The effects of front-of-package warning labels on consumer attitudes and purchase intentions toward reformulated food products

Jakub Baczynski

A Thesis
In the
John Molson School of Business

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Science (Marketing)

at Concordia University
Montreal, Quebec, Canada

August 2024

CONCORDIA UNIVERSITY

School of Graduate Studies

This is to certify that the thesis prepared

By: Jakub Baczynski

Entitled: The effects of front-of-package warning labels on consumer attitudes and purchase intentions toward reformulated food products

and submitted in partial fulfillment of the requirements for the degree of

Master of Science (Marketing)

complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the final Examining Committee:

_____ Chair/Examiner
Dr. Caroline Roux

_____ Examiner
Dr. Darlene Walsh

_____ Supervisor
Dr. Kamila Sobol

Approved by _____
Dr. Mrugank Thakor, Graduate Program Director

_____
Dr. Anne-Marie Croteau, Dean of John Molson School of Business

Abstract

The effects of front-of-package warning labels on consumer attitudes and purchase intentions toward reformulated food products

Jakub Baczynski

To address the growing concern of non-communicable diseases and obesity, the Government of Canada will introduce a mandatory front-of-package (FOP) warning label for prepackaged foods "high in" saturated fats, sugars, and sodium. This intervention, set to be implemented in January 2026, aims to nudge consumers into making better-informed and healthier food choices. Through a series of three experimental studies, this research seeks to examine: (1) the influence of the proposed FOP label on consumer attitudes and purchase intentions toward reformulated products; (2) the mediating effects of perceived healthiness and perceived tastiness; and (3) the moderating roles of goal salience (health vs. indulgence) and product type (healthy vs. unhealthy). Study 1 found that warning labels led to declining consumers' attitudes and purchase intentions toward reformulated products, with perceived healthiness mediating the effect. Study 2 revealed that participants with a prominent health goal exhibited less favorable attitudes toward the reformulated product with (vs. without) the warning label, while those with an indulgent goal showed no difference in attitudes. Study 3 showed that participants demonstrated heightened sensitivity to the warning label when displayed on healthy (vs. unhealthy) food products. This thesis contributes to the literature on consumer behavior in the food industry, offering insights into the dynamics between health and indulgence within the framework of warning labels and product reformulation. The findings hold managerial implications for new product development, packaging, and communication strategies, and can help inform governments and policymakers about the effectiveness of warning labels for reformulated products.

Acknowledgements

First of all, I have to thank all those in the health and fitness industry who utilize evidence-based science to educate, inspire and motivate others to become the best version of themselves.

Thank you to my dear Montreal. Your world-class fitness centers, premium grocery stores, and diverse selection of excellent restaurants from various cultures have provided me with the energy needed to pour sweat into this project.

Thank you to my committee members, Dr. Caroline Roux and Dr. Darlene Walsh. Your reviews and critiques have helped enrich this thesis during the editorial phase and are greatly appreciated.

Special thanks to my supervisor, Dr. Kamila Sobol, for your invaluable guidance and feedback throughout this journey. In recollection, I can say with full confidence that when other professors and students highly praise and vehemently recommend Prof. Sobol as an outstanding thesis supervisor – I think they are right. Thank you for setting me up to win!

Table of Contents

List of Figures

Introduction

For many years now, food labelling has fulfilled an essential role in supporting public health. While regulatory differences exist between countries, packaged foods generally feature two types of labels. Traditional back-of-package (BOP) labels include the nutrition facts table, which shows the serving size, calories, nutrient information, and a list of ingredients (Health Canada, 2024). More recently, research has shifted its focus toward front-of-package (FOP) labels. This shift is partly attributed to consumers' low usage of BOP nutritional labels, often perceived as complex and requiring significant effort to interpret. FOP labels are designed to quickly and simply inform and guide consumers toward making healthier food choices (Talati et al., 2017; Temple & Fraser, 2014).

To help combat the growing concern of non-communicable diseases and obesity, the Government of Canada is implementing a mandatory FOP warning label for prepackaged foods that exceed specific thresholds of saturated fats, sugars, and sodium. Specifically, prepackaged foods that contain 15% or more of the recommended daily value per serving of saturated fats, sugars, and/or sodium will warrant the new warning label (see Figure 1). These thresholds are in accordance with Canada's Food Guide (Health Canada, 2016). The new FOP warning labels will be implemented in January 2026 for all prepackaged food products, with some exceptions. For example, certain dairy products (e.g., milk, plain yogurt, cheese) are exempt as they are important sources of calcium to promote bone health and reduce the risk of osteoporosis. Other exceptions include raw fruits and vegetables (with no added sugar), single-ingredient meats, healthy fat products such as vegetable oils, fatty fish and nuts, and some natural-sugar products such as honey and maple syrup. The goal of this intervention is to enable consumers to make better-informed and healthier food choices by ensuring that the nutritional content of processed

foods is easily accessible. The purpose of this research is to examine whether this specific intervention will likely influence consumer attitudes and choices.

Figure 1. New Canadian FOP warning labels. On the left, the warning label indicates that the food product is high in saturated fats and sodium. On the right, the warning label indicates that the food product is high in sugars.

