Walk it off: Examining Consumer Perceptions of Calories and Physical Activity Equivalents

by

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ABSTRACT

WALK IT OFF: EXAMINING CONSUMER PERCEPTIONS OF CALORIES AND PHYSICAL ACTIVITY EQUIVALENTS

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This research investigated the accuracy of estimations of calories and exercise when considering snack food items. Participants were significantly more accurate when asked to estimate exercise equivalents than when asked to estimate calories. Exercise estimation hadn’t been considered previously, but calorie estimation and calorie understanding had been considered in order to scrutinize calorie labels, and this same argument is used for exercise understanding. Additionally, factors such as consumers state of mind, and the type of product they are considering had an influence on the accuracy of estimation. Results indicate that consumers respond better to exercise estimations than calorie estimations. We argue that due to the confusion around calories, consumers will respond better to exercise labels because they can understand the impact of exercise on themselves. The results of two studies indicate that participants are significantly further research into applying exercise equivalent labels on food products of different types is required.
DEDICATION

This manuscript is dedicated in loving memory to my uncle, Aaron Panchoo. He may have never understood what I was talking about, but every time he saw me, he made a point to ask me how my school work and thesis work were going. This manuscript is dedicated to Uncle Aaron because although the majority of this writing took place whilst he was sick, and we were all worried about him, he continued to encourage me and remind me of how proud he was of me and how much he loved me. Without his constant encouragement and prayers, this manuscript may not have been completed. He may have been taken from us far too soon, but he loved greater than an average person could in a full lifetime. His legacy will continue on through Aunty Sharon, his sons Arlen, Tristan, Calan, and the rest of his family and many friends. He will forever be missed and always remembered.

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1 Chapter 1 - Introduction

Two thirds (66%) of American’s are considered overweight, and 38% are dangerously obese, 60% of Canadian adults are considered overweight while around a third are considered obese (21%), and 68% of Mexicans are considered overweight, while 39% are considered obese (Hall & Kahan, 2018). It is becoming increasingly clear that even in the last half decade, citizens of developed countries have become at a growing rate (Hebert, Allison, Archer, Lavie, & Blair, 2013; Arroyo-Johnson & Mincey, 2016; Hall & Kahan, 2018). The topic of obesity and overconsumption has become a subject undergoing intense study and receiving close review for academics, physicians and the mass media over the past decade. This rapid increase of interest into this pandemic is due to impact that it has had on the public. There has been a great increase in public suffering and economic stress from utilizing health care resources to help treat a number of serious, however, preventable chronic diseases that are tied to obesity and unhealthy lifestyles; such as type 2 diabetes, and other cardiovascular diseases (Bates, Burton, Huggins & Howlett, 2011, Hebert et al., 2013). Nearly half of all yearly food costs for the average North American family occurs from food purchases outside the home (Emrich et al., 2017). This trend is especially beneficial to restaurant and fast-food chain brands, however, there has been a raising concern for the health of consumers as they partake in increasingly high calorie meals (Bates et al., 2011). In recent years, there has been a great amount, of legislation requiring restaurants and food-service locations to post the number of calories found in a meal around the world. In the United Kingdom and other countries in Europe, systems such as traffic-light labelling, is in place on consumer-packaged food products (Emrich et al., 2017.) The intention of this legislation is to have the average consumer become aware of the calories that they are
bringing into their body (Menu Labeling Requirements, n.d.). Research into the United States of America, the United Kingdom, and Europe has been thoroughly explored. However, smaller developed countries such as Canada have not been researched. Interest in these countries are important as individuals from counties such as Canada have higher than average levels of education and score higher on environmentalism, both of which have an influence on decisions.

An overview of the current literature on food product labelling shows that academics and governments recognize the obesity pandemic as a serious issue (Wilson et al., 2016), and that steps need to be taken to help the large number of obese Americans in order to protect them from deadly diseases associated with obesity (Werle et al., 2010, Tal & Wansink, 2014). Mandating that individuals live healthy lifestyles is a very difficult task, especially while trying to circumnavigate all potential ethical issues surrounding stereotyping and what may be considered shaming of individuals. For this reason, governments, public health researchers, and business professionals determined that making calorie and fat amounts more transparent in order for consumers to understand what they are putting into their bodies (Bates et al., 2011). Reviews of the legislation in North America, Europe and the United Kingdom illustrate the ineffectiveness of calorie amounts on food labels and menus (Bates et al., 2011, Emrich et al., 2017). Consumers may become habituated to calorie amounts or may just not entirely understand what these calorie amounts or daily value percentage mean (Nielsen, 2012, Emrich et al., 2017). Other types of information given to consumers may further impact this misunderstanding. Consumers understanding of caloric content in foods is further confused or miscalculated when a label such as an organic label is present, because it adds more information for the consumer to consider before coming to a decision (Schuldt & Schwarz, 2010). One particular type of labelling of
interest in research is that of a Physical Activity Calorie Equivalent label, or PACE label. This type of label utilizes the information provided on calories, but rather than simply describe the number of calories in the food product, and equivalent value of exercise is given (Viera & Antonelli, 2015). This type of labelling has been operated using the distance needed to walk, or the number of minutes needed to walk (Lee & Thompson, 2016), because this type of information may be a more understandable method for consumers.

In order to determine the effectiveness of the nutrition table, calorie labelling and other forms of food labelling, one must first understand how consumers observe and understand these labels (Carels, Konrad & Harper, 2007). Understanding these labels is an important aspect of product decision making because this is the first amount of information that consumers are presented with, and the goal of each label is to help consumers make a more educated decision (Roberto, Haynos, Schwartz, Brownell, & White, 2010). Once this mechanism of the decision-making process has been thoroughly understood, a better alternative can be recommended to help consumers make healthier food choices. The overarching objective of this research is to gain a better understanding of consumers estimation judgements. The first objective of this study is to understand and observe participants estimations of calories and exercise required to burn off the food, in a given snack food item. Using the theoretical framework proposed by Carels et al., (2007) and Roberto et al., (2013) for calorie estimations, a framework for having participants estimate exercise equivalents is created. Secondly, this study aims to determine whether consumers understand calories or exercise better, and by extension offer potential recommendations for types of labels that may be more effective than the current methods. In
order to do this, effects of priming and licensing will be observed alongside participants opinions across a number of food product categories.

Two studies were employed in this research observing the ability of participants to estimate the number of minutes required to burn off a product by walking, and the number of calories found in a food item. In the first study, the objective was to create a framework for the estimations of both exercise and calories, and to determine which type of estimations participants were more accurate with. In this study we found that participants who were asked to estimate exercise were more accurate in these estimations for the unhealthy product (doughnut). In the second study we introduced an additional unhealthy product (beef jerky), as the findings in the first study were driven by the unhealthy product, a prime was shown to the participants to influence their state of mind, and the element of choice was given to determine stated preference for these products based on participants state of mind. In this study we found that when participants were primed to think about physical exertion, they were more accurate with their exercise estimations, and they were more likely to choose an unhealthy product. These studies and findings will be discussed further in this manuscript.
2 Chapter 2 - Literature Review

2.1 Introduction

This literature review will discuss the current research on food product labelling and consumers perception on the nutrition and health values of food products. As with much of the literature in the food and nutrition research, the obesity pandemic is a topic that must be considered. Governments, health officials and researchers all agree that the issue of obesity needs to be further investigated to find a solution (Hebert et al., 2013, Hall & Kahan, 2018). However, because this topic is very broad and well researched, specific root causes and factors that accompany this pandemic must be considered. Because food products are the basis of this study, consumers’ food decision processes are considered along with the understanding and education regarding nutrition are reviewed. More specifically, literature observing consumer understandings of calories and exercise, and the numerous types of food labelling are discussed in this review to generate a foundation for this study because they have been observed in previous literature to have an influence on individuals ability to choose and estimate the contents of a food.

2.2 Background

2.2.1 The Obesity Pandemic

According to Hebert et al., (2013), despite numerous observations into the causes of the obesity pandemic, it seems as though there has been no progression into dealing with the issue. This stalemate in the progression of dealing with the obesity issue has been found across
different disciplines including, business, nutrition, and health (Hebert et al., 2013; Emrich et al., 2017; Hall & Kahan, 2018; Keuhn, 2018). Hebert et al., (2013) discuss that despite all attempts to help consumers make better food decisions, a number of issues continue to pervade all decisions; many consumers do not care enough about the nutritional facts or about the food they eat, consumers may not be able to afford (time wise or money wise) to consider the food that they are purchasing and must only consume what they can afford, consumers do not understand the nutritional values in the food that they eat to begin with, and they do not know what is required for their bodies to burn off the number of calories they bring into their body. One overarching issue is that consumers feel that they do not have the time, patience, and knowledge in order to understand what is on a nutritional value table or an ingredient list (Hebert et al., 2013; Taksler & Elbel, 2014; Wilson et al., 2016; Arroyo-Johnson & Mincey, 2016; Hall & Kahan, 2018). In this way, these authors provide a call to arms for researchers to continue to determine ways of helping to deal with the obesity pandemic, while also looking for ways to make the nutritional table more attainable to consumers.

Consumers have begun to take notice of obesity issue as becoming a pandemic and have started to look for their own solutions to combat this obesity issue. In a study, Nielsen (2012) found that more than three-quarters (78%) of their participants across 56 countries, are trying to lose weight. While every individual who tries to lose weight is not necessarily obese, utilizing certain diets for individuals who are obese may be one method for dealing with this issue. Unfortunately, fad diets such as the ketogenic diet, and the baby food diet, are difficult to maintain and can often be detrimental to one’s health in the long run (Jauregui-Lobera, 2017). Nutritionists have long stated that the best solution to the obesity issue is also the most
parsimonious; eat less, and move more (Hebert et al., 2013, Arroyo-Johnson & Mincey, 2016). This statement demonstrates that consumption is not the only issue in the obesity pandemic, sedentary lifestyles is another aspect to consider. The persistent issue however, is that many consumers are not willing to try a diet, and continue in their set ways, purchasing food that is not the healthiest option. Choosing unhealthy foods repeatedly is a dangerous decision for one’s health, and for this reason the literature on consumers food choices should be considered.

2.2.2 Food Decision

During the food purchasing or consuming decision-making process, Sharf et al. (2012), determined that a majority of consumers do consider the nutritional information in a food product prior to making a decision. Although this is the case, VanEpps et al., (2016) found that consumers will take less than 7 seconds to make a decision regarding their food. This amount of time is an average found among participants in the study and shows that consumers will weigh a cost/benefit analysis in their minds. These 7 seconds are a relatively short amount of time considering the 30-minute average individuals spend at a supermarket, and therefore this decision occurs very quickly and may require much mental resources (VanEpps et al., 2016). This cost/benefit analysis comprises of weighing the costs of taking the time to analyze the nutritional information, and the benefits that the new product (or older product) potentially has over the alternative.

Because of the short amount of time the average consumer can spend while shopping, they must make a quick decision regarding their next purchase (Sharf et al., 2012). When it comes to food purchases, consumers must decide if they should look for a new product or continue to go with a product they are habituated to purchasing. If this decision-making process
takes longer than 7 seconds, consumers will tend to their previous purchasing habits. Any amount of confusion can extend this consideration period beyond the 7 seconds, and consumers will fall back into their old habits of purchasing (VanEpps et al., 2012). 7 seconds is a fairly short period of time, and for this reason, nutritional information must be understood well and must be illustrated clearly. With this, however, consumers may not fully understand nutrition to begin with.

2.2.3 Nutrition Education

Because of this short amount of time, consumers need to search for the information that is important to them, typically; flavour, price and contents (ingredients, what they are craving) (Filimonau et al., 2017). Due to this limited time and cognitive capacity, when consumers are given more information (nutritional facts table, calories in food), they may become overwhelmed and simply resort to their typical purchasing habits (Cantu-Jungles et al., 2017; Filimonau et al., 2017). Wilson, Buckley & Bogomolova (2016), found that the nutrition facts table in the United States is too confusing for consumers to understand because they have not been properly educated on what the items on the nutrition facts table actually mean for their bodies. The nutrition values table is typically found on the back of a packaged food.

The table is labelled as the Nutrition Facts. Beneath this the table details how many servings/pieces this table is relevant for. The table also shows the amounts of certain elements in the food and the daily value percentage for each element. Common elements that are seen is the calories, fat, cholesterol, sodium, carbohydrates and protein. These items are then followed up by vitamins and minerals. Finally, below or near the table is often the ingredients list, which describes all of the individual elements that are present in this food. Typically, consumers who
take the time to consider this table are drawn to considering the calorie amounts in the food (Wilson, Buckley & Bogomolova, 2016), and for this reason calorie labels have been included on the front of some packages, this concept will be discussed further in this paper.

Wilson et al. (2016), introduce the idea that nudging can be used to influence habitual behaviours by altering the presentation of options to consumers. One possible way to do this the authors found in their study is to increase the salience of the nutrition in food product packaging and presentation. In order to increase the amount of salience here, the authors made the nutrition table on the back of the package more noticeable by adding colour and bold lettering and increasing the visibility of the front-of-package nutrition information by contrasting them with the rest of the package. While they did find that consumers took note of more salient presentations, participants who were presented with information found on the nutritional values table, found the new information difficult to digest (Mancino & Lin 2015). Considering nutrition education focusses on the concept of calories very frequently, consumers may not entirely understand calories as a concept in itself.

2.2.4 Calorie Understanding

The nutritional values table is not the only area in which consumers knowledge is lacking. Consumers have a very poor understanding of the calories row on nutritional tables, but this may go even further, consumers may have a poor understanding of calories as a whole concept (Carels et al., 2007, Holmstrup, Stearns-Bruening, Rozelle, 2013, Roberto et al., 2013, Jiang & Lei, 2014, Taksler & Elbel, 2014). When consumers are asked to guess the number of calories found in meals and snack foods, they are often either grossly over or underestimated (Roberto et al., 2013). This overestimation is seen when consumers are asked to estimate the
number of calories found in a meal on a menu, before menu labelling for calories was implemented, consumers will be underestimated calories by 216-409 calories (Taksler & Elbel, 2014). Studies have demonstrated that subjects are relatively inaccurate in the estimation of calories in food items, independent of individual characteristics including body weight, body composition and sex (Holmstrup et al., 2013). These inaccurate estimations do not indicate that individual who do not understand calories will be obese, rather the literature indicates that if participants can better understand these calorie labels, they may be encouraged to make better food decisions in order to help consumer better (Carels et al., 2007; Holmstrup et al., 2013, Taksler & Elbel, 2014).

