your ethnicity:

____

Q113 If you have two bananas and three apples, how many pieces of fruit do you have?

◯ 3 (1)

◯ 5 (2)

◯ 7 (3)

◯ 9 (4)

Q4 What is the highest level of school you have completed or the highest degree received?

◯ Less than High School (1)

◯ High school graduate/GED (2)

◯ Some college (3)

◯ 2 year (Associate's) degree (4)

◯ 4 year (Bachelor's) degree (5)

◯ Graduate or Professional degree (6)

Q5 What was your pre-tax household income in 2017?

- Less than $20,000 (1)
- $20,000-$39,999 (2)
- $40,000-$59,999 (3)
- $60,000-$79,999 (4)
- $80,000-$99,999 (5)
- $100,000-$119,999 (6)
- $120,000-$139,999 (7)
- $140,000-$159,999 (8)
- $160,000-$179,999 (9)
- $180,000-$199,999 (10)
- Greater than $200,000 (11)
- Prefer not to answer (12)

Q8 Suppose you have been informed today that you won a prize. For the prize, you can receive a payment of $1000 immediately, or a payment of $1200 with absolute certainty if you wait one month. Which would you prefer: $1000 today or $1200 one month from today?

- $1000 immediately (1)
- $1200 in one month (2)
- Do not know (3)

Q9 What if the payment was $1000 immediately, or a payment of $1300 with absolute certainty if you wait one month. Which would you prefer: $1000 today or $1300 one month from today?

- ○ $1000 immediately (1)
- ○ $1300 in one month (2)
- ○ Do not know (3)

Q10 What if the payment was $1000 immediately, or a payment of $1400 with absolute certainty if you wait one month. Which would you prefer: $1000 today or $1400 one month from today?

- ○ $1000 immediately (1)
- ○ $1400 in one month (2)
- ○ Do not know (3)

Q11 What amount would you have to receive in one month to make you wait one month for the payment instead of receiving $1000 today?

____

Q32 The "Nutrition Facts Panel", which is used on packaged food items is displayed on this page. Please examine it before responding to the following question.

Nutrition Facts

8 servings per container

Serving size 2/3 cup (55g)

Amount per serving	
Calories	**230**
	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Q33 When choosing among different food items at the grocery store, how often do you use the Nutrition Facts Panel to help you decide which item to buy?

○ Always (1)

○ Most of the time (2)

○ Sometimes (3)

○ Rarely (4)

○ Never (5)

○ I have never seen the Nutrition Facts Panel (6)

○ Do not know (7)

Appendix B: Exercise and Food Choice

Participant Informed Consent Form

Title: Calibrating Activity Tracking Devices

Purpose:
This research project will collect data to help improve the accuracy of activity tracking devices and better understand choices related to exercise and health. You must be 19 years of age or older to participate. You have been invited to participate in this study because you have come to a Campus Recreation Center to exercise.

Procedures:
After you have agreed to participate in the study and signed this document, you will be fitted with the activity tracking device. We will further give you a wristband to wear so that we can identify as a study participant. To calibrate the device, we will take weight and height measurements, and record your age. After that, you will be free to complete your exercise routine. Please do not alter your planned exercise based on participation in the study. Once you have finished exercising, we ask you to return the activity tracker to the researchers before you shower. We will also ask you what type of exercise you did and for how long you worked out. At this point, we will remove your wristband. You will be given the choice of a snack for participating in the research study. You will then be free to go.

Benefits:
There is no guarantee of direct benefits as a research participant in this project; however, your research results will be explained to you by study personnel and in this way, you may learn more about how many calories you burn when you exercise. By participating in this research, you will help us to improve the accuracy of activity tracking devices.

Risks and/or Discomforts:
There are no risks associated with this study. Since we are not asking you to change your exercise routine, you do not face any research-based health risks or discomfort. We will ensure that you are not allergic to anything in the snack that we offer to you. You will not be held responsible should you damage or lose the activity tracker.

Confidentiality:
All of the data collected from this research session (date of birth, height, weight, activity data) will be identified only by a random code. Only research personnel will have access to the data, which will be stored on a password-protected computer. The information obtained in this study may be published in scientific journals or presented at scientific meetings, but we will only summarize data. We will never identify your individual data in publications or presentations. We will only assess information that is important for this study.

Compensation:
You will not receive monetary compensation for participating in this study. However, you will receive a free snack for participating.

Opportunity to Ask Questions:
You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may contact the investigators at (402) 472 2336 or cgustafson6@unl.edu, or (402) 472-7521 or kkoehler3@unl.edu. Please contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965 to voice concerns about the research or if you have any questions about your rights as a research participant.

Freedom to Withdraw:
Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy:
You are voluntarily making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate after having read and understood the information presented. You will be given a copy of this consent form to keep.

The University of Nebraska-Lincoln wants to know about your research experience. This 14- question, multiple-choice survey is anonymous; however, you can provide your contact information if you want someone to follow-up with you. This survey should be completed after your participation in this research. Please complete this optional online survey at: http://Go.unl.edu/IRBfeedback.