Given the well-documented detrimental effects of warning labels on consumer purchase decisions (Ares et al., 2018; Arrúa et al., 2017; Bandeira et al., 2021; de Alcantara et al., 2022; Khandpur et al., 2018), such warning labels are likely to motivate food manufacturing corporations to reformulate their products to be healthier, bringing them below the set nutrient thresholds and thereby avoiding the label. Indeed, in their comprehensive review encompassing multiple longitudinal studies across various countries, Ganderats-Fuentes and Morgan (2023) found that a secondary benefit derived from FOP labelling is their consistent impact on driving product reformulation. For example, the Chilean FOP warning label, introduced in 2016, effectively reduced the percentage of products with warning labels from 51% to 44% over a two-year period from 2015 and 2017 (i.e., pre- versus post-intervention: Reyes et al., 2020).

Despite the growing trend of government-mandated FOP warning labels and the heightened motivation they provide for product reformulation, there is little research, investigating how consumers react to warning labels on products marketed as reformulated. On the one hand, the warning label can signal product unhealthiness and imbue adverse consumer reactions (Mansfield et al., 2020; Mazzonetto et al., 2022; Silva & Costa, 2022). On the other hand, the warning label can have a counterproductive effect on reformulated products, serving as

a reassurance that, despite being more healthy, the reformulated product remains tasty because it still contains all the unhealthy ingredients that contribute to its delicious flavor (Raghunathan et al., 2006), encouraging more purchases. The present research aims to clarify how warning labels impact consumer responses to reformulated products.

Specifically, through a series of three experimental studies, this research aims to elucidate: (1) how warning labels influence consumers' attitudes and purchase intentions toward reformulated products; (2) whether perceived healthiness and/or perceived tastiness mediates this effect; and (3) the moderating role of goal salience (health versus indulgence) and product type (healthy versus unhealthy). This investigation examines the effectiveness of the newly proposed FOP label by the Canadian government and offers substantial theoretical contributions. First, this thesis adds to the body of literature examining the role of warning labels within the specific context of product reformulation. Second, it expands our understanding of why some warning labels displayed on reformulated products work better than others. And finally, it adds insights into the dynamics between health and indulgence within the framework of warning labels and product reformulation. Moreover, the findings hold managerial implications for new product development, packaging, and communication strategies, and they can help inform governments and policymakers about the effectiveness of warning labels for reformulated products.

Theoretical Background

Product Reformulation

Product reformulation involves modifying the composition of a food product to make it healthier (Granderats-Fuentes et al., 2023). There are two main strategies for product reformulation. The first, known as *silent* reformulation, entails making modest changes to the

food composition without explicitly informing consumers. This approach aims to maintain taste perceptions while subtly improving health aspects (Jensen & Sommer, 2017). In a study testing silent reformulation within a Danish retail chain's private-label brands, reducing the calorie contents of products without consumer notification led to a decrease in calorie intake across seven out of eight product categories over a year, based on weekly sales data (Jensen & Sommer, 2017). The second strategy, known as *announced* reformulation, explicitly promotes health-benefit changes in food composition (Jensen & Sommer, 2017). For example, Kellogg's included such labels as "Lower Sugar" (Kellogg's, n.d.-a) and "Made with wholewheat" (Kellogg's, n.d.-b) on its Special K products' package. People are generally health-conscious and want healthier options (Euromonitor International, 2024), and are more concerned about their health than ever before (Wang et al., 2023), thus reacting positively to reformulated products that explicitly notify consumers of their products' health improvements. However, suspicion may arise if consumers perceive a compromise in taste. To address this, companies often use slogans reassuring consumers that the reformulated product remains tasty. For example, Lay's lightly salted chips are advertised as "Made with 50% less sodium than our original recipe, with the same crisp flavor guaranteed to bring a smile to your face" (Lay's, n.d.), and Ingham's chicken tenders are promoted as "50% less fat, same great taste" (Ingham's, n.d.), to reassure consumers that they can enjoy improved health benefits without sacrificing flavor or taste.

Product reformulation faces limitations due to great technological and economic challenges (Onyeaka et al., 2023; Scrinis & Monteiro, 2018). For instance, reducing salt may compromise the texture or shelf life of the product; sugar reduction might involve compensating with artificial sweeteners and additives – i.e., processed ingredients which do not require warning labels; fat reduction could affect flavor release or increase production process time

(Onyeaka et al., 2023). Therefore, companies often face constraints in the extent to which they can reformulate products without compromising critical factors, such as flavor, production efficiency and avoiding consumer deception. Consequently, despite efforts to reformulate products to eliminate the need for warning labels, unhealthy processed products often fail to meet the necessary standards for fat, sugars, sodium, or calorie content. Indeed, a systematic review and two meta-analyses of fifty-nine studies indicated varying levels of product reformulation. For instance, there was a slight average reduction in total calories (0.4% - 3%), a reduction in sugars (2% - 3%), and a decrease in sodium (4% - 15%) (Gressier et al., 2021). Thus, while a granola bar company might make their product healthier by reducing sugar content from 12g to 10g, if the warning label threshold for that specific product is set at 8g, the company would still be required to display a warning label regardless of their efforts to reformulate. The findings were encouraging in that even with modest changes to food composition, five out of six studies reported positive health outcomes (Gressier et al., 2021). Moreover, product reformulation is viewed as a highly cost-effective strategy for preventing non-communicable diseases and obesity (Basto-Abreu et al., 2020; Reyes et al., 2020), yielding measurable reductions in both direct and indirect healthcare costs (Basto-Abreu et al., 2020).