Carels et al. (2007), observed that consumers tend to use heuristics to group types of food in their minds in order to make food decisions. Heuristics, here, are mental short cuts that people take in order to solve a problem or understand something better (Carels et al., 2007). People often will place foods into “healthy” or “diet” categories. These categories that consumers create, will influence the calorie estimates of the foods in question. Contrary to the work of Holmstrup et al. (2013), Carels et al. (2007) found that individual difference characteristics, such as diet-status, weight, and gender influence people’s perceptions of foods healthiness or ability to influence weight. In this study, Carels et al. (2007), found that these differences can systematically bias their estimates of the caloric content of foods. Roberto et al. (2013) conducted a similar survey, using participants with self-reported eating disorders. In both Carels et al. (2007), and Roberto et al. (2013), participants were show images of food products, and simply asked to estimate the number of calories they believed were in the given food item. In Roberto et al (2013) study, binge eating disorders, purging disorders, and those without eating
disorders were considered, where the results indicated that people overestimate the calories in meals regardless of the presence or lack thereof of an eating disorder. In this study by Roberto et al. (2013), the vast majority of respondents to an online multiple-choice survey, regardless of the presence of eating disorders, were only able to identify the correct number of calories in a meal 33% of the time. In this study, participants were given a list of calorie-amounts to choose from. These numbers may have primed participants responses, as they were exposed to the correct answer at some point. When given no nutritional information or labels at all, consumers fared worse when estimating the number of calories present, than when this information was given (Werle, Wansink & Payne, 2010; Tal & Wansink, 2014; Brown et al., 2015; Zhou et al., 2018).

Consumers inability to correctly identify the number of calories in a meal is easily made worse by the heuristics they group the food types into. This is further worsened when toppings or additional elements of a meal of food are present (Jiang & Lei, 2014). Consumers underestimated the number of calories in both health and unhealthy foods, however they further underestimate unhealthy foods when a healthy topping or addition is added to it (for example; a side salad with a cheeseburger), meaning the combination of an unhealthy item with a healthy item pairing tends to have lower calorie estimates than just the unhealthy item alone (Jiang & Lei, 2014). This concept may indicate the level of processing that a product goes through can influence health perceptions and by extension calorie estimations. Consumers underestimate the number of calories, to a lesser extent, in healthy foods regardless of a healthy or unhealthy pairing. This indicates here that based on the present study by Jiang & Lei (2014), consumers will tend to incorrectly identify the number of calories and will use their heuristics of whether a food is perceived as health or unhealthy in order to make that decision.
Additionally, Tal & Wansink (2014), found that when participants simulated eating bags of snacks estimated that food items provided fewer hours of energy than those who did not. This means that participants were asked to imagine actually consuming the snacks, they underestimated the number of calories that is consumed. For this reason, actual consumption, or more simply, simulation of consumption should be considered to determine, how responses differ from simple survey responses to images shown to participants. Similar to the idea proposed here by Tal & Wansink (2014), that consumers will report different number of calories when asked to imagine consuming the snacks, rather than just looking at it, consumers may also experience a difference in caloric understanding between what they report that they eat, and what they actually eat. This difference between actual consumption and considered consumption was observed by Lichtman et al. (1992). These authors realized that self-reported calorie amounts, will be different than actual caloric intake. Lichtman et al. (1992) observed that obese participants failed to have a general understanding of how caloric amounts affected their bodies. The authors found that individuals who were asked to report the number of calories they consumed, underreported the actual food intake by nearly 50%. This indicates that errors in judgement still occur when the food product is actually consumed. Edenbrandt & Smed (2018), conducted a similar study, in which the authors observed the differences between self-reported and actual preference of food products. They discussed a theory called the intention-behaviour gap, the value-action gap, or the attitude-behaviour gap (Edenbrandt & Smed, 2018). This gap theorizes that there is a distinct difference between what consumers say they will do, want, or understand, and what they actually do, want, or understand. This gap is an important consideration in food product decisions as consumers want to eat healthy and make healthy
choices, but often fail to do so, this effect is also see in exercise, where consumers know they need to exercise but fail to follow through (Tal & Wansink, 2014; Viera & Antonelli, 2015).

2.2.5 Exercise Understanding

Prior research has operated under an untested assumption that consumers make calorie estimations when exposed to a food product, and using this calorie estimation, and understanding of the exercise needed to burn off these calories is assumed. However, very little research has gone into this calorie-exercise relationship. This is problematic as many authors use this assumption to make assertions about the effectiveness of calorie and exercise information given to consumers. This may be because exercise estimations have not been considered in research yet, and physical activity labelling is a recent area of research, and failed studies have not prompted this type of research as of yet. While much research has gone into including exercise equivalents (Viera & Antonelli, 2015; Lee & Thompson, 2016), very little has looked at how consumers estimate calories, and subsequently, estimate exercise. Due to this prior assumption, researchers have proposed that including exercise labels on food products will reduce the amount of consideration needed when looking at a new food product (Dowray et al., 2012). These physical activity labels are in place to supplement current labelling efforts to encourage consumers to make better food decisions and keep exercising top-of-mind (James et al., 2015). Very mixed results have come from this type of research, such that, studies that have shown these activity labels to help reduce the number of calories consumed, and, these labels showing that it causes more confusion among participants leading to an increase in caloric intake. This leads to the questioning of this assumption that calories and exercise are estimated
using the same mechanism, based on these Physical Activity Calorie Equivalent (PACE) studies that operate on the assumption that these two work together in the mind of consumers, so that including these PACE labels would reduce the number of calories consumed. Further research is needed to determine the mechanisms behind estimating calories and estimating exercise.

Exercise has been examined in other aspects of healthy living and food consumption. Werle, Wansink & Payne (2015), questions how snacking and exercise are related. These authors posit that consumers are open and willing to eating more when they exercise more. Werle et al. (2015), determined that perception of physical activity changed how participants considered snacking. When physical activity was framed as fun, people consumed less dessert at mealtime and consumed fewer hedonic or unhealthy snacks. When physical activity is perceived as exercise, this triggers the search for reward. This means that when physical activity is seen as exercise, participants felt the need to search out a reward for their hard work, but this was not the case when physical activity was framed as fun (Werle et al., 2015).

A similar effect has been found when considering mental effort rather than physical activity. Werle, Wansink & Payne (2011), observe a compensatory mechanism between thinking about physical activity and food intake. The authors determined this mechanism by considering the compensation between mental effort and subsequent food consumption. They argue that this may be due to the use of cognitive resources, and the bodies need to replenish itself (Werle et al, 2011). The authors found that there is a consumption mechanism in used when physical activity and calories are considered together. Participants who read about physical activity lead participants to compensate for this “exertion” by serving themselves more snacks. The implications of this study are that when consumers even consider physical activity (without
following through and actually taking part in the exercise) they are more likely to consumer more snack foods. This is due to the cognitive resources being used up, as well as physical activity being framed in the sense of exercise, as found in the 2015 study.

In a study, conducted by Edenbrandt & Smed (2018), similar to that of Litchman et al. (1992), the authors observed the correlation between self-reported preferences and actual purchases of nutrition labeled products. The authors discuss a behaviour-intention gap that exists between participants self-reported preferences and actual preferences. If consumers experience this intention-behaviour gap when considering eating food products and actually eating food products (Litchman et al., 1992; Tal & Wansink, 2015), then consumers may experience the same gap while considering the amount of exercise needed to burn off a food, in that, consumers may intend to do more exercise than they truly expect to do as a behaviour. Lee & Thompson (2016), determine that including exercise equivalents on food labels, may encourage consumers to make better food decisions, and eat less. However, if the intention-behaviour gap discussed by Edenbrandt & Smed (2018) extends to this literature, consumers may be willing to choose products with exercise labels and may choose to eat less, this may not turn to a behaviour of actually exercising. While these studies do not explain the relationship between calories and exercise in the mind of consumers, it does help to generate an understanding of how consumers perceive exercise as a whole and the relationship that may exist within food consumption. The mode in which these pieces of information in another important consideration as consumers may be more likely to consider food labels that are easier for them to understand.
2.2.6 Food Labels

2.2.6.1 Labelling on Food Products

Consumers in North America show relatively high levels of confidence in understanding nutritional labels, with more than half (57%) indicating they mostly understand the information (Nielsen, 2012). This may be due to a number of different factors including; the country participants came from, levels of education of the participants and amount of income. These are important factors because consumers from western countries paid more attention to the calories they consumed as they may be more concerned with healthier lifestyles, those with post-secondary levels of education understood information better, and individuals above the poverty line have the ability to make better food decisions because of their higher levels of income (Nielsen, 2012; Sharf et al., 2012). A Nielsen study (2012) shows that global respondents are skeptical about the accuracy and believability of health claims found on food packaging, such as “low fat” and “all natural.” Calorie count claims are the most trusted, with 33 percent of respondents believing calorie count claims are always accurate, and 58 percent finding them sometimes accurate. These values mean that only a third of consumers believe that the nutritional information presented to them can be trusted and should be believed. This indicates that consumers are aware of these labels and claims found on their food, and because of this we can understand these labels do have an influence on consumers decisions, albeit not always a good influence.

Sharf et al., (2012), discussed in a similar study to that of Nielsen (2012), that many of their participants believed that they understood nutritional labels, significantly better than they actually did. In their study, Sharf et al., (2012) studied the comprehension of food labels among
young adults. In this study they found that the majority of participants (77.5%) reported that they took food labels into account. Of these participants, women who were educated, and who engage regularly in physical exercise were the most likely to consider food labels. The study showed that participants found the nutritional table section significantly easier to understand than that of the ingredient list, and nutritional declaration (health/nutrition claims) section.

This study determined that only 27.2% of participants achieved high scores (>60%) on correctly identifying the impact of nutritional items found on the nutritional values table, showing that a majority of participants did not understand the nutritional table, ingredients list, and nutritional declaration. Sharf et al., discuss that a number of strategies are necessary to help educate consumers on the nutritional values found in food, prior to placing this type of information on menu labelling. These strategies are the traffic light system, health claims, and front-of-package-labels, each of which will be discussed in detail further in this paper. The purpose for concern over these strategies is; adding a piece of information to a menu that consumers already do not understand, will lead them to disregard the number even more, or cause further confusion regarding nutritional values.

### 2.2.6.2 Labelling on Restaurant Menu’s

One prevalent method researchers and governments have attempted in order to help consumers gain a better understanding of the number of calories found in the food they eat, is menu labelling. This method consists of labelling calorie information directly on the restaurant menu for meals and food items (Roseman, Joung, Choi & Kim, 2016, Dallas, Liu & Ubel, 2018). This has become a very common method in helping educate consumers however, it has shown
very little influence on actually helping consumers to make more educated decisions. Although much research has been found recommending more education on nutritional values, rather than menu labelling, consumers around the world show support for calorie counts on restaurant menus, with half (49%) of global respondents reporting that fast food restaurants should always include calorie information on menus, and 31 percent indicating that fast food restaurants should sometimes do so (Nielsen, 2012).

Bates, Burton, Huggins & Howlett (2011) discuss that a majority of the food consumed by Americans, is purchased pre-made outside of the home. Because this food is not made from fresh, purchased items in the home, and it often is not the healthiest options (Kniffin & Wansink, 2013). While healthy, premade options are available, these options tend to cost more, and be less tantalizing. Many restaurants have begun to label menu’s with caloric information for meals (Lee & Thompson, 2016, Masic, VanEpps, Downs & Loewenstein, 2016, Christiansen & Boyland, 2017, Dallas et al., 2018). Unfortunately, across North America, little to no positive results have been found after implementing this menu labelling strategy (Lee & Thompson, 2016, Masic et al., 2016, Christiansen & Boyland, 2017, Dallas et al., 2018). The disappointing results of these attempts to help consumers understand their caloric inputs, has prompted the question as to why consumers failed to use the caloric labelling to help them live healthier lifestyles.

When university educated individuals were tested, adding calorie labels to fast food menus helped respondents to choose meals with the fewer calories (Roseman et al., 2016). However, when respondents were questioned as to why they picked the lower calorie meal, the majority responded that they knew calories were bad for them and they should avoid having too
many calories (Roseman et al., 2016). While this reduction in caloric intake is positive because it indicates that individuals are controlling their intake of food and calories, the lack of understanding of why and which calories should be avoided is still concerning, additionally, these educated participants may have a general understand of how calories effect their bodies, but not what needs to be done to get rid of them. In addition to this, the implementation of a change in labelling legislation is difficult to obtain (Thomas, 2015). It should be noted, however, that a reduction of calories is not required for every individual, and the opposite may be required for some people.

There are a number of barriers that are present when providing nutrition information on menus in restaurants. Thomas (2015), discusses that; the lack of nutrition expertise and the change to common menu’s may pose as an issue for restaurants and consumers alike. For these reasons, voluntary participation in these practices is very limited, and governmental intervention is often needed. Because of the difficulty in implementation and the lack of knowledge and understanding around what the calorie labels truly mean, little significant results have been found, and therefore, other areas of food purchasing should be considered as ways to help consumers understand the food they are eating and how it will have an affect on their body (Roseman et al., 2016).

Sacco, Lillico, Chen & Hobin (2016) look deeper into the use of menu calorie labelling, specifically on the impact it has on children and youth. This demographic is explored because childhood and youth are pivotal times in an individual’s life which can shape future food decisions. Sacco et al. (2016) conducted a study in which the objective was to assess whether menu labelling influences the number of calories ordered by children and adolescents in food
outlets including restaurants and cafeterias. Literature searches were conducted by the authors across a number of databases, studies were assessed using a validated quality assessment tool. Examinations of the hypothetical food purchases in lab environments show that menu labelling may be effective in reducing calories purchased for or by children and adolescents. While this was a positive result for calorie labelling, real-world studies that were observed are less supportive. This is an important consideration because these food decisions will shape the types of decisions made later on in life when these individuals are the ones responsible for making their own decisions.

Hypothetical food labelling situations and those in real life scenarios cannot be assumed to operate in the same manner, and a number of studies have gone into observing the difference between hypothetical and real-world settings in research. In their study, Sacco et al., (2016) shows that evidence supporting the impact of menu labelling on lowering the energy content of food choices made for or by children or youth is limited. There is still a need for high-quality studies conducted in real world settings. Although the caloric menu labeling method has shown little results, academics find some utility in this process. As VanEpps et al. (2016), illustrated with the traffic-light system, albeit not a perfect system, a form of labelling which gives consumers a more abstract or relative way of relaying nutritional information may be easier to understand for consumers.