Front-of-Package Labels

Front-of-package (FOP) labels are nutritional information labels displayed on the front of food packaging. They are intended to provide consumers with quick and easy access to key nutritional information about a product, helping them make informed choices about their food with minimum cognitive effort. FOP labels fall into two major classifications: *non-interpretive* labels, which provide straightforward information about the nutritional content of a product without additional context or guidance on how to interpret it (e.g., a nutritional label that

specifies the amount of sodium per serving); and *interpretive* labels, which go beyond just presenting nutritional data by offering guidance or interpretations that help consumers better comprehend the meaning of the information (e.g., a label that uses a traffic light system where red indicates high levels of sodium, while green indicates lower, healthy levels). Despite some mixed and occasionally inconclusive findings on the overall effectiveness of the two types of FOP labels (An et al., 2021), the prevailing consensus strongly supports interpretive labels as the more successful type in assisting consumers to evaluate the healthiness or unhealthiness of packaged foods (Lima et al., 2018; Siegrist et al., 2015; Song et., 2021; Talati et al., 2017; Temple, 2020; Van Herpen & Van Trijp, 2011). For instance, Siegrist et al. (2015) conducted an eye-tracking study revealing that participants processed information more quickly and effectively when exposed to a traffic light label (interpretive), which not only provided nutritional information but also utilized a colored-scheme guideline – green (healthy range), amber (caution range) and red (unhealthy range), compared to those who were presented solely with nutritional information (non-interpretive label). Even the World Health Organization (WHO) recognizes interpretive FOP labels as useful and cost-effective indicators that highlight the nutritional quality of products and guide consumers toward healthier food choices (World Health Organization, 2020). Consumers also favor interpretive labels, with their preference largely attributed to the labels' ability to facilitate quick comprehension of nutrition information, ease of identification, simplicity, and overall usefulness (Bhattacharya et al., 2022). This is especially crucial in today's food environment, characterized by the prevalence of products high in nutrients linked to non-communicable diseases and obesity (Ares et al., 2018).

Influence of Warning Labels on Consumer Responses

Warning labels on FOP are designed to alert consumers to certain health risks associated with a product. The newly devised FOP label by the Canadian government aims to serve as a warning label, cautioning consumers about the high levels of saturated fats, sugars and sodium in foods. Research has shown that warning labels effectively capture consumers' attention (Alonso-Dos-Santos et al., 2019; Machín et al., 2019; Tórtora et al., 2019). For instance, in a real-world eye-tracking study by Machín et al. (2019), the authors showed that warning labels significantly increased attention to nutritional details. Specifically, when a FOP warning label was included on product packaging, a significantly higher percentage of participants focused on these labels during the choice task. In contrast, under the control condition, where products lacked warning labels, none of the participants paid attention to conventional nutrition information.

In addition to capturing attention and facilitating processing and comprehension, warning labels have a robust negative impact on product evaluation (Ares et al., 2021; Clarke et al., 2020; Crosbie et al., 2023; Khandpur et al., 2018; Mansfield et al., 2020; Taillie et al., 2020). Analysis by Ikonen et al. (2020) found that warning labels adversely affect consumer attitudes toward both unhealthy and healthy products. Further, warning labels have been shown to shift consumer purchase intentions from unhealthy products to healthier options (Khandpur et al., 2018). Additionally, Mansfield et al. (2020) conducted a study in Canada using eye-tracking technology and a custom-designed retail food lab. Their research demonstrated that "high in" warning labels effectively guided Canadians, with varying health literacy levels, toward healthier food choices by making it easier to identify products high in saturated fats, sugars, and sodium. Structured interviews further corroborated these findings by demonstrating that consumers rely on FOP warning labels to make informed food choices.

Based on these findings, we hypothesize that the FOP warning label mandated by the Canadian government on reformulated food products will have a negative impact on consumer reactions. Formally stated:

H1a: The presence (vs. absence) of a warning label will decrease consumers' attitudes toward the reformulated product.

H1b: The presence (vs. absence) of a warning label will decrease consumers' purchase intentions toward the reformulated product.

Mediating Role of Perceived Healthiness

Perceived healthiness refers to consumers' expectations regarding the effect of a product on their health (Howlett et al., 2009). Understanding how individuals evaluate food healthiness is crucial, as these assessments significantly impact their food choices (Chan & Zhang, 2022). Warning labels have been found to influence perceptions of a product's healthiness, signaling that the food is unhealthy (Adasme-Berríos et al., 2020; Ares et al., 2018; Khandpur et al., 2018; Sagaceta-Mejía et al., 2022; Vargas-Meza et al., 2019). Considering the growing emphasis and value consumers place on their health (Euromonitor International, 2024; Wang et al., 2023), and recognizing that values serve as antecedents to consumer attitudes and intentions (Bredahl, 2001), it is reasonable to expect that consumers' attitudes and purchase intentions will be affected by their perceptions of a product's healthiness. Positive perceptions of healthiness generally lead to favorable consumer reactions (De Temmerman et al., 2021; Hwang et al., 2016), while negative health perceptions tend to have more adverse effects on consumer responses (Bandeira et al., 2021; Devia et al., 2021).

In the context of reformulated products, where the product is advertised as being healthier, perceptions of healthiness are likely to be salient and significantly impact consumer outcomes. Formally stated:

> **H2:** Perceived healthiness will mediate the negative effect of warning label on consumers' attitudes and purchase intentions toward the reformulated product.