2.2.6.3 Front-of-Package Labelling (FoPL)

A front-of-package label is a label found on the front of a food product package which illustrates or details certain nutrition information that the brand wishes to illustrate, or in some cases, can include endorsements or partnerships with other companies (such as, the heart and
stroke foundation). Not all food products have packages and labels (produce), and products without these labels at all force consumers to make assumptions about the food that are not entirely salient. While many attempts have been made to generate front-of-package labelling (FoPL) which can make nutritional information more digestible and easier to understand, Talati et al.,(2006) found that these FoPL’s were not clearly understood, and actually created a positivity bias in products that featured these FoPL’s. This means that when consumers see FoPL’s they feel a false sense of preference for these products because they believe they are healthier. Although Talati et al. (2006), found a positivity bias, the root issue of consumers lack of understanding of nutritional values persists. For this reason, in order for researchers to find an efficient way to educate consumers on the contents of the food they are eating, they must illustrate the contents of a food item in a concise and simple manner, that is easy for consumers to understand (Mancino & Lin 2015).

### 2.2.6.4 Traffic Light Labelling System

Another method researchers and governments (European Union, United Kingdom) have employed is that of the traffic light system. The traffic light system is a FoPL, in which food product packages are prepared with a coloured label; Green, Yellow, and Red (Healthiest to Least Healthy). VanEpps, Downs & Loewenstein (2016) conducted a study done in an online workplace lunch ordering site. The employees who participated in this study ordered lunch through a website, where they were presented with menus. These menus had either numeric calorie labels (as found in Sacco, Lillico, Chen & Hobin, 2016), traffic light system labels, or both together.
These three groups were compared to a control group which had no calorie information. Both the traffic light label and traffic light label with calorie label group type helped to reduce the ordered number of lunch calories by 10% (VanEpps et al., 2016). While the number of calories was significantly reduced nutrition knowledge was not improved by any menu format, showing that consumers levels of nutrition knowledge was not significantly improved by calorie labels, or traffic light labels. VanEpps et al. (2016), show that consumers may benefit most from help in identifying relative healthier choices buy rely little on information about the exact caloric content of items.

2.2.6.5 Physical Activity Labels

Lee & Thompson (2016) tested ways of presenting ways of menu labelling that may be easier for consumers to understand in a relative way as such. The reason they completed this study was because of the small, inconsistent effects on behaviour that calorie menu labelling had shown. Lee & Thompson (2016) propose that supplementing calorie amounts with an exercise amount may produce stronger results in having consumers order fewer calories in a lunch-time scenario. The authors looked at calories plus the distance in miles of walking necessary to burn off the number of calories in a meal. Lee & Thompson (2016) describe these labels as Physical Activity Calorie Equivalent (PACE) labels. The authors found that the labels had little effect on ordering behavior, with no significant differences in total calories ordered, similar results were also found by Dowray, Swartz, Braxton & Viera (2012). The labels also had little impact on the exercise-related outcomes (Dowray et al., 2012). This and the poor results may be attributed to the fact that distance to walk may be a difficult concept for consumers to understand only adding to their confusion. The findings of this paper concur with the previous literature that there are
small and inconsistent effects of menu labeling strategies. The authors suggest that alternatives such as finding another method of showing exercise equivalents, or the traffic light systems should be considered (Dowray et al., 2012; Lee & Thompson, 2016).

Determining the effect of menu labels displaying the energy content of food items or the exercise equivalent on energy ordered and consumed is an area that requires more research in order to understand the most effective way to create a labelling system to help consumers make better decisions (James, Adam-Huet, Shah, 2015). The authors observed young adults and the number of calories that were ordered and consumed at lunch and energy intake for the remainder of the day in young adults. The subjects in the design of this study were randomized to a menu with no labels, menu with kilocalorie labels displaying the energy content of the food items, or menu with exercise labels displaying the minutes of brisk walking needed to burn the food energy. Subjects ordered and consumed foods/beverages for lunch from the menu to which they were assigned. James et al. (2015), found that the menu with the exercise-labels resulted in less energy ordered and consumed and this led to lesser energy consumption post lunch, compared to the menu with no-labels. This research showed positive results for physical activity calorie equivalents in a different manner than Lee & Thompson (2016) found, in that they used the minutes required to walk rather than the distance.

Dowray, Swartz, Braxton & Viera (2012) completed a similar study, prior to the works of James et al. (2015) and Lee & Thompson (2016). In their study, Dowray et al. (2012) examined the effects of physical activity-based labels on the calorie content of meals selected from a sample fast food menu. Like much of the similar research done, this was done in an online hypothetical setting. Participants in this study were randomly assigned to one of four conditions,
each condition was a menu that differed from other only in the labeling schemes used (menu with no nutritional information, a menu with calorie information, a menu with calorie information and minutes to walk to burn those calories, or a menu with calorie information and miles to walk to burn those calories).

There was a significant difference in the number of calories ordered based on menu type, with an average of 1020 calories ordered from a menu with no nutritional information, 927 calories ordered from a menu with only calorie information, 916 ordered from a menu with both calorie information and minutes to walk to burn those calories, and 826 calories ordered from the menu with calorie information and the number of miles to walk to burn those calories. This was different than the results found by James et al. (2015), in that in this case the distance condition ordered less calories, rather than the minutes needed to walk. Common between these studies (Dowray et al., 2012, James et al., 2015, and Lee & Thompson, 2016, Masic, Christiansen, & Boyland, 2017) the majority of participants reported a preference for physical activity-based menu labels over labels with calorie information alone and no nutritional information.

Viera & Antonelli (February, July 2015) conducted two studies similar to each other. These studies observed the effects that PACE menu labelling had on parents ordering for their children (February 2015), and adults ordering for themselves (July 2015). PACE (Physical Activity Calorie Equivalents) labelling is when the number of calories present in a food item is presented by the number of minutes or distance needed to move in a certain way in order to burn off the number of calories found in the food item. In their first study, Viera & Antonelli (February 2015) conducted a survey of parents randomized to 1 of 4 fast food menus; No labels, calories only, calories plus minutes, calories plus miles needed to walk to burn the calories.
Respondents were asked to imagine they were ordering for their child, which increased the involvement level present in participants because the decision they made had an effect on another individual who they cared for greatly. The authors found that PACE labeling can influence parent’s decisions on what fast food items to order for their children and encourage parents to remind and encourage their children to get their exercise, because exercise and the type of food eaten was top of mind for parents.

In their second study, Viera & Antonelli (July 2015), looked only at adult’s responses to a purchasing situation where adults were purchasing meals for themselves. Similar to many other studies of this type, this study was done as an online survey. Participants across the US were randomly assigned via internet survey to one of 4 fast food menus: no label, calories only, calories + minutes to walk off calories, or calories & distance needed to walk off calories. After completing hypothetical orders participants were asked to rate the likelihood of calorie-only and PACE labels to influence food choice and physical activity. The authors concluded their studies by determining that PACE labels may be helpful in reducing the number of calories ordered in fast food meals and may have the added benefit of encouraging exercise (Viera & Antonelli, 2015, Masic, Christiansen & Boyland 2017).

One additional addition to this type of study would be to use kilo-calories instead of a typical calorie label (Platkin, Yeh, Hirsch, Weiwel, Lin, Tung & Castellanos, 2014). According to Platkin et al. (2014), the calorie amount featured on most nutritional values tables is the total number of calories found in a food, this includes both good and bad calories, meaning that some of these calories are necessary for one’s daily life, and some are in excess and are available to be burned up upon digestion (Platkin et al., 2014). Kilocalories are the number of calories that are
only available to be burned up immediately upon digestion and do not include those the body needs, only those in excess (Platkin et al., 2014). Kilocalories have long been used in different areas around the world. The only and simple difference between calories and kilocalories is that kilocalories are the number of calories divided by 1000. Platkin et al., (2014) mention that adding kilocalorie information to labels in jurisdictions where only calories have been used, may lead to increased confusion for consumers or even research participants.

Hartley, Keash & Liem (2018) aimed to determine why nutrition labelling has not proven to influence food choices that have lower energy amounts. In this article the authors aimed to determine why nutrition labelling has not proven to influence food choices that have lower energy amounts. Consistent with the discussion by Platkin et al. (2014), Hartley et al. (2018), considered the difference between labelling with kilocalories (kcals) and calories, and were concerned with kcals would cause more confusion for consumers. In order to do this Hartley et al. (2018) aimed this study to investigate the impact of the PACE front-of-pack label on consumption, prospective consumption and the liking of familiar and unfamiliar discretionary snack foods.

Using this research, further research is called to look into other methods of food purchasing, including food products purchased in supermarkets, vending machines, and commissaries serving packaged food products, rather than simply looking at menu labels that are edited using these PACE and calorie labels.
2.2.7 Organic Foods

Organic foods feature labels which are used to denote how a product is produced, and not as a method to help consumers make healthier decisions, however, it is frequently perceived as healthier than its non-organic (conventional) counterpart because of a possible health-halo, where consumers assume it is healthy because there are positive aspects associated with this label (Schuldt & Schwarz, 2010; Paul & Rana, 2012; Prada, Garrido & Rodrigues, 2017). The term organic explicitly informs consumers about the food production method, yet consumers utilize this term to infer unrelated food attributes (Prada et al., 2017). Schuldt & Schwarz, (2010) argue that organic claims influence other food attributes such as calories and nutrition, due to a health halo (for these participants) that surrounds the term organic (Women’s Health, 2015; Bui, Tangari, & Haws, 2017). This health halo causes consumers to consider food with the organic term on it or associated with it to be healthier than that of one without an organic label (Bui et al., 2017). This is an error in thinking, considering the term organic only takes the farming method of a food product into consideration (Prada et al., 2017).

The method of farming would not change the nutritional value in the food, including calories and nutrients found in the food (Schuldt & Schwarz 2010, Bui et al, 2017). The term “organic” infers, to consumers, that there is something healthier about the product, although this is not the case, and this error causes consumers to choose an “organic” product as a “healthy” product and will choose to consume more of this organic labelled item. Some research has argued that an organic label is incongruent with certain types of food products (Women’s Health, 2015; Bui et al., 2017). Consumers seem to understand that soft drinks, certain high-sugar desserts and snack foods have no place in a healthy diet, and should not be considered healthy.
food, therefore when an organic label is placed on these foods, consumers may recognize that these unhealthy foods are not created healthy by the organic label (Women’s Health, 2015).

2.2.8 Causes of Confusion

Health officials and governments believe that adding this calorie information to menus would be an effective tool in helping consumers to understand the number of calories they are eating. This has been shown not to work across a number of studies as discussed in previous sections, but the issue may lie deeper than just making the number of calories more visible to consumers. A more inherent issue may be that consumers do not understand the nutrition values of a food product to begin with. Nutritional labelling of packaged foods, which is mandated by law in most jurisdictions around the globe, include the details of the food content and composition (Sharf et al., 2012), and this information can affect individual and public lifestyle decisions and health status.

Nutritional labelling is the nutritional values table found on the pack of most food products. This is different than nutritional claims, where nutritional claims are other claims found on food packaging such as; low fat. Nielsen (2012) observed how consumers around the globe perceived the nutritional values tables found on most food packaging. This study found that 59 percent of consumers around the world have difficulty understanding nutritional labels on food packaging and more than half (53%) consider themselves overweight. Consumers recognize that they are obese and feel the need to find solutions to this problem.

Nielsen’s (2012) study found that nearly three fifths of (59%) consumers around the world have difficulty understanding nutritional facts on food packaging, with 52 percent
understanding the labels “in part.”. Participants in this study who claimed they understood labels “in part” either believed that they understood nutritional facts, but were incorrect, or only understood the nutritional facts partly. Nielsen (2012) also found that forty-one percent of global respondents “mostly” understand nutritional labels, down from 44 percent in a similar 2008 Nielsen report. Seven percent of these individuals say they do not understand nutritional labels to any extent at all. These results indicate that the excess of information and labels present of food items does not make food decisions and understanding of foods easier, rather as seen in the change between the 2008 (44%) and 2012 (41%) study, consumers have a lesser understanding of nutrition amidst changes in legislation around food packaging.

2.2.9 Effect Explanations

Multiple theories are required to be considered for this study. Two specific effects may help to answer the question of consumers ability to understand the number of calories and exercise equivalents in food products, as well as to determine which type of labeling would be the best in aiding consumers to make healthier food decisions. Priming effects and the Licensing effect are both required to be considered in these estimation studies.

2.2.9.1 Priming Effect

Priming is described as a nonintentional or nonconscious way to influence behaviour (Bargh & Chartrand, 2000, Kahneman, 2015, & Minas, Poor, Dennis & Bartlet, 2016). Priming is an activation of mental representations, sometimes considered heuristics or mental schemas, that can influence one’s behaviour (Bargh & Chartrand, 2000). When a prime is utilized to activate an individual’s mental schema or representation, memories, heuristics or shortcuts are associated with the targeted behaviour (Minas et al., 2016). Due to the specific nature of primes,
primes may affect an individual or a group of people but does not necessarily work on every single individual (Kahneman, 2015). Primes can elicit a response through any of the human senses (Mors, Polet, Vingerhoeds, Perez-Cueto & de Wijk, 2017). This would mean that primes can elicit a memory through an image, words, sounds, or even other senses such as smell, taste, touch and sound. This concept of priming has been utilized in current research in observing food decisions and consumption. Minas et al., (2016) use weight control as a priming tool to curb over-eating. The authors find that priming is shown to influence subconscious cognition and can be an effective method in helping participants reduce food intake. When dieting participants were primed with a weight-loss goal, they were more likely to moderate their eating and reduce their food intake, as well as choose a healthier food option, because they were reminded of their efforts in order to lose weight (Minas et al., 2016). Although this study focused on individuals who are dieting, according to the results of the Nielsen (2012) study, an overwhelming majority of individuals in North America are currently dieting or trying to lose weight.