Potential Backfire Effect of Warning Labels

Warning labels generally have a negative impact on consumer responses (Ares et al., 2021; Crosbie et al., 2023; Taillie et al., 2020). However, in the context of reformulated products it is possible that FOP warning labels may lead to a backfire effect due to the perception that taste may be compromised. The "unhealthy = tasty intuition" (UTI) is a prevalent implicit belief that foods perceived as less healthy are better tasting and more enjoyable (Raghunathan et al., 2006) and has been shown to have a substantial impact on consumer perceptions and decisions (Chan & Zhang, 2022; Fenko et al., 2016; Mai et al., 2016; Ye et al., 2020).

In the first study by Raghunathan et al. (2006), participants were significantly quicker to associate unhealthy foods with words describing tastiness and enjoyment compared to words describing lack of taste and enjoyment. In a second study, participants were more likely to believe that crackers higher in unhealthy fats would taste better. In a subsequent experiment, participants sampled an unfamiliar drink, i.e., a mango lassi, which was described as containing mango pulp, yogurt, and milk. One group was informed that the mango lassi was healthy, while the other group was told it was unhealthy. Consistent with the lay theory prediction, those who were told the mango lassi was unhealthy rated its taste significantly higher than those who were told it was healthy. This effect persisted even among participants who explicitly disagreed with

the notion that healthiness and tastiness are inversely related (Raghunathan et al., 2006). Additionally, Ye et al. (2020) showed that people perceived foods from a hamburger truck as less healthy but more tasty than foods from a salad truck, reinforcing the idea that unhealthy foods are associated with better taste. Similarly, Mai et al. (2016), in a series of studies manipulating food packages on various products (such as yogurt, orange juice, cream cheese, and potato chips), showed that positive health impressions activate negative taste inferences, with these opposing inferences jointly guiding the purchase decisions.

Contrary to the predictions of H1a and H1b, it is possible that the FOP warning label mandated by the Canadian government may have an unintended backfire effect for reformulated food products that emphasize health improvements. Specifically, the label could inadvertently shift the consumers' attention to the food's tastiness, potentially leading to positive consumer attitudes and purchase intentions. Accordingly, we propose the following alternate set of hypotheses:

> **H3a:** The presence (vs. absence) of a warning label will increase consumers' attitudes toward the reformulated product.
>
> **H3b:** The presence (vs. absence) of a warning label will increase consumers' purchase intentions toward the reformulated product.

Mediating Role of Perceived Tastiness

Perceived tastiness reflects consumers' expectations regarding taste and has been shown to positively affect product evaluations (Bowen et al., 1992; Clark, 1998; Liem & Russell, 2019). Packaging information and product descriptions that emphasize a product's health benefits can significantly influence consumer sensory experiences and product evaluations, particularly

regarding taste (Krishna & Elder, 2021; Schifferstein et al., 2013). As such, it is conceivable that the implementation of front-of-package (FOP) warning labels on reformulated food products, which claim to be healthier, could paradoxically enhance consumer perceptions of the product's tastiness. This counterintuitive effect may arise because the presence of such labels can imply that the product, despite its healthier formulation, retains its desirable taste attributes. Consequently, these elevated perceptions of tastiness will likely yield positive consumer responses, driving increased acceptance and consumption of the reformulated products. Thus, the following hypothesis is proposed:

> **H4:** Perceived tastiness will mediate the positive effect of warning label on consumers' attitudes and purchase intentions toward the reformulated product.

Moderating Role of Goal Salience

According to Fishbach and Ferguson (2007), "a goal is a cognitive representation of a desired endpoint that impacts evaluations, emotions and behaviours" (p. 491). For instance, when consumers desire to lose weight and look more fit (i.e., desired endpoint), they become motivated to eat more healthy foods to achieve their weight-loss goal. As long as the goal remains activated and unmet, goal-consistent behavior should persist (Baumeister et al., 2007; Carver & Scheirer, 1982; Gregory et al., 2011). Carver and Scheier (1982) describe this process as a feedback loop. Specifically, when pursuing a goal, individuals first recognize a discrepancy between their current and ideal state (goal attainment). This recognition motivates them to take action to close the gap and achieve their goals. They continuously monitor their progress, and as long as a discrepancy exists, they pursue goal-congruent behaviours until the discrepancy is resolved and the goal no longer motivates their actions.

Relevant to the current study, when a health goal is salient, individuals are likely to prioritize healthiness in their choices (Van Herpen & Van Trijp, 2011). As a result, they are expected to exhibit more negative responses to warning labels on reformulated products, as these labels emphasize the food's unhealthiness, rendering its consumption incompatible with their salient health goal. Conversely, when an indulgence goal is salient, consumers will likely prioritize tastiness in their choices, as they often perceive unhealthy foods as more enjoyable and indulgent (Raghunathan et al., 2006). As a result, they might respond more favorably to warning labels on reformulated products, as these labels' emphasis is on signaling the pleasure of the taste rather than health implications. This leads to the following hypotheses:

H5a: A salient health (vs. indulgence) goal will moderate the observed effects. Specifically, consumers will have more negative (positive) attitudes toward the warning label of a reformulated product when a health (indulgent) goal is salient.

H5b: A salient health (vs. indulgence) goal will moderate the observed effects. Specifically, consumers will have more negative (positive) purchase intentions toward the warning label of a reformulated product when a health (indulgent) goal is salient.