Understanding this, priming may be able to be utilized as a useful tool in reminding participants that a low-calorie intake may be an important tool in controlling consumption (Webster, Chakrabarty & Kinard, 2016, Mors et al., 2017). In this research primes are used in order to have participants think about a certain part of their day and observe how these primes change the preferred food choice of participants as well as their ability to correctly estimate the calories or exercise in a food product.
2.2.9.2 Licensing Effect

Another theory that is valuable and pertinent when considering food choice is that of the Licensing effect. The licensing effect, simply stated, is when a prior action licenses or allows for a more self-indulgent option (Khan & Dhar, 2006). The literature on the licensing effect tends to focus on vice and virtue options (Thomas, Desai & Seenivasan, 2010).

This means that when individuals do something good or virtuous, they feel that they are allowed to then partake in something bad or seen as more of a vice (Thomas et al., 2010). This is seen in individuals’ actions (Khan & Dhar, 2006, Merritt, Effron & Monin, 2010), as well as purchases and food decisions (Thomas et al., 2010, Huberts, Evers & De Ridder, 2011, Effron, Monin & Miller, 2012). When first proposed by Khan & Dhar (2006), the licensing effect was described as an instance when and individual is making a choice between a relatively good option and a relatively bad option. A previous choice or action will influence the choice between these two products depending on the relative good or bad-ness of the prior action. The authors found that participants would allow themselves to consume something considered more of a vice if their previous action was good or considered very positive. In this way, they give themselves permission for the vice because they feel they have earned it (Khan & Dhar, 2006, Merritt et al., 2010). This effect was quickly considered in the food decision realm as well.

The Licensing effect in consumer decisions can be illustrated by a shopper doing something good, like donating to a charity or choosing to carpool, and because of this decision, will now allow themselves to buy a more expensive, luxurious or indulgent option later on (Merritt et al., 2010). Effron et al., (2012) found that in food decision instances, participants in their study would exaggerate pervious decisions where they made a healthier decision to license
unhealthy behaviour. Hedonic consumption is often considered to be caused by impulsive factors (Huberts et al., 2011), however, this licensing effect may be completely independent of impulsivity (Thomas et al., 2011). Understanding that these unhealthy choices may be due to a prior choice, the licensing effect may plan an important role in the decision making of food choices that feature either healthy or unhealthy aspects, and that priming can have an important effect on the decision that is made. This is an important consideration in this study, as a prime may elicit the licensing effect as to which product type is chosen.

Additional literature on self-control and organic labels can be found in Appendix A.

2.2.10 Gaps in the Literature

While calorie labeling, and obesity control has been heavily researched, there has been very little interdisciplinary research in this area. Research has failed, thus far, to observe PACE labels in grocery store scenarios, and in terms of consumer-packaged goods food items (Christian & Boyland, 2017). This may relate back to the intention-behaviour gap that has been discussed in prior research (Edenbrandt & Smed, 2018). Prior research in PACE labeling has observed distance as a metric for the label, utilizing minutes rather than distance may prove to be a more effective metric (James et al, 2015). Another gap in the literature is observing the effects of PACE labels specifically on students and/or young adults. This experience is typically a period of new experiences for individuals as they are becoming more self-reliant and doing more of their own grocery shopping, allowing them to create their own shopping habits, and therefore, the introduction of a new label may be able to influence these individuals (Sacco et al, 2016). Additionally, these young adults, or millennials, fare high in pro-environmentalism and for this reason they may be more effected by organic labels and the health-halo that is generated with
this type of label (Bui et al., 2016). Additionally, in prior research with PACE labels on food items, menus were used, which featured a number of different types of food products. These products range on levels of healthfulness and processing, however differences among these product types are never reported. Finally, research into estimation accuracy for calories began with Carels et al., (2007). This method concluded that an individual’s ability to estimate the number of calories in a food represented their understanding of calories as a whole and that food specifically (Carels et al., 2007; Roberto et al., 2013). However, since the emergence of physical activity labels, consumers understanding of exercise and its relation with food has not been observed in a similar way.

For these reasons, in order to determine how accurate or inaccurate youth individuals are at estimating the number of calories and minutes of exercise required to burn off a food a study would be required to determine the direction of these estimations across different product types. This pilot study is modelled after the work of Carels et al. (2007), and Roberto et al. (2013), and we expected to find similar results that consumers underestimate the number of calories found in foods, and when an organic label is present, these estimates would be further reduced. A second study was required in order to further this understanding of consumers ability to estimate calories and exercise while including another food product to determine if product type did indeed have an influence on the estimations. Additionally, this study would include an instance of priming and an opportunity for choice for participants in order to determine if state of mind influenced their estimations and their choice of food product. The results of these studies would introduce a new element of exercise estimations and observe estimations differences across different food types.
Chapter 3 - Conceptual Model and Hypotheses

3.1 Introduction

Food choice is a necessary and common occurrence in an adult’s daily life. Food choice has an impact on lifestyle and the type of foods that one consumes can influence the lifestyle one has (VanEpps et al., 2016). Frequent, poor food choices can lead to obesity as well as the accompanying health issues (Hebert et al., 2013). One of the many reasons that consumers end up living unhealthy lifestyles and becoming obese is that consumers do not understand the contents of their food, and therefore how to choose healthier options (Sharf et al., 2012). One of the major points of confusion is that of calories (Carels et al., 2007). The confusion that consumers feel when thinking about the caloric content of a food they are trying to choose, can cause them to revert back to products that they know and are habituated to, regardless of the nutritional content, which means this decision may not be the healthiest choice (Sharf et al., 2012). Because of this, literature has looked into other methods of presenting nutritional information and caloric content to the consumer in order to try and make more sense of the content. However, utilizing front-of-package labels, and menu labelling of calories only provided consumers with more confusion (VanEpps et al., 2012).

A recent diversion from this push towards more saliency of caloric content is physical activity calorie equivalents (PACE). This understanding of the concept of caloric content is an important consideration because prior literature has utilized participants understanding and ability to estimate caloric content to understand consumers ability to comprehend a food product.
(Carels et al., 2007, Roberto et al., 2013). Frequently missed by consumers is the fact that a calorie is a simple unit of energy. Since consuming food is how calories are brought into the body, the opposite would be exercise where the calories, or unit of energy is burned and taken out of the body (Viera & Antonelli, 2015). For the reason that calories have been found to not be entirely understood by consumers, recent studies have looked at alternatives, such as physical activity equivalents, which illustrate the caloric amounts in terms of the distance one would need to walk to burn off said calories (Lee & Thompson, 2016). These PACE labels have been met with very mixed results, meaning that some studies have found these PACE labels have been very successful in encouraging individuals to make healthier choices, and others have found that the presence of a PACE label elicits no different results than when just a calorie label is present (Dowray et al., 2012; James et al., 2015; & Lee & Thompson 2016). This may be due in part to the types of food products that were tested, as other authors have determined that product type and perception will influence consumer choice (Tal & Wansink, 2014), consumers state of mind, and the type of physical activity equivalent presented to the participants in these studies (distance to walk versus time to walk) (Viera & Antonelli, 2015). Based on the work of Carels et al., (2007), and Roberto et al., (2013), this connection between a participant’s estimation accuracy, and their understanding of calories, a new extension to exercise estimations and exercise understanding can be made in order to scrutinize the current PACE literature.

For these reasons, more food products types should be considered, and different consumer states of mind should be considered when observing consumer understanding of calories and/or physical activity equivalents. Consumer experiences, which place them in a certain state of mind, particularly prior to a purchase or consumption can have a large impact on
the decision that is made (Minas et al., 2016), therefore, observing consumers understanding of the concepts of calories and physical activity must be observed over a number of situations. Additionally, rather than considering distance, time to exercise should be considered because the concept of time is more salient in the mind of consumers (Dowray et al., 2012). This method of PACE labels on food products have not yet been tested in the wider market, and therefore research is solely relying on prior work to determine the effectiveness of these strategies. In this study, estimations of the number of calories and the number of minutes needed to walk to burn off a food product need to be taken in order to determine how well consumers understand each concept. Using the method proposed by Carels et al., (2007), and Roberto et al., (2013) estimations of both calories and exercise are used to determine participants understanding ability of these concepts. We expect exercise equivalents on food products may help participants make better food choices, because they have a concept that they actually understand how it impacts their body, versus just calorie information alone, meaning that this novel label may increase consumer attention and therefore help consumers make better decisions. This can be determined by the accuracy of exercise estimations relative to calorie estimations across different food product types. Conceptual Maps and formal hypotheses summarizing these expectations are produced below.
3.2 Main Effect Hypothesis

Figure 1: Conceptual Map of Main Effect Hypothesis

*Hypothesis 1:* When participants are asked to estimate exercise (calories), their estimations will be closer (further) from the true value.

Prior research has indicated that consumers are very poor at understanding what calories are, and calorie amounts found in the food they are eating (Sharf et al., 2012). It has also been found that participants, when asked to do so, are very poor at guessing or determining how many calories are found in a given food product (Carels et al., 2007), and this effect was found across different food types (perceived healthy to unhealthy foods, Tal & Wansink, 2014). While prior research has not looked into participants ability to estimate the amount of exercise required to burn off a food product, when PACE labels are present on menu’s or food items, participants take this information into account and some studies have found that they choose healthier (lower in calories) food products (Lee & Thompson 2016). Because of this, increase in consideration for this additional label (Lee & Thompson, 2016), which leads to fewer calories being ordered/consumed we hypothesize that when participants are asked to estimate exercise equivalents, they will be closer to the true value in their estimations than for calorie estimations, because exercise times may be an easier concept for consumers to grasp, particularly when
making a food decision in a short period of time. This is due to the fact that participants can guess and therefore understand this concept, and the label would represent their expectation (Carels et al., 2007, Roberto et al., 2013, Viera & Antonelli, 2015).

3.3 Moderation Hypotheses

3.3.1 Hypothesis 2

![Conceptual Map for the First Moderation Hypothesis](image)

Figure 2: Conceptual Map for the First Moderation Hypothesis

*Hypothesis 2:* When participants are asked to estimate exercise, we expect that unhealthy products will elicit an estimation closer to the true value.

Although consumers do not necessarily understand what calories are or how they work, consumers have become habituated to observing calories on food packages and have a common understanding that an excess of calories are bad for their health (Jiang & Lei, 2014; Taksler &
Elbel, 2014). Because consumers know that calories are bad for their health, and in turn unhealthy foods must be high in calories, when unhealthy products are presented, participants will overestimate the number of calories in the product because they associate unhealthy with high in calories, this effect may be considered an unhealthy halo effect (Bui et al., 2017). Based on the prior work of Carels et al., (2007), and Roberto et al., (2010), in their studies on participants ability to estimate the number of calories found in a given food or meal, these authors found that participants in their study underestimated the number of calories in healthy foods, and over estimated the amount of calories in unhealthy foods. Using these findings and the findings of Dowray et al., (2012) indicating that consumers understand exercise equivalents better than they do calories, we posit that this effect of participants ability to better understand exercise than calories, will be seen for unhealthy products where calorie estimations will be overestimated to a great degree. Additionally, when a healthy product is presented, participants will underestimate the amount of exercise required to burn off the product because participants assume there are few calories in the product and therefore will need little work to burn off the product (Roberto et al., 2013; Viera & Antonelli, 2015). It was found that when participants were exposed to PACE labels, they utilized the direction of the exercise (low number of minutes vs high number of minutes) to ascertain the number of calories found in the food, however when the PACE label was not present, the calorie amount on its own was highly overestimated. Conversely, when an unhealthy product is presented, participants will overestimate the number of calories found in the food product, however because exercise is a more understood concept, they will be more accurate in their estimations of exercise. For this reason, we hypothesize that estimation type will moderate the relationship between product type and percent difference from
the true value, such that when an unhealthy product is presented, participants asked to estimate exercise will estimate closer to the true value than when asked to estimate calories.

3.3.2 Hypothesis 3

![Conceptual Map for the Moderated Moderation Hypothesis]

Figure 3: Conceptual Map for the Moderated Moderation Hypothesis

*Hypothesis 3*: When participants are asked to estimate exercise (vs. calories), they will be closer to the true value of the exercise amount for unhealthy products (vs. healthy products) when primed to think about physical exertion (vs. mental exertion)
Similar to the first hypothesis, which states that estimation type will have a sort of influence estimation (percent difference from the true value), such that exercise estimations will be closer to accurate, this hypothesis posits that there are other elements that have an impact on this relationship. Primarily we hypothesize that this estimation type will moderate the relationship between product type and percent difference (hypothesis 2), however, in addition to this moderation, we posit that the prime condition that participants are placed in will have an impact on the moderation that estimation type plays. We expect that there is an over-estimation of calories for unhealthy products when participants are primed with physical exertion because of the licensing effect once again (Merritt et al., 2010). The licensing effect influences these estimations because participants who have been primed to think about having just done physical exertion are considering the amount of energy and calories burned in that physical exertion and allow themselves to partake regardless of the amount of calories present. This hypothesis combines Hypothesis 1 and Hypothesis 2 and includes the moderation of a prime on the participants in consideration of the estimation accuracy that participants were asked to generate. As seen previously, participants, when exposed to unhealthy products over estimate the number of calories in the product due to a lack of understanding of calories while understand that unhealthy typically means high in calories (Taksler & Elbel, 2014). This is due to the fact that when participants are primed to be in a certain state of mind, the Influence in hypothesis 2 of the moderating effect of estimation type, and hypothesis 3 of the moderating effect of a prime are exaggerated. Taken together we hypothesize that when participants are asked to estimate exercise, these estimations will be closer to the true value when primed to think about working
out at the gym or physical exertion because exercise and the amount of time exerting one’s self is top of mind for these participants.