Moderating Role of Product Type

People categorize products as healthy and unhealthy based on their nutrient composition, which impacts their evaluations and intentions (Banna et al., 2016; Furst et al., 2000; Gao et al., 2012; Kombanda et al., 2022). For instance, young Australians identified nutrient content and nutritional value as the primary criteria for food classification, actively seeking beneficial nutrients while avoiding those that are unhealthy. They considered foods with lower levels of saturated fat, salt, and sugar to be healthy, while those with higher amounts of these components

were deemed unhealthy (Kombanda et al., 2022). Similarly, Chinese and American undergraduate students emphasized limiting sugar, salt, and fat intake, and preferred foods with reduced sugar or fat (Banna et al., 2016).

Research indicates that when consumers are exposed to a product perceived as healthy, their focus on healthiness becomes more pronounced and they are likely to consume more healthy products (Tal & Wansink, 2015). This heightened salience of healthiness prompts consumers to scrutinize health-related cues more closely. For instance, studies have shown that when individuals are primed with health-related goals, they are more likely to pay increased attention to nutritional information and warning labels (Van Herpen & Van Trijp, 2011). On the other hand, when consumers encounter foods with negative health attributes, they are more likely to prioritize sensory appeal, such as taste, over health considerations and end up consuming more unhealthy foods (Bodenlos & Wormuth, 2013; Harris et al., 2009). This shift in focus occurs because, when faced with an unhealthy option, individuals often seek immediate gratification through pleasurable eating experiences, which can outweigh their health concerns (Papies et al., 2017). Therefore, we expect that:

H6a: Product type (healthy vs. unhealthy) will moderate the observed effects. Specifically, consumers will have more negative (positive) attitudes toward the warning label of a reformulated product when the product is perceived to be relatively healthy (unhealthy).

H6b: Product type (healthy vs. unhealthy) will moderate the observed effects. Specifically, consumers will have more negative (positive) purchase intentions toward the warning label of a reformulated product when the product is perceived to be relatively healthy (unhealthy).

Conceptual Model

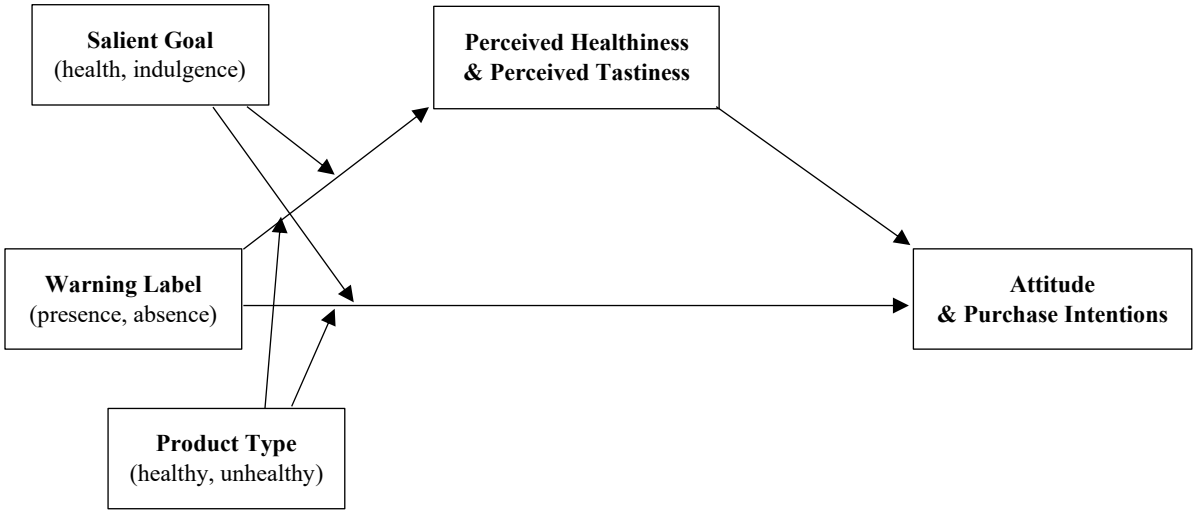


Figure 2. Conceptual Model.

Overview of Studies

The main purpose of the studies is to evaluate the effectiveness of the new FOP warning label being introduced in the Canadian food industry, particularly within the context of reformulated food products designed to enhance healthfulness. Study 1 tests the main effect of warning labels on consumer responses. In a between-subject design, participants were shown an image of a granola bar packaging which either included or did not include a warning label highlighting that the food product is "high in" sugars. The findings revealed that the presence of the warning label led to a decline in consumers' attitudes and purchase intentions toward reformulated products (H1a and H1b). Furthermore, the study expressed that the product's perceived healthiness mediated the observed effect (H2). No evidence was found to support the proposed backfire effect (H3a and H3b) or the mediating role of perceived tastiness (H4). In Study 2, the moderating effect of goal salience (health versus indulgence) was examined. A 2

(warning label: present vs. absent) x 2 (goal: health vs. indulgent) between-subject design was used, where the same warning label stimuli was used as in Study 1. In addition, participants were either primed with a health or indulgence goal. The findings indicated that participants with a prominent health goal exhibited less favorable attitudes towards the reformulated product when a warning label was present compared to when it was absent. Conversely, participants with a prominent indulgent goal showed no significant difference in their attitudes based on the presence or absence of a warning label (H5a). There was no significant interaction effect observed between warning label and salient goal on purchase intentions (H5b). In Study 3, the moderating effect of product type (healthy vs. unhealthy) was examined. A 3 (warning label: less severe vs. more severe vs. absent) x 2 (product type: healthy vs. unhealthy) between-subject design was used. In addition to the two warning stimuli that were used in the first two studies, a third warning label stimulus was added, highlighting that the product is "high in" sugars, saturated fats and sodium (i.e., a more severe warning label). The warning label was displayed either on a relatively healthy (i.e., oats and honey) versus unhealthy (i.e., chocolate chips) granola bar product. The results showed that participants demonstrated heightened sensitivity to the severity of the warning label when assessing their attitudes and purchase intentions for healthy (versus unhealthy) food products (H6a and H6b). Overall, these findings support the effectiveness of the proposed FOP warning label, which is especially likely to detract sales of reformulated healthy products and when the health goal is salient.

Study 1

Previous research suggests that within the context of reformulated food products aimed at enhancing healthiness, the presence of a warning label may have either positive or negative effects on consumer attitudes and purchase intentions. On the one hand, a warning label may

imply that the product is unhealthy, potentially eliciting negative consumer responses despite the reformulation efforts (H1 and H1b). On the other hand, while the reformulation may suggest that the product has been improved and made healthier, the warning label might concurrently signal to consumers that it retained its great taste, due to the unhealthy = more tasty bias (Raghunathan et al., 2006) (H3a and H3b). The objective of Study 1 is to determine which main effect prevails and to examine the mediating roles of perceived healthiness and tastiness (H2 and H4). To test these hypotheses, a 2 (warning label: present vs. absent) x 2 (order: mediators first vs. dependent variables first) between-subject design was employed.

Methods

Two hundred and thirty-six undergraduate business students were recruited to complete a 5-minute online Qualtrics questionnaire in exchange for course credit. Participants who failed the attention check ($N = 13$) and reported low English proficiency ($N = 2$) were excluded from the analysis. Similar exclusion criteria were applied in subsequent studies. The final sample comprised two hundred and twenty-one participants ($M_{age} = 20.95$; $SD = 2.66$; 44.3% female).

After consenting to participate in the study, participants were randomly assigned to one of two conditions: warning label (present vs. absent). They first read a brief cover story about a renowned brand reformulating their product to enhance its healthiness, seeking consumer opinion on the new product and packaging. The cover story was accompanied by an image of the front package view of an Oats and Honey granola bar product, which included an image of the granola bar, as well as the slogan “Same great taste, but healthier”. Participants were instructed to carefully examine the image and pay close attention to all the information provided on the packaging. The image was identical across both conditions except for the warning label. In the warning-label-present condition, the packaging included a warning label indicating that the

granola bar was high in sugar. In the warning-label-absent condition, the warning label was omitted. Once ready, participants proceeded to the next slide to answer several questions assessing their evaluation of the new product and packaging. See Appendix A for the complete stimuli.

After stimuli exposure, we measured the mediators (i.e., consumer perceptions of tastiness and healthiness) and dependent variables (i.e., attitudes and purchase intentions) in randomized order. Perceived tastiness was measured on the following 7-point bipolar scale: untasty/tasty, disgusting/delicious, flavorless/flavorful (3 items: $\alpha = 0.89$). Perceived healthiness was also measured on a 7-point bipolar scale: unhealthy/healthy, artificial/natural, unnutritious/nutritious (3 items: $\alpha = 0.86$). To verify whether participants in the warning-label-present condition paid attention to the warning label, we added a 7-point bipolar item that asked participants whether the product was (1- low vs. 7- high) in sugar. Next, to assess attitudes toward the granola bar product, participants responded to a 3-item 7-point bipolar scale (adapted from Andrews et al. (2021): negative/positive, bad/good, unfavorable/favorable; $\alpha = 0.98$). Purchase intentions were measured by asking participants "If you were specifically looking to buy a granola bar, how likely are you to buy the granola bar featured in this study?" (1- not at all likely, 7- very likely). An attention check was included, aiming to identify participants who were not fully engaged or rushing through the survey. The question concluded by asking respondents to select the "strongly agree" response. Participants who selected any other response were flagged as having failed the attention check. We also included a few questions gauging participants' health consciousness (4 items measured on a 7-point scale (1- disagree completely, 7- agree completely): "I am always able to avoid indulgent eating", "I am very concerned about eating healthy", "I control my daily calorie intake", "I pay close attention to nutritional

information on food packaging"; $\alpha = 0.78$), their granola bar eating habit ("How often do you eat granola bars?"; 1- never, 4- almost weekly, 7- multiple times per day) and their current hunger levels (1- not hungry at all, 7- very hungry) as potential control variables. Finally, participants completed standard demographic questions (age, gender, English proficiency).

Results

Manipulation Check. An independent sample t-test indicated that people exposed to the warning label identified the granola bar product as containing high sugar compared to those who were not shown the warning label ($t(219) = -3.57$, $p < 0.001$, $d = -0.48$, $M_{warning\_label\_present} = 5.35$, $SD = 1.79$; $M_{warning\_label\_absent} = 4.52$, $SD = 1.67$), confirming that participants paid attention to the manipulation.

Order effect. Two-way ANOVAs revealed no order effect for either of the dependent variable measures. The order variable did not have significant main effects on the two measures (ps > 0.05). Importantly, the interaction effects were also non-significant (ps > 0.05), indicating that the warning label effects were not affected by whether participants responded to the perception of tastiness and healthiness questions before or after assessing their attitudes and purchase intentions towards the granola bar product.