3.3.3 Hypothesis 4

![Conceptual Map for the Second Moderation Hypothesis](image)

**Figure 4: Conceptual Map for the Second Moderation Hypothesis**

*Hypothesis 4a:* When participants are primed to think about just having gone through physical exertion (vs no exertion), we expect them to choose an unhealthy product (vs. healthy product)

*Hypothesis 4b:* When participants are primed to think about just having gone through mental exertion (vs no exertion), we expect them to choose a healthy product (vs. unhealthy product)

Including a prime, when asking participants to think about food estimations, allows researchers to get a better idea of how consumers would respond to these types of choices in the real world (Mors et al., 2017). A prime influences the state of mind of a participants, the two primed conditions (study and gym) were included to elicit a state of mind of exertion or exhaustion. In the decision making process, consumers state of mind will influence the way that
their decisions are made (Bargh & Chartrand, 2000), and for this reasons influencing their state of mind in this study is necessary in order to understand the responses of our participants as it relates to the general population. When a participant is primed to consider the amount of work they have just expended, either mental or physical, before heading to their next class, their snack product choice will change. This is due to a number of reasons, including the mindset that they are in and a possible licensing effect (Khan & Dhar 2006). When participants have just finished a long studying session, or any time of mental exertion, we expect that they will choose a healthy product because they have not expended any calories when doing this mental exertion, and while this does use up valuable resources, in comparison to physical exertion where they are more likely to choose an unhealthy product. When participants have just finished working out at the gym, we expect them to choose an unhealthy product because they are allowing themselves to consume more calories because they know they just burned a large number of calories off, this may be due in part to the licensing effect (Merritt et al., 2010). This would mean that participants who have just completed heavy physical exertion, such as going to the gym, are more likely to choose an unhealthy product because they may be trying and willing to replace the calories that they just burned off and are a valuable resource for life. Taken together, we hypothesize that product type (healthy vs. unhealthy) will have an influence on the relationship between priming condition (study, gym, lunch) and product choice.
4 Chapter 4 - Research Methodology and Results

4.1 Introduction

Two experiments (online surveys using SONA at the University of Guelph, Marketing and Consumer Studies) were conducted to provide evidence for these proposed hypotheses. REB approval (REB#18-08-029) was granted prior to running said online studies. The experiments were designed and run in Qualtrics, and the data was analyzed using SPSS. Across all studies, participants are asked for calorie estimations in units of calories, and exercise estimations in units of minutes of brisk walking. In order to compare estimations accurately, both estimations are converted to percentage difference from correct response and will thus forth be referred to as estimation in relation to the true value.

4.2 Experiment 1

The objective of Experiment 1 was to illustrate, in general, that consumers are better at estimating the amount of exercise minutes required to burn off a food than when estimating the number of calories found in a food item (hypothesis 1). Additionally, this experiment aims to show that when participants are asked about unhealthy foods (vs healthy food), we expect their estimation to be closer to the true value than when making calorie estimations (hypothesis 2).

4.2.1 Design and Procedure

In order to determine the specific number of participants required to generate useful results for this study, G-Power, a statistical software, was used to calculate an a priori sample size. The sample size for this study was calculated based on a 0.80 power, an alpha level of $p <$
.05 and for an effect size of 0.25 (which is considered a medium effect). Based on the results generated by the software, a minimum of 128 participants were required for adequate results from this study. Because additional students were available through the SONA system, a maximum of 165 timeslots (opportunities for students to partake in the study) were made available.

161 undergraduate students (44.1% female) participated in this 2 (Organic vs Conventional Label) x 2 (Calorie vs Exercise Estimate) x 3 (Apple – healthy product, Granola – control product, Doughnut – unhealthy product) mixed design experiment where product type is within-subjects for 2% course credit in their undergraduate Marketing and Consumer Studies course. Data collection ran from 5th, October 2018 to 10th, October 2018. Students were recruited through the SONA system of the Department of Marketing and Consumer Studies SONA system (http://uoguelph-mcs.sona-systems.com/). Students interested in participating accessed the anonymous link for the survey through the SONA website on a computer with internet access. Only participants who agreed to the consent form at the very beginning of the survey were able to advance on the experiment. As per the guidelines of REB, all students who signed up to take part in the study, regardless of whether they affirmed consent or not, were granted the 2% course credit.

In this survey, participants were presented with images of a healthy product (apple), an unhealthy product (doughnut) and an intended control product (granola). These food products were accompanied by a title for the product, which were either based on a conventional version of the product or based on an organic version of the product. Please see Appendix A: Stimulus used in Experiment 1. Organic labels were utilized in this experiment as an exploratory measure.
Prior research observes organic labels on perceived healthiness (Prada et al., 2017), however this concept was yet to be used in the estimation research. Once participants had an opportunity to view each product, they were asked to estimate either the number of calories found in each product, or the number of minutes required to walk briskly to burn off the food item. Individuals in the exercise estimation condition were specifically told that a brisk walk is considered as walking more than 100 steps per minute. Estimations were reported by participants as calories for the calorie condition and minutes for the exercise condition. These values were then subtracted from the true value and divided by the true value in order to create a metric that can be compared. Once participants listed their estimations, they were asked some follow up questions regarding their overall lifestyle including snacking and exercise habits, and familiarity with calorie counting (all on a 7-point scale adopted from Roberto et al., 2013). As control variables, participants were asked how familiar they were with each of the 3 food products and responded a 7-point familiarity scale. Finally, participants gave some demographic questions such as age, gender, and year of study. The stimulus used for Experiment 1 can be found in Appendix B.

4.2.2 Results

After accounting for non-consenting participants, missing data, incomplete surveys and outliers, a sample of 153 participants took part in the study (45.1% female) were analyzed. Based on the minimum number of participants required as determined by the G-Power software (128), even after removing outliers, the sample size of 153 is more than adequate.

Figure 5: Experiment 1 Manipulation Check - Familiarity
Estimation Levels. Through a test of ANOVA, there was a moderately significant effect of estimation type on percentage difference ($F_{1,248}=3.27; p=.071$) confirming our hypothesis 1. To further this finding, another ANOVA was conducted, with percentage difference as the DV, and Product Type and Estimation Type as IV’s. A moderately significant two-way interaction was observed ($F_{2,248}=2.87, p=.058$). This interaction effect was mainly driven by the estimation differences for the unhealthy product (doughnut: $M_{Calorie}=45.92, M_{Exercise}=5.32, p=.034$) compared to the healthy product (apple: $M_{Calorie}=1.31, M_{Exercise}=27.75, p=.333$).

These results illustrate that the type of product that participants were asked to consider and the type of estimation they were asked to consider jointly influenced the accuracy of their responses. This effect was driven by the unhealthy product, which indicates that the unhealthy product saw a significant difference between estimations for calories versus for exercise. This is illustrated further by the Pairwise comparison seen below. The mean difference for estimation type is significant for the unhealthy product, doughnut. The percentage difference for doughnut is significantly different between estimation types ($M_{Calorie} = 5.32, M_{Exercise} = 45.92$). This means that participants in the exercise estimation condition were closer to the true value with their estimations than their calorie estimation counterparts. Differences between the other two products were not significant for estimation type ($M_{AppleCalorie}=1.31, M_{AppleExercise}=27.75, M_{GranolaCalorie}=2.74, M_{GranolaExercise}=18.14$). This confirms our hypothesis 2 such that, when participants considered unhealthy food, they did in fact estimate closer to the true value when making exercise estimations compared to calorie estimations. This was further confirmed by a moderately significant ($F_{2,248}=2.87, p=.058$) interaction effect found between Product Type X Estimation Type.
Additionally, when looking at the ANOVA considering the influence of the Organic Label on each product type, there was no significant effect or interaction of the Organic Label ($F_{1,248}=.199 \ p=.820$). This indicates that the organic label did not have a significant impact on the estimations that participants made. For this reason, the organic label did not need to be considered for further studies. More detailed tables for Experiment 1 can be found in Appendix C.

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<td>2.87**</td>
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*Significant at $p<.1$ **Significant at $p<.05$

Table 1: Experiment 1 ANOVA of Product Type and Estimation Type
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<th>(J) EstType</th>
<th>Mean Difference (I-J)</th>
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</table>

*Significant at $p<.05$

Table 2: Experiment 1 Mean Estimation Comparisons
These means are illustrated in the chart below.

**Figure 6: Experiment 1 Estimation Differences**

_Familiarity Check._ Consideration of familiarity worked, with participants being found to see each product as relatively familiar (M>3.5), where apple is the most familiar product (\(M_{\text{Apple}}=5.59, F_{1,2}=9019.33, M_{\text{Granola}} = 4.34, F_{1,2}=3367.13, M_{\text{Doughnut}} = 4.3, F_{1,248}=2941.11, p<.01\)). This familiarity check was considered because the means for each product were greater than three. The chart below illustrates the mean familiarity for each product:
4.2.3 Discussion

Experiment 1 was designed to test the main effect hypothesis of estimation type on percent difference from the true value, and the second hypothesis that when participants consider unhealthy food, we expect people to be estimate closer to the true value when making exercise estimations compared to calorie estimations. Prior research has not tested the accuracy of calorie estimations versus exercise estimations and failed to observe differences in estimations based on product type (healthy vs. unhealthy). Hypothesis 1 assumes the type of estimation will influence how accurate an estimation is, such that when participants were asked about exercise estimations, their estimations will be more accurate than when they were asked about calorie estimations. Additionally, this experiment was designed to observe the moderation effect that product type has on the relationship between estimation type and how close estimations were to the true value, such that when participants were considering unhealthy foods, people would be
more accurate when making exercise estimations. Hypothesis 2 assumes that participants who were asked to make exercise estimations will be more accurate when they were presented with an unhealthy product (doughnut). 153 undergraduate students (N = 153) participated in this between subject study where they estimated the number of calories or minutes of exercise required to burn off a given food product. An ANOVA test revealed that there was a moderately significant two-way interaction of the food product type on estimation type, this effect was driven by the unhealthy product, doughnut. This ANOVA also showed that conventional unhealthy products were significantly estimated more accurately, when participants were asked to estimate exercise. This result supported the main effect hypothesis (Hypothesis 1) and our moderation hypothesis (Hypothesis 2), in that the type of estimation influence the accuracy of the estimation. Finally, the control product (granola) say no significant results for both hypotheses confirming that this product was seen as less healthy than an apple, but more healthy than a doughnut. Additionally, organic labels were shown to have no effect on estimations across any product type and estimation type. In this study, the inclusion of the organic label was intended to be exploratory research in the realm of calorie and exercise estimations due to the influence of organic labels found in other disciplines within food packaging, where consumer find products with organic labels to be more appealing and perceived as healthier (Schuldt & Schwarz, 2010, Doorn et al., 2011, Lee et al., 2013). Because there was no significant effect of the organic label this concept does not need to be observed any further and the details will be discussed in the limitations section.
4.3 Experiment 2

The objective of experiment 2 was to further the results found in experiment 1. This study included the 3 products found in experiment 1 but included one additional product. Beef Jerky was included as an additional product because beef jerky was intended to be an unhealthy product that is observed as low in processing. By using a lower processed, unhealthy product here, we aimed to determine how participants observed this product because it is still unhealthy similar to that of our previous study (doughnut), but it is seen as less processed than the unhealthy product. Participants in this study were given a prime (Lunch, Study, Gym), and then asked to choose a product before estimating both calories and exercise. The lunch condition was intended as a control group, the study condition is intended prime participants in such a way that they believe they just used a lot of mental resources, and the gym condition is intended to prime participants in such a way that they believe they had just used a lot of physical resources. This impact of the lunch condition operating as control condition was not tested because we did not want questions regarding the prime each participant was in to influence their initial reaction to the prime and therefore change their responses to their choices and estimations. Participants were asked to estimate both calories and exercise in order to determine participants accuracy of these estimations within subjects.

4.3.1 Design and Procedure

Similar to the first experiment, G-Power, a statistical software, was used to calculate an a priori sample size. The sample size for this study was calculated based on a 0.80 power, an alpha
level of $p < .05$ and for an effect size of 0.25 (which is considered a medium effect) and 3
groups. Based on the results generated by the software, a minimum of 179 participants were
required for adequate results from this study. Because additional students were available through
the SONA system, a maximum of 230 timeslots (opportunities for students to partake in the
study) were made available.

229 undergraduate students participated in this, 2 (estimation type: calorie vs.
exercise) x 3 (prime: study vs. gym vs. lunch) x 4 (product type: apple vs granola vs beef jerky
vs doughnut) mixed design where estimation type and product type were within subjects. Data
collection ran 5th, February 2019 to 8th, March 2019. Students were recruited through the SONA
system of the Department of Marketing and Consumer Studies SONA system (http://uoguelph-
mcs.sona-systems.com/). Students interested in participating accessed the anonymous link for the
survey through the SONA website on a computer with internet access. Only participants who
agreed to the consent form at the very beginning of the survey were able advance on to the
experiment. As per the guidelines of REB, all students who signed up to take part in the study,
regardless of whether they affirmed consent or not, were granted the 2% course credit.

Once participants opened the survey and responded to the consent questions, they were
shown the 4 products and descriptions of said products and then were equally and randomly
divided into 3 conditions. Each condition was shown a paragraph intended to prime their later
responses. Participants in the lunch condition were shown a paragraph stating that they had just
finished eating lunch, and were heading to their next class at school, on the way to class they
decided to eat a snack to tie them over until their lecture was finished. The lunch condition was
intended to be a control group as this prime had participants did not imagine they had used any
effort. Participants in the study condition were told they had just finished studying for a midterm for an extended period of time and were hungry and wanted a snack. This condition was intended to have participants imagine they had just completed much mental effort. Finally, participants in the gym condition read a paragraph describing how they had just spent over an hour at the gym doing cardio and weight lifting, and they wanted a snack after working out. This condition was intended to have participants imagine they had just completed much physical effort. After being shown their prime from their respective conditions, participants were then asked to rate how likely they would be to consume each product on a 7-point Likert scale.

Once participants had rated the likelihood of consumption of each product they were then asked the same 4 questions for each of the products as in Experiment 2, pertaining to healthfulness, tastiness, desirability, and level of processing. Participants were then asked to estimate, both, the number of calories and exercise minutes required to burn off the food item (in minutes of brisk walking) in a random order. Participants were specifically instructed that a brisk walk consists of taking more than 100 steps per minute. Participants were asked both calories and exercise minutes in order to determine if the accuracy of one estimation is independent of the other. Similar to the first study, participants reported their estimations in terms of calories for calories and minutes for exercise. These numbers were subtracted from the true value and divided by the true value in order to get a percentage difference metric that could be compared. Refer to Appendix D to see the stimulus and prime sentences shown to participants in each condition for Experiment 2.
4.3.2 Results

After accounting for non-consenting participants, missing data, incomplete surveys and outliers, a sample size of 201 participants (48.5% female) were analyzed. 54 participants were placed in the Lunch condition, 88 participants were placed in the Study condition and 59 were placed in the gym condition. The unbalanced results of these conditions were due to removing outliers from conditions. Based on the number of participants required for this study from the G-Power program (179), the sample size of 201 is more than adequate in order to run this study.

A two-way ANOVA was run with Product Type and Prime Type as the IV’s and Product Choice as the DV. A significant two-way interaction was found of product type and prime on choice. This was found for Apple and Beef Jerky ($F_{1,200}=4.03, p=.046$). This indicates that participants had moderately significant differences in choices depending on condition. This interaction was driven by beef jerky. When beef jerky is considered as the base product there were no other significant relationships (Granola: $F_{1,200}=1.09, p=.30$; Doughnut: $F_{1,200}=.576, p=.449$). Additionally, when the ANOVA was run with the other products as the base this the pairwise comparison did not elicit this effect anywhere else (these additional comparisons that do not elicit a significant interaction can be found in Appendix E). This finding partially confirms our Hypothesis 4, such that when participants were primed to think about just having gone through physical exertion (gym condition vs study condition), we expect them to choose an unhealthy product (beef jerky), and when participants were primed to think about just having gone through mental exertion (studying vs gym condition), we expect them to choose a healthy
product (apple). Hypothesis 4b is not significantly confirmed and therefore our third hypothesis is only partially confirmed. The two-way interaction can be observed below in the Table 3.

Further choice means illustrate the significant difference for the unhealthy product in this experiment (Apple: $M_{Study} = 4.47$ $M_{Gym} = 4.01$ $M_{Lunch} = 4.39$; Granola: $M_{Study} = 4.29$ $M_{Gym} = 4.24$ $M_{Lunch} = 4.59$; Doughnut: $M_{Study} = 3.52$ $M_{Gym} = 3.24$ $M_{Lunch} = 3.59$ Beef Jerky: $M_{Study} = 2.95$ $M_{Gym} = 3.42$ $M_{Lunch} = 3.07$). This can be further seen as illustrated in Figure 7 below. It can be seen that, participants were most likely to choose apple when in the study condition, granola when in the lunch condition, and beef jerky was chosen significantly more when in the exercise condition than in any condition (Beef Jerky: $M_{Study} = 2.95$ $M_{Gym} = 3.42$ $M_{Lunch} = 3.07$, $p = .046$). Additionally, it was found that the doughnut was not chosen significantly across any condition (Doughnut: $M_{Study} = 3.52$ $M_{Gym} = 3.24$ $M_{Lunch} = 3.59$, $p = .449$).

A second ANOVA was run considering estimation accuracy and estimation type. This was similar to the ANOVA run in the first experiment. This ANOVA resulted in a two-way moderately significant interaction of estimation type and product type on estimation accuracy for Apple and Jerky, as well as Granola and Jerky (Apple and Jerky: $F_{2,200} = 3.57$ $p = .008$; Granola and Jerky: $F_{2,200} = 1.60$ $p = .018$). This interaction was once again driven by the unhealthy product (Beef Jerky), however the relationship between beef jerky and apple and beef jerky and granola were both found to be highly significant.

As illustrated in Figure 8, we see as significant interaction between estimation type and product type on estimation accuracy (Apple and Beef Jerky: $F_{2,200} = 3.57$ $p = .008$; Granola and Beef Jerky: $F_{2,200} = 1.60$ $p = .018$). This further confirms our hypothesis 2, such that, when
participants consider unhealthy food, we expect people to be estimate closer to the true value when making exercise estimations compared to calorie estimations. Furthermore, this interaction is seen between estimation type and product type on estimation accuracy, indicating that the significant interactions were found between the healthier products (apple and granola) and the unhealthy product (beef jerky), however, this effect is not seen with the second unhealthy product (doughnut).

A three-way ANOVA was run with percentage difference from the true value as a DV and Product Type, Estimation Type, and Prime Type as IV’s. In this ANOVA Estimation Type X Product Type X Priming Condition on estimation accuracy was considered to determine if all of these factors influenced participants accuracy in their estimations. This three-way ANOVA determined that there is a significant three-way interaction between the three factors, estimation accuracy, estimation type, and priming condition on estimation accuracy ($F_{1,200}=4.95, p=.027$). As illustrated in prior ANOVA’s this relationship is once again found for apple and beef jerky, our healthy and unhealthy products, respectively. This three-way ANOVA was run with each of the other three products as the base, and there were no additional significant results (these additional tests can be seen in Appendix E).

This interaction partially confirms our final hypothesis (hypothesis 3), such that when participants were asked to estimate exercise (compared to calories), they will be closer to the true value in their estimation for the unhealthy product (Beef Jerky). However, this result was not
observed for the second unhealthy product (doughnut), this indicates that this effect is supported for one unhealthy product but not the other, meaning that another factor may be at play. This may be due in part to the fact that they were more accurate because they were in a mindset of exertion. Taken together this shows a significant three-way interaction. This interaction is illustrated in Figure 9, 10 and 11 (separated by priming condition) below. Additionally, apple calorie and jerky calorie estimations were less accurate than their exercise counter parts, regardless of prime that they were given (Apple Calories: M_{Study}= -54.38 M_{Gym}= -52.34 M_{Lunch}= -36.44; Beef Jerky Calories: M_{Study}= 9.62 M_{Gym}= -12.75 M_{Lunch}= -0.68) and is illustrated in Figure 12.
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<td>Apple vs. Beef Jerky</td>
<td>1</td>
<td>499.92</td>
<td>47.05***</td>
</tr>
<tr>
<td></td>
<td>Granola vs. Beef Jerky</td>
<td>1</td>
<td>35.28</td>
<td>3.47*</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Beef Jerky</td>
<td>1</td>
<td>578.50</td>
<td>55.73***</td>
</tr>
<tr>
<td>Choice X Condition</td>
<td>Apple vs. Beef Jerky</td>
<td>2</td>
<td>31.54</td>
<td>2.97**</td>
</tr>
<tr>
<td></td>
<td>Granola vs. Beef Jerky</td>
<td>2</td>
<td>22.22</td>
<td>2.19</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Beef Jerky</td>
<td>2</td>
<td>15.45</td>
<td>1.49</td>
</tr>
</tbody>
</table>

*Significant at p<.1 **Significant at p<.05 ***Significant at p<0.01

Table 3: Experiment 2 ANOVA of Condition and Product Choice
*Not Significant  **Significant

Figure 8: Experiment 2 Product Choice
## Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Products</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage Different from True Value</td>
<td>Apple vs. Beef Jerky</td>
<td>1</td>
<td>820607.539</td>
<td>91.102***</td>
</tr>
<tr>
<td></td>
<td>Granola vs. Beef Jerky</td>
<td>1</td>
<td>5100280.716</td>
<td>175.403***</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Beef Jerky</td>
<td>1</td>
<td>98053.649</td>
<td>12.378***</td>
</tr>
<tr>
<td>Percent from True Value X Estimation Type</td>
<td>Apple vs. Beef Jerky</td>
<td>1</td>
<td>251214.148</td>
<td>27.889***</td>
</tr>
<tr>
<td></td>
<td>Granola vs. Beef Jerky</td>
<td>1</td>
<td>8667230.378</td>
<td>298.074***</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Beef Jerky</td>
<td>1</td>
<td>260.764</td>
<td>.033</td>
</tr>
</tbody>
</table>

***Significant at p<.01

Table 4: Experiment 2 ANOVA of 2-way interaction of Percent and Estimation
Figure 9: Experiment 2 Estimation Differences

<table>
<thead>
<tr>
<th></th>
<th>Apple</th>
<th>Granola</th>
<th>Doughnut</th>
<th>Jerky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>-48.96</td>
<td>281.11</td>
<td>37.76</td>
<td>21.31</td>
</tr>
<tr>
<td>Exercise</td>
<td>-19.97</td>
<td>-34</td>
<td>15.1</td>
<td>10.8</td>
</tr>
</tbody>
</table>
### Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Products</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference from True Value X Estimation Type X Condition</td>
<td>Apple vs. Beef Jerky</td>
<td>2</td>
<td>31733.771</td>
<td>3.572**</td>
</tr>
<tr>
<td></td>
<td>Granola vs. Beef Jerky</td>
<td>2</td>
<td>21606.571</td>
<td>.741</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Beef Jerky</td>
<td>2</td>
<td>12726.667</td>
<td>1.605</td>
</tr>
</tbody>
</table>

**Significant at p<.05

Table 5: Experiment 2 ANOVA of a 3-way interaction found
Figure 10: Experiment 2 Estimation Percentage for Study Condition

<table>
<thead>
<tr>
<th></th>
<th>Apple</th>
<th>Granola</th>
<th>Doughnut</th>
<th>Beef Jerky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories Study</td>
<td>-54.38</td>
<td>275.49</td>
<td>39.04</td>
<td>16.82</td>
</tr>
<tr>
<td>Exercise Study</td>
<td>-23.78</td>
<td>-42.04</td>
<td>13.15</td>
<td>9.62</td>
</tr>
</tbody>
</table>
Figure 11: Experiment 2 Estimation Percentage for Exercise Condition
**Figure 12:** Experiment 2 Estimation Percentage for Lunch Condition

**Figure 13:** Experiment 2 Estimation Percentage for Apple and Beef Jerky
Discussion

Experiment 2 was designed to test the moderation hypothesis that when participants were primed to think about just having gone through physical exertion, we expect them to choose an unhealthy product (hypothesis 4a) and conversely, when participants were primed to think about just having gone through mental exertion, we expect them to choose a healthy product (hypothesis 4b). Additionally, this experiment aimed to replicate the results of the first study for hypothesis 2 such that when participants consider unhealthy food, we expect people to be estimate closer to the true value when making exercise estimations compared to calorie estimations. Finally, this study also aimed to confirm our third hypothesis, a moderated moderation which elicits a three-way interaction such that Product Type, Prime Type and Estimation Type will influence the accuracy of participants estimations such that when participants were asked to estimate exercise, they will be closer to the true value in their estimation of exercise for unhealthy products when primed to think about physical exertion.

Taken together, experiment 2 demonstrated the moderating effect of estimation type on estimation accuracy. In this study we find that when participants were primed to consider studying or lunch they were more likely to choose a relatively healthier product, being apple and granola respectively. There was a significant two-way interaction between choice X condition for apple versus beef jerky. This confirms our hypothesis 4a and, we find that beef jerky is statistically the most chosen product when participants were primed to think about physical exercise.

The results of this study imply that when consumers were placed in a certain state of mind, their food decisions will be impacted by this type of thinking. We see here that the prime
that participants read prior to making decisions had an influence on the type of decision they made. These primes were not manipulation checked, and this should be considered for future studies. When participants were asked to think about mental exertion or no exertion at all they tended towards healthier food products, however, when participants were primed to think about physical exertion, they significantly more often choose unhealthy products (Beef Jerky in this instance). This is due to a licensing effect, where participants allow themselves to have something less healthy because they just did something very healthy (physical exertion). This would mean that individuals who just completed some form of physical exertion (going to the gym, taking the stairs etc.) were more likely to choose an unhealthy product.

When participants were then asked to estimate the number of calories and minutes needed to walk we find a significant interaction of estimation type on the accuracy of the estimations such that when participants were asked to estimate exercise, they were more accurate for beef jerky (vs apple and granola). This confirms our hypothesis 2 in that product type does influence the relationship of estimation type on estimation accuracy. This estimation accuracy indicates, according to the research of Carels et al., (2007), that participants actually understand exercise elements of unhealthy foods, whereas they do not understand the caloric content of these foods very well. This implies that consumers may respond better to exercise labels on unhealthy foods because it confirms their expectations of the exercise required to burn off the food, and therefore may have less of this unhealthy product or avoid it for something healthier.

An interesting finding of this study is that participants overestimated the calories found in the beef jerky, meaning that they understood that is was high in calories, and even further so believed there were more calories than there actually were, but these participants still chose the
unhealthy product when primed to think about physical exertion. This indicated that participants inflated the number of calories found in this food product, however when they were considering physical exertion they still deemed it okay to consume this product that they assumed had a very high number of calories. This possibly confirms our indication that a licensing effect is employed by participants who were in the physical exertion condition. In this licensing effect, participants understood they had just completed some physical exertion (virtue) and therefore were allowed to consume something unhealthy (vice) and it would not be an issue for them (Dhar, 2006). This furthers the understanding that the state of mind of participants does have an influence on their estimations and their choices and even further, can elicit other effects such as a licensing effect. An unexpected result was that the impact of the unhealthy product on estimation accuracy was not seen for doughnut. This may be due to a mere presence effect in that because the Beef Jerky is present, participants simply discounted the doughnut and did not consider it as thoroughly, but this result indicates that further research needs to observe the differences in product types.

5 Discussions

5.1 General Discussion

This research evaluates the relative ability for consumers to estimate and understand the number of calories found in an arbitrary food product. Current research observes exercise equivalents as an alternative to the proven confusing calories estimations found in food products (Carels et al., 2007; Lee & Thompson, 2016).

Experiment 1 (N = 153) tested the main effect of food product on estimation accuracy, and it was found that in a test of Between-Subjects Effects (ANOVA), there was a mildly
significant influence of estimation type on percentage difference ($p = .071$) indicating that there is a mild main effect, confirming our hypothesis 1 in that when participants were asked to estimate exercise they were more accurate than when asked to estimate calories. Additionally, for certain food types, particularly unhealthy products (doughnuts in experiment 1) participants were more accurate at estimating exercise minutes rather than calories estimations, meaning that their estimations were closer to the true value. This confirmed our hypothesis 2 in that the type of food had an effect on the accuracy of these estimations.