Main Analyses. Independent sample t-tests revealed a significant main effect of warning labels on attitudes ($t(219) = 2.88$, $p = 0.004$, $d = 0.39$) and purchase intentions ($t(219) = 2.95$, $p = 0.003$, $d = 0.40$). Specifically, the presence of a warning label decreased participants' attitudes ($M_{warning\_label\_present} = 4.87$, $SD = 1.51$; $M_{warning\_label\_absent} = 5.42$, $SD = 1.33$) and purchase intentions ($M_{warning\_label\_present} = 4.02$, $SD = 1.64$; $M_{warning\_label\_absent} = 4.63$, $SD = 1.46$)

toward the granola bar product. These results support H1a and H1b, while fail to support H3a and H3b.

Further, a second set of t-tests confirmed that the presence of a warning label on the granola bar packaging negatively impacted participants' perceptions of product healthiness ($t(219) = 2.59$, $p = 0.01$, $d = 0.35$; $M_{warning\_label\_present} = 4.54$, $SD = 1.44$; $M_{warning\_label\_absent} = 5.02$, $SD = 1.29$), but it did not influence perceptions of tastiness ($t(219) = 0.92$, $p = 0.36$, $d = 0.12$; $M_{warning\_label\_present} = 5.09$, $SD = 1.29$; $M_{warning\_label\_absent} = 5.24$, $SD = 1.18$).

To establish that perceptions of healthiness mediate the observed negative effects of warning labels on consumer responses, we conducted mediation analyses using PROCESS (model 4, 5,000 bootstrap samples; Hayes, 2017). In the first model, warning label was included as the independent variable (0: absent, 1: present), perceptions of healthiness as the mediator and attitude as the dependent variable. Results revealed a significant mediation ($\beta = -0.25$, $SE = 0.10$, 95% CI: -0.47, -0.06). Specifically, the warning label had a significant negative effect on perceptions of healthiness ($\beta = -0.48$, $SE = 0.18$, $t(219) = -2.59$, $p = 0.01$), which in turn had a significant impact on participants' attitudes ($\beta = 0.53$, $SE = 0.06$, $t(219) = 8.67$, $p < 0.001$). When the mediator was included in the model, the direct effect of warning label on attitude was no longer significant ($\beta = -0.30$, $SE = 0.17$, $t(219) = -1.79$, $p = 0.075$), indicating a full mediation. In the second model, warning label was included as the independent variable (0: absent, 1: present), perceptions of healthiness as the mediator and purchase intentions as the dependent variable. Results revealed a significant mediation ($\beta = -0.25$, $SE = 0.10$, 95% CI: -0.45, -0.06). Specifically, the warning label had a significant negative effect on perceptions of healthiness ($\beta = -0.48$, $SE = 0.18$, $t(219) = -2.59$, $p = 0.01$), which in turn had a significant impact on participants' purchase intentions ($\beta = 0.53$, $SE = 0.07$, $t(219) = 7.82$, $p < 0.001$). When the mediator was

included in the model, the direct effect of warning label on purchase intentions was no longer significant (β = -0.36, SE = 0.19, t(219) = -1.93, p = 0.055), revealing a full mediation. These results support that perceptions of healthiness explain the negative impact of warning labels on attitudes and purchase intentions, congruent with H2. Conversely, the mediation via perceptions of product tastiness was non-significant (attitude: β = -0.09, SE = 0.10, 95% CI: -0.29, 0.11; purchase intentions: β = -0.09, SE = 0.09, 95% CI: -0.27, 0.10), not supporting H4.

Control variables. Two control variables – i.e., participants' granola bar eating habits and hunger, showed significant correlations with the dependent variables (ps < 0.001). Although these correlations were statistically significant, they were relatively weak (rs range from 0.19 to 0.24). Nevertheless, we re-ran the above analyses, incorporating these two variables as covariates. A one-way ANOCOVA revealed that the results remained unchanged. Specifically, the main effect of warning label on attitudes remained significant (F(1,217) = 8.27, p = 0.004, η_p^2 = 0.037), and so did the effect on purchase intentions (F(1,217) = 8.48, p = 0.004, η_p^2 = 0.038). The mediation models via perceptions of product healthiness also remained statistically significant (attitude: β = -0.23, SE = 0.10, 95% CI: -0.43, -0.05; purchase intentions: β = -0.23, SE = 0.09, 95% CI: -0.43, -0.06).

Discussion

The results of study 1 corroborate that warning labels on reformulated food products negatively influence consumer attitudes and purchase intentions, which provide support for H1a and H1b. Additionally, the results indicate that the adverse effects of warning labels on attitudes and purchase intentions are mediated by heightened perceptions of product healthiness, as predicted in H2. Specifically, consumers interpret warning labels as indicators of the product's

unhealthiness, leading to negative responses. In the next study, we will examine whether the salience of an indulgent (health) goal might attenuate (amplify) these negative effects.

Study 2

The objective of study 2 was to examine whether a salient goal (indulgent vs. health) moderates the observed effects in study 1 (H5). Specifically, considering that study 1 established the negative impact of warning labels on consumer responses through evoked perceptions of product unhealthiness, we hypothesize that these adverse effects of warning labels will be amplified when a health goal is salient. Conversely, when an indulgent goal is salient, consumers may exhibit more favorable reactions to the presence of a warning label due to the implicit theory that associates unhealthiness with greater tastiness (Raghunathan et al., 2006). To test these hypotheses, a 2 (warning label: present vs. absent) x 2 (goal: health vs. indulgent) between-subject design was employed.