Experiment 2 tested the moderation effect of product type on the relationship between prime and product choice (hypothesis 3a, hypothesis 3b), the moderation effect of product type on the relationship between estimation type and estimation accuracy (hypothesis 2) as well as the moderated moderating effect of prime type on product type on the relationship between estimation type and estimation accuracy (hypothesis 4). 242 undergraduate students ($N = 242$) participated in this study. A significant 2-way interaction was found between prime condition X product choice for apple and beef jerky and granola and jerky. This finding confirmed our hypothesis 3a and hypothesis 3b in that individuals who were primed to think about mental effort were more likely to choose a healthy product (apple, hypothesis 3a) and when individuals were primed to think about physical effort, they were most likely to choose an unhealthy product (beef jerky, hypothesis 3b). Additionally, a two-way interaction was found, similar to the first study, between product type and estimation accuracy. Finally, a 3-way interaction was also found between Estimation Accuracy, Estimation Type and Prime for the products apple and beef jerky. This confirmed Hypothesis 4 in that prime type moderated the moderation that product type played on the relationship between estimation type and estimation accuracy (hypothesis 4).
These results show that when a participant is primed to think about exercising, their estimation is more likely to be correct if it is an exercise estimation for an unhealthy product, and they will be more likely to choose an unhealthy product. All of this tells us that participants were influenced by the state of mind that they were in as well as the type of estimation they were completing or considering. This means that consumers understanding of the contents of food is determined by the state of mind they were in because when asked about beef jerky participants who were primed to think about going to the gym and exercise, were most likely to consume this product. Additionally, participants also overestimated the number of calories found in beef jerky. This shows us that participants were intentionally assuming beef jerky has more calories, this may be due to the fact that they were primed to think about exercise, so they understand that beef jerky is unhealthy and may conflate this idea in their mind. While this was the case, participants still allow themselves to consume beef jerky, knowing that is has a supposed higher number of calories. This may be due to a licensing effect, where participants have gone to the gym and know they have burned calories (virtue) so they allow themselves to consume this high caloric product (vice), in order to make up for the calories lost. However, we do see the same participants overestimating the calorie percentage of the beef jerky. This indicates that participants were overestimating the calories in the food, but still choosing this product when they were in the exercise condition. This finding goes beyond the licensing effect literature, in that the licensing effect only accounts for individuals allowing themselves to consume (something bad) because they have recently done something to earn it (something good). Here, we find that participants actually make (or assume) the product is worth than it actually is, and
still choose this product when they have done some physical exertion in order to earn the snack food.

Understanding that consumers consider nutritional values of food products when making food decisions (Sharf et al., 2012), this research may indicate another method of labeling a food product to encourage consumers to make better decisions about their food. Previously, calories have been used as the main metric for a food's level of healthiness (Carels et al., 2007 & Holmstrup et al., 2013), however in prior research and even in the current studies, it is found that consumers may not have as clear of an understanding of calories as once believed (Roberto et al., 2013). The current research has illustrated that participants overestimate the number of calories in unhealthy foods and underestimate the number of calories in healthy foods, as had been found previously (Roberto et al., 2013). Exercise equivalents have been proposed as an alternative to these calorie labels that have been grossly misunderstood (Viera & Antonelli, 2015; Lee & Thompson, 2016). Mixed results have been found by these authors, meaning that research into these physical activity calorie equivalent labels have found success in some studies and failures in others. This may be due to the type of exercise equivalent they proposed being the distance needed to walk, rather than the number of minutes needed to burn off a food product, which may be better for consumers to understand (Werle et al., 2015). Taken together, calorie estimation and exercise estimations were completed in the current research modelling after the work of Carels et al., (2007), having participants estimate the assumed amount of calories/exercise found in a given food item across a number of different conditions. The results of the current studies add to the calorie and exercise estimation literature in that we find effects for the type of estimations asked, where exercise is seen as more accurate, as well as for product
types, where unhealthy products tend to be estimated more accurately for exercise estimations. Additionally, the state of mind a consumer is in is seen to have an influence on an individual snack product choice, here being the unhealthy snack when primed to think about physical exertion.

Much of the previous research in the area of food package labelling focusses on stated versus real preference. In experiment 2 we took measures of participants stated preference. One of the major limitations of this paper is we did not extend and observe participants real preference. Further research would be required either in a lab setting or a natural setting where participants have the opportunity to make stated preferences as well as real preferences to determine the gap between these two as well as determine if these results extend to real preference.

Our hypotheses were not always confirmed in each experiment. In the first experiment we did find that estimation type had an influence on the accuracy of the estimation (h1), and we did find that participants were significantly more accurate when estimating exercise for unhealthy products (h2), but we did not see a significant interaction of calorie estimation for healthy products on estimation accuracy, therefore hypothesis 2 is only partially confirmed in this experiment. Additionally, in experiment 2 we find that the prime a participant is exposed to as well as the type of estimation they were making and the type of product they were considering have an influence on the accuracy of the estimation (h4), however this interaction is only found for apple versus beef jerky. This interaction is not found for any other product pairing. This only partially explains hypothesis 4 because the second unhealthy product (doughnut) does not see a similar effect.
In the first experiment, organic labels were included in the descriptions of the products. This inclusion of an organic label was used as an exploratory measure in order to determine if these labels impact participants ability to estimate calories and exercise accurately. There was no effect of these types of labels found, and for this reason these labels were not considered any further. While previous research shows that these organic labels can have an influence on the perception of the healthfulness, tastiness, and affordability, we do not find any evidence that these organic labels will influence estimation accuracy (Schuldt & Schwarz, 2010, Prada et al., 2017).

In the second experiment, a control condition was included. This condition was that of the Lunch prime. In this condition participants were primed to consider that they had just completed eating lunch and were preparing to walk to a lecture coming up at their university, as they walk to class they decided to have a quick snack to tie them over to the end of class. This prime was intended to create a situation where participants understood that they did not experience any exertion (mental or physical), and then made their decisions. There were no significant results found for this condition, although, none were expected because this was intended as a control. Similar to the rest of the conditions, a shortcoming of this second experiment is that these primes were unable to be manipulation checked at the risk of losing the influence of the prime. Subsequent studies need to include a manipulation check or find participants who were already in these states of mind so that the researcher can be sure that these states of mind were influencing the decisions of the participant.
5.2 Contributions and Implications

Given this information, there are implications that can be gleaned from the results of these studies. These results indicate that our two studies were successful in adding to the literature and finding a potential new solution which can help consumers make healthier choices when deciding on snack foods. For academics, this research extends the exercise equivalent labelling research by illustrating a new method of estimations regarding food products as exercise estimation has not been studied yet. Additionally, this work showed two successful studies where exercise estimations were made more accurately than their calorie equivalent. This indicates that consumers respond better to exercise information when framed as the number of minutes of exercise required to burn off a product, rather than just calories alone. A number of theories were utilized in this paper. Priming effects were used in experiment 2 in order to have participants imagine their estimations and choices from a certain state of mind. The concept of priming has been considered thoroughly in different disciplines (Bargh & Chartrand, 2000; Minas et al., 2016). This research adds to this priming research by illustrating that priming prior events can influence participants state of mind, and therefore their later decisions. Additionally, the concept of a licensing effect is considered in this study. After participants were primed in experiment 2, we find that participants who were primed to think they had just completed some physical exertion, overestimated the number of calories found in the unhealthy product (beef jerky), but this product was still the most significantly chosen in this condition. We show here that when participants were primed to think about physical exertion they allow themselves to consume the less healthy product. This aligns with and adds to the literature on the licensing effect where individuals who do something food or partake in a virtue (physical exertion here),
allow themselves to balance this out by partaking in a vice (beef jerky here), even when they overestimate the number of calories and understand that this is unhealthy (Khan & Dhar, 2006; Merritt et al., 2010).

For businesses and consumer packaged good firms, managers may consider placing exercise equivalents, in terms of minutes needed to burn off the food product, on the front of food packages, particularly those of unhealthy products. If brands are interested in consumers eating a much of a product as possible, however, managers may want to ensure that these types of labels are not placed on their products. For policy makers there are additional implications of this research. Because we found differences in product type, policy makers should consider the types of labels that are present in certain food products. This may be completed by implementing policies that discriminate food products by the number of calories found in a serving, and then have a different type of label present on these foods. This research does not discount the previous work, effort, and results found for calorie labelling however proposes an alternative or another method of labelling that may be able to be used in tandem with these types of label. Exercise labels may be more effective as front-of-package labels, while calories are found on the back of products in the nutritional values table. Such results would require further research.

5.3 Limitations and Future Research

This research is not without limitations, however. Across the two studies, there were a number of changes that should have been made. In experiment 1, the organic label was used, however participants were never asked their perceptions and understanding of these types of labels. Not having a clear understanding of participants perceptions of this concept make it difficult to determine why these organic labels did not have an impact on the estimations made
by our participants as previous studies have indicated (Paul & Rana, 2012; Prada et al., 2017). In experiment 2 participants were not asked their familiarity with the products and therefore this type of check was not completed. This was problematic because we did not create a baseline of familiarity for the new product (beef jerky). Additionally, this type of manipulation check may have helped to understand why calorie estimations for the granola bar were always significantly higher than the rest of the products even though participants indicated that this product was relatively healthier than both doughnut and beef jerky.

Another limitation of this type is the lack of a manipulation check for the primes given in this study. For this reason, we cannot be sure that the results found regarding the priming conditions were accurate even though participants were reminded of their prime before responding to their questions. Finally, another limitation of this research is the lack of real-world testing. Having participants responding to online surveys disallows for the most accurate responses of our participants, and only priming participants rather than having them go through physical or mental exertion may have produced different results than in the real world, as well as the aspect of choice in a hypothetical and online survey may not elicit the same types of responses in a natural setting. A limitation of the results of this study may be that when participants were exposed to exercise labels they may ignore such labels because they were relatively accurate for these types of labels and may see them as unnecessary.

The sample of participants presented a limitation in both studies. Using a student sample has a number of innate flaws. Student participants in these studies were collected using the SONA system. These participants are typically in first or second year and tend not to take these types of studies as seriously as necessary. Additionally, participants in a student sample at the
University of Guelph is a relatively homogeneous sample. All of the participants in this study came from the same school, and many were pursuing identical degrees. Their age and levels of education were very similar. For this reason, this sample of participants is not representative of the general population. This small sample of ages and education levels will have influenced the responses of the participants as individuals with post-secondary education are more concerned with health and wellness and therefore may be more likely to give a more accurate response. A more representative sample of subject would be beneficial. This could include a number of elements that would be helpful. First, a broader spectrum of ages, which would be done to determine how age can influence the accuracy of estimations. There may be differences in accuracy between generations, where younger participants who are more health-aware are more accurate, or older generations who have more wisdom may be better at estimations. Future research would be required to address these differences. Additionally, education levels may influence the responses of participants. Individuals with no education may fare worse at these estimations while individuals with different types of education may increase their accuracy. All of these taken together would change the types of results found in these two studies.

The current studies open a number of avenues for future research. A post hoc study was completed by an undergraduate student, Lauren Weaver, at the University of Guelph, for course credit, while data analysis was being completed on the current two studies. In this study, the researcher had participants approach a table in a natural setting (a lab at the University), where they were presented with a poster with different information about a cookie across 3 conditions. In the control condition participants only saw the name of the cookie, in the calorie condition participants saw the name of the cookie as well as the number of calories found in one serving,
and finally, in the exercise condition participants were shown a poster with the name of the cookie and the number of minutes required to walk off one serving of the cookies. This project was done as an undergraduate class credit, so an adequate number of participants were not reached, and no significance was found. However, some interesting effects can be gleaned from the means for each condition. In the control condition, participants only ate an average of 2.6 of the cookies ($M_{\text{Control}}=2.6$), in the calorie condition participants ate almost double the control condition at 5.1 cookies on average ($M_{\text{Calorie}}=5.1$), and finally in the exercise condition, participants ate less than the calories condition but more than the control condition at 4.1 cookies on average ($M_{\text{Exercise}}=4.1$). We can see here that when participants were shown the exercise labels they eat less than when they see calorie information, however when participants see no labels they actually eat fewer calories than in any other condition. This may indicate that these participants overestimate the number of calories in these cookies (a product that may be seen as unhealthy), and therefore eat less. A study like this would need to be considered again using a larger group of participants as well as more product types. In order to further extend this study, future research could conduct this study in a natural environment but take note of the state of mind participants are in. This could be done by manipulating the task they had completed prior to the study, or this can be done by a more natural selection such as taking participants who are just leaving the gym (physical exertion) or the library (mental exertion). Finally, future research should include a longitudinal study of implementing these types of physical activity calorie equivalent on consumer-packaged goods and observing purchase and consumption patterns of products with these labels present, as well as include managerial perceptions of such labeling techniques.
Taken together these results illustrate that participants were better at estimating exercise than estimating calories. This indicates that participants may understand the concept of exercise better than the concept of calories. This concept of calories has proven to confuse many consumers, and this research indicates that utilizing exercise may be easier to understand. Using physical activity labels may be one way to utilize this concept, however these results do not indicate that calorie labels should not be used.
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doi:10.1016/j.foodqual.2018.01.019


APPENDICES

Appendix A: Literature Review Supplement

Self-Control

One important aspect of consideration when discussing the obesity pandemic, is the levels of self-control. Self-control plays an important role in consumers decision making, at the time of purchase, as well as at the time of food consumption. Salmon, Fennis, de Ridder, Adriaanse & de Vet (2014), define self-control as; one’s ability to alter or override responses of impulse and regulate thoughts and behaviours. Self-control has been shown to elicit positive outcomes in a number of different areas including; healthy-related outcomes, increased levels of healthy eating, less binge eating, more physical activity, and the ability to meet weight-management goals (Salmon et al., 2014, Haynes, Kemps & Moffitt, 2015). In contrast, low-self control is associated with adverse consequences including; decreased task-related performance, consuming sugary and fatty foods, meaning that people made fewer healthy food choices when undergoing times of low self-control (Salmon et al., 2014, Haynes, Kemps & Moffitt, 2015). Low levels of self-control make individuals more impulsive and more prone to external, environmental cues (Salmon et al., 2014), meaning that when an individual is experiencing a time of low self-control they are more likely to be affected by external elements that can influence their decision making.

Repeatedly exerting self-control will use up the resource, causing individuals to enter the state of self-regulatory resource depletion (Honkanen, Olsen, Verplanken, Tuu, 2011). This means that individuals only have a set amount of self-regulatory resources, and whether through multiple instances of needing to use mental resources, such as self-control while grocery
shopping, stress, or any other mentally demanding task, these resources become depleted. When this occurs, individuals struggle to make good decisions when it comes to self-control, leading them to a time of low-self control (Salmon et al., 2014). Traditional approaches to health promotion have typically relied on fostering increased level of self-control (Honkanen et al., 2011). Efforts to raise self-control to face challenges of overcoming healthy consumption has shown limited success in the past (Honkanen et al., 2011, Salmon et al., 2014). The bulk of health-related choices are made under mindless conditions, when self-control is low rather than high. Salmon et al. (2014), find that chances for health promotion is substantially improved when this default state of reduced self-control is accepted and exploited rather than challenged and fought. External and environmental cues can help individuals to make more healthy decisions. For this reason, when an individual is experiencing low levels of self-control, their decisions often result in an impulsive adoption of unhealthy choices, however, when health related cues are used the opposite may be found (Honknen et al., 2011). An influence heuristic can be an important tool in helping consumers make better food decisions in times of low self-control. Heuristics can help provide an automatic easy way out (Salmon et al., 2014). This would mean that in an instance where a shopper was experiencing low levels of self-control, having an image that elicits a health heuristic, the shopper may be more likely to choose a healthier product, or avoid one that is less healthy.

Gillebaart, Schneider and De Ridder (2015), found that this negative effect of low self-control on food choice was reversed when the healthy option was associated with the social proof heuristic, meaning the individual was reminded of a healthy goal. An individual who is low in self-control may find that being in this state is even more beneficial for healthy food
choices than high self-control in the presence of a heuristic because they are more likely to be influenced by a heuristic during times of low self-control (Honknen et al., 2011). Gillebaart et al., (2015), discuss that individuals experience competing behavioural tendencies when coping with times of low self-control. For example, when a hungry individual encounters a very hedonic and tantalizing doughnut, their initial response may be both positive (the doughnut looks very tasty), making them want to purchase and eat it, as well as negative (fatty, high in calories, needing lots of exercise to burn off), making them want to avoid the doughnut. Therefore, the doughnut would represent both reward and punishment, and determining how to excise each response to elicit a healthy response is a valuable research opportunity (Gillebaart et al., 2015).

Another avenue for self-control is utilizing the implicit association test in order to train individuals to train participants to pair unhealthy food stimuli with either positive or negative stimuli (Haynes, Kemps & Moffitt, 2015). Many individuals find it difficult to regulate their eating behaviour in order to fit in line with long their health or weight-management goals. Haynes et al. (2015) find that a more positive implicit evaluation of food has been shown to predict choice of unhealthy over healthy food and higher intake of unhealthy snack food. In order to combat this, higher inhibitory processes need to be employed to ensure behaviour is consistent with personal standards rather than being guided by unhealthy impulses (Gillebaart et al., 2015). This means that in order to be sure that a consumer’s behaviour matches their standards and expectations, they need to employ processes, thoughts and actions that remind an encourage them to avoid doing things that do not mesh with their standards. Weaker levels of inhibitory control has been associated with obesity and a greater intake of unhealthy food. Training using the implicit association test is seen to be moderated by inhibitory self-control with participants
who are low in inhibitory self-control, which led to lower snack intake (Haynes et al., 2015). While this type of training is not possible for every individual aspects of this can be translated into marketing efforts to help consumers make better healthy food decisions.

An important note regarding lack of self-control and food consumption is that snacking is often an impulse action, while food purchasing is an impulse act, but the purchase does not necessarily mean consumption (Honkanen et al., 2011). Snacking itself may be reflective and deliberate or it may be impulsive. The reflective route is presented as an attitude toward unhealthy snacking, while the impulsive route is presented by the tendency to buy a snack on impulse. Snacking in general is notoriously impulsive. Impulsiveness stems from many factors including hunger, emotions, social cues, or habits (Haynes et al., 2011), such that all of these aspects will influence an individual's purchasing behaviour, including impulse shopping. A consumer who is influenced by how hungry they are, the state of mind they are in and habits they have, will have an influence on their purchasing behaviour. Many individuals experience tendencies to buy snack products on impulse as a potential source of impulsive snacking (Salmon et al., 2014). Impulsive buying occurs when a consumer experiences a sudden often powerful and persistent urge to buy something immediately. Both attitudes to unhealthy snacking and impulsive snack buying tendency are positively related to snack consumption (Haynes et al., 2011). Food related self-control moderated the relationship between attitude and behaviour, as well as the relationship between impulsive snack buying tendency and behaviour. The effect of attitude on consumption was relatively strong when food related self-control was strong while the effect of impulsive snack buying on consumption was relatively strong when food related self-control was weak (Salmon et al., 2014, Gillebaart et al., 2015).
Organic’s Continued

Understanding this, when healthy or unprocessed foods are considered, an organic label encourages consumers to believe that these foods are healthier to an even further extent. Bui et al. (2016) go so far to argue that food products, whether healthy or not, that include an organic label, induce a health-halo in which consumers believe that these products are healthier (on unrelated nutritional metrics) and it is therefore appropriate to consume more of this product. This generates the assumption that “healthy = safe to eat more” (Schuldt & Schwarz 2010; Bui et al., 2016), which may further add to the overconsumption and obesity issue. Additionally, Schuldt & Schwarz (2010) argue that individuals who are high on pro-environmentalism are more likely to be affected by organic claims, reflecting that these healthy-halo effects would increase with the positivity of the attitude toward the organic label. This could mean that millennials and young-adults, who typically fare high on pro-environmentalism would be most affected by these types of labels, particularly in North America and western, more developed nations (Bui et al., 2016).

Organic labels have been shown to have an effect on more than just food preferences and calorie judgements. Lee, Shimizu, Kniffin & Wansink (2013), discuss that organic labels can bias taste perceptions of food products. In their study, the authors found that participants estimated that foods which featured an organic label to be lower in calories that those without the organic label, and food with these labels elicited a higher willingness-to-pay and better nutritional evaluations, as well as being much tastier due to these unrelated aspects. This would mean that participants in this study would have a more favourable perception of the product featuring the organic label, and would be more likely to consume, regardless of the true
nutritional value (of which there is no difference). Contrary to the argument of Schuldt and Schwarz (2010), Lee et al. (2013), found that the health halo effect is primarily driven by automatic processing based on heuristics, which would indicate that the effects of the organic label on caloric estimations were less pronounced among people who typically read nutritional labels, but organic, and engage in pro-environmental activities. In their study Lee et al. (2013), asked students to taste and evaluate three food samples. They found that when an organic label was present, participants were willing to pay more for the product, and preference ratings were higher for these products as well. This idea of a higher willingness-to-pay for organic products have been found amongst other research as well, this is due in part to organic foods being more costly to produce, and therefore consumers assume all organic foods should be worth more, and if it is worth more, it should be better on other aspects as well (Batte, Hooker, Haab & Beaverson, 2007; van Doorn & Verhoef, 2011, Paul & Rana, 2012).

This willingness-to-pay metric has been observed across a number of categories because a higher willingness-to-pay has serious implications for industry (van Doorn & Vernhoef, 2011). Batte et al. (2007), determined that when a product that is considered healthy (determined by being a whole, or unprocessed food), consumers are willing to pay more for these products. From a managerial standpoint, having a food product line that is assumed to be healthier (than highly processed foods), would increase sales of this product line for the brand as consumers are willing to pay more, and have better perceptions of this food product (Paul & Rana, 2012). From these findings, one can glean that an organic label has a number of implications for the food on which they are found, including judgement errors about the nutritional value of the product, taste preferences of the product, willingness-to-pay for the product and overall sales of the product.
Therefore, the organic labelling literature must be considered when critiquing the overall food labelling literature.

Appendix B: Experiment 1 Stimulus

<table>
<thead>
<tr>
<th>Product</th>
<th>Calories</th>
<th>Exercise (minutes)</th>
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</thead>
<tbody>
<tr>
<td>Gala Apple (1)</td>
<td>80</td>
<td>16</td>
</tr>
<tr>
<td>Plain Granola Bar (1)</td>
<td>190</td>
<td>38</td>
</tr>
<tr>
<td>Vanilla Dip Doughnut (1)</td>
<td>250</td>
<td>50</td>
</tr>
</tbody>
</table>

Experiment 1 Product Information
Apple Image Presented to Participants

Granola Image Presented to Participants
Questions in the Organic and Calorie Condition:

1. How many calories do you think are in this Organically Grown Apple?
2. How many Calories do you think are in this Plain Granola Bar with all Organic ingredients?
3. How many Calories do you think are in this Vanilla Dip Doughnut made from all Organic ingredients?

Questions in the Conventional and Calorie Condition

1. How many calories do you think are in this typical Apple?
2. How many Calories do you think are in this Plain Granola bar made from conventional ingredients?
3. How many Calories do you think are in this Vanilla Dip Doughnut made from conventional ingredients?

Questions in the Organic and Exercise Condition:

1. How many minutes do you think you would need to briskly walk to burn off the calories in this Organically Grown Apple?
2. How many Minutes would you need to briskly walk to burn off the calories in this Plain Granola Bar made from Organic ingredients?
3. How many minutes would you need to briskly walk to burn off the calories in this Vanilla Dip Doughnut made from Organic Ingredients?
Questions in the Conventional and Exercise Condition:

1. How many Minutes would you need to briskly walk to burn off the calories in this Plain Granola Bar made from Conventional ingredients?
2. How many minutes would you need to briskly walk to burn off the calories in this Vanilla Dip Doughnut made from Conventional Ingredients?
3. How many minutes do you think you would need to briskly walk to burn off the calories in this typical Apple?

Appendix C: Experiment 1 Supplemental Data

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<th>Age</th>
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<th>Height (Feet)</th>
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Experiment 1: Participant means

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*Significant at p<.1

ANOVA Table illustrating the significant effect of Estimation Type on Estimation Accuracy

Appendix D: Experiment 2 Stimulus

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<th>Product</th>
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<td>50</td>
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<tr>
<td>Lean Beef Jerky (4 strips)</td>
<td>232</td>
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</table>

Experiment 2 Product Information

Apple Image Presented to Participants
Granola Image Presented to Participants

Doughnut Image Presented to Participants
Prime Presented to Participants in the Gym Condition:

- You have just come from a 90-minute studying session in the library preparing for an upcoming midterm. After studying you begin to feel a little bit hungry and decide to have a quick snack.

Prime Presented to Participants in the Gym Condition:

- You have just left the gym, your workout consisted of 90 minutes of cardio-training and some light stretching. You begin to feel a little bit hungry and decide to have a quick snack.

Prime Presented to Participants in the Lunch Condition:

- You have just left having lunch with your friends and are about to enter your next lecture in a few minutes, and you decide to have a quick snack while waiting.

Supplemental Questions Presented to Participants in all Conditions

- Think about the 4 food products you viewed earlier, please rate how likely you would be to consume each snack.
- How healthy would you rate each of these products?
- How tasty would you rate each of these products?
- How desirable would you rate each of these products?
- How processed (highly altered from its natural form) would you rate each of these products?
Estimation Questions Posed to Participants in the Exercise Condition:

- How many minutes of brisk walking do you believe it would take to burn off this Gala Apple?
- How many minutes of brisk walking do you believe it would take to burn off this Vanilla Dip Doughnut?
- How many minutes of brisk walking do you believe it would take to burn off this Plain Granola Bar?
- How many minutes of brisk walking do you believe it would take to burn off these 4 Strips of Lean Beef Jerky?

Estimation Questions Posed to Participants in the Calorie Condition:

- How many calories do you believe are in this Gala Apple?
- How many calories do you believe are in this Vanilla Dip Doughnut?
- How many calories do you believe are in this Plain Granola Bar?
- How many Calories do you believe are in these 4 Strips of Lean Beef Jerky?
Appendix E: Experiment 2 Supplemental Data

<table>
<thead>
<tr>
<th>Age</th>
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Experiment 2: Participant means

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## Tests of Within-Subjects Contrasts

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** Significant at $p<0.05$

*Experiment 2 ANOVA illustrating no relationships when Doughnut is the base product*
## Tests of Within-Subjects Contrasts

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** Significant at $p<0.05$

*Experiment 2 ANOVA illustrating a two-way interaction between Beef Jerky and Apple when Apple is the base*
## Tests of Within-Subjects Contrasts

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*** Significant at $p<0.01$

*Experiment 2 ANOVA illustrating no relationships between products when doughnut is the base*
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*** Significant at $p<0.01$

*Experiment 2 ANOVA illustrating no relationships when Granola is the base product*
### Tests of Within-Subjects Contrasts

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*** Significant at $p<0.01$

*Experiment 2 ANOVA illustrating a two-way interaction between Beef Jerky and Apple for Accuracy X Estimation Type*
Tests of Within-Subjects Contrasts

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** Significant at p<0.05

Experiment 2 ANOVA illustrating no relationships when Doughnut is the base product

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Descriptive Statistics for the healthfulness perceptions of each product

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Descriptive Statistics

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Descriptive Statistics for the tastiness perceptions of each product

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</tr>
<tr>
<td>DesireJerky</td>
<td>4.72</td>
<td>.108</td>
</tr>
</tbody>
</table>

Descriptive Statistics for the processing perceptions of each product

<table>
<thead>
<tr>
<th>ProcessedApple</th>
<th>Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProcessedDoughnut</td>
<td>6.30</td>
<td>.114</td>
</tr>
<tr>
<td>ProcessedGranola</td>
<td>5.59</td>
<td>.079</td>
</tr>
<tr>
<td>ProcessedJerky</td>
<td>3.04</td>
<td>.101</td>
</tr>
<tr>
<td>Source</td>
<td>Accuracy</td>
<td>df</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>-----</td>
</tr>
<tr>
<td>Accuracy * EstimationType * Condition</td>
<td>Apple vs. Granola</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Jerky vs. Granola</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Granola</td>
<td>2</td>
</tr>
</tbody>
</table>

** Significant at $p<0.05$

*Experiment 2 ANOVA illustrating no relationships when Granola is the base product*
### Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Accuracy</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy * EstimationType * Condition</td>
<td>Beef Jerky vs. Apple</td>
<td>2</td>
<td>31733.771</td>
<td>3.572**</td>
</tr>
<tr>
<td></td>
<td>Doughnut vs. Apple</td>
<td>2</td>
<td>16353.724</td>
<td>2.089</td>
</tr>
<tr>
<td></td>
<td>Granola vs. Apple</td>
<td>2</td>
<td>3613.166</td>
<td>.113</td>
</tr>
</tbody>
</table>

** Significant at $p<0.05$

*Experiment 2 ANOVA illustrating a two-way interaction between Beef Jerky and Apple for Accuracy X Estimation Type*

<table>
<thead>
<tr>
<th></th>
<th>Apple</th>
<th>Granola</th>
<th>Doughnut</th>
<th>Beef Jerky</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>2.5%</td>
<td>-6.5%</td>
<td>-1.9%</td>
<td>-3.9%</td>
</tr>
<tr>
<td>Gym</td>
<td>-8.7%</td>
<td>-7.6%</td>
<td>-9.7%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Lunch</td>
<td>4.39</td>
<td>4.59</td>
<td>3.59</td>
<td>3.07</td>
</tr>
</tbody>
</table>

*Experiment 2 Percentage Differences for Product Choice*