Methods

Four hundred and thirty-six undergraduate business students were recruited to complete a 10-minute online Qualtrics questionnaire in exchange for course credit. Participants who failed an attention check ($N = 20$), reported low English proficiency ($N = 0$), or responded inadequately to the goal prime[1] ($N = 21$) were excluded from the analysis. The final sample comprised three hundred and ninety-five participants ($M_{age} = 20.86$; $SD = 2.68$; 50.1% female).

[1] Participants were excluded if they reported having no goal, elaborated on a healthy food when describing an indulgent goal (e.g., delicious fresh salad), stated that they wanted to reduce alcohol, cigarettes or coffee consumption as a way to be healthier versus actually consuming more healthy foods, wrote food-unrelated or incomplete statements.

After consenting to participate in the study, participants were randomly assigned to either an indulgent or a health goal activation task, which instructed them to take a few moments to reflect on and describe their indulgent or health (food-related) goal, respectively. See Appendix B for the detailed instructions. Next, participants were randomly assigned to the same cover story, which introduced the reformulated product aimed to enhancing its healthiness, and to the granola bar packaging stimuli as in Study 1. The packaging stimuli either included or did not include a "high sugar" warning label. Participants were instructed to carefully examine the image and information on the granola bar packaging (Appendix A).

The initial series of questions focused on participant perceptions of the granola bar. This study measured mediator variables before the dependent variables in a fixed-order presentation. In Study 2, we measured perceived tastiness using a different scale from Study 1 to see if it would yield different results. Perceived tastiness was measured using a 2-item scale adapted from Raghunathan et al. (2006): "How tasty do you think this granola bar would be?" and "How much do you think you would enjoy eating this granola bar?" (1- Not at all, 7- Very; $r = 0.82$, $p < 0.001$). Perceived healthiness was measured using a 2-item scale adapted from Raghunathan et al. (2006): "How healthy do you think this granola bar is?" and "How nutritious do you think this granola bar is?" (1- Not at all, 7- Very; $r = 0.77$, $p < 0.001$). Next, to assess attitudes toward the product, a 3-item 7-point bipolar scale was used (adapted from Andrews et al. (2021): negative/positive, bad/good, unfavorable/favorable; $\alpha = 0.94$). To assess purchase intentions, participants responded to a 3-item 7-point bipolar scale (adapted from White et al. (2016): very unlikely/likely to buy this product, very unwilling/willing to buy this product, very uninclined/inclined to buy this product; $\alpha = 0.95$). The same attention check question was included as in Study 1. As manipulation recall questions, participants proceeded to report

whether they initially reflected on an indulgent or health goal. They were also asked whether the granola bar packaging included a warning label or not. Subsequently, several potential control variables were included: participants' lay belief that healthy food is generally less tasty (3-item measure adopted from Mai et al. (2015): 7-point scale (1- strongly disagree, 7- strongly agree): "things that are good for me rarely taste good", "there is no way to make food healthier without sacrificing taste", "healthy food is usually less tasty"; $\alpha = 0.82$), participants' granola bar eating habit (1 item: "How often do you eat granola bars?"; 1-never, 4- almost weekly, 7-multiple times per day), participants' overall liking of granola bars (1 item: 1- not at all, 7- very much), participants' current hunger levels (1 item: 1- not hungry at all, 7- very hungry), participants' overall preoccupation with food tastiness (2-item scale adapted from Mai et al. (2015): 7-point scale (1- strongly disagree, 7- strongly agree): "I find the taste of food products important" and "taste is very important to me when shopping for groceries"; $r = 0.80$, $p < 0.001$), and participants' overall preoccupation with food healthiness (2-item scale adapted from Mai et al. (2015): 7-point scale (1- strongly disagree, 7- strongly agree): "when shopping for food products, I pay close attention to how healthy the product is" and "healthiness is very important to me when shopping for groceries"; $r = 0.88$, $p < 0.001$). Finally, participants completed demographic measures (age, gender, English proficiency).

Results

Manipulation checks. Before testing the hypotheses, we assessed participants' recall accuracy regarding their reflected goal, and whether the granola bar packaging included a warning label or not. For the first check, 78% of participants in the indulgent goal condition accurately identified the goal they reflected on, while 99% of participants in the health goal condition did so ($\chi^2(1) = 248.03$, $p < 0.001$). For the second check, 72% of participants assigned to the warning-label-

present condition accurately reported seeing a warning, and 95% of participants in the warning-label-absent condition correctly reported not seeing a warning ($\chi^2(1) = 192.94$, $p < 0.001$).

Main analysis. To test the moderation effect of goal salience (H5), we conducted two-way ANOVAs on attitudes and purchase intentions. The first set of analysis revealed a significant main effect of warning label on attitude ($F(1,391) = 17.35$, $p < 0.001$, $\eta_p^2 = 0.04$), a non-significant main effect of goal on attitude ($F(1,391) = 0.004$, $p = 0.95$, $\eta_p^2 < 0.001$), and importantly a marginally significant interaction effect on attitude ($F(1,391) = 3.18$, $p = 0.075$, $\eta_p^2 = 0.008$). As expected, follow-up pairwise contrasts revealed that the negative warning effect is more pronounced among people with a salient health goal versus an indulgent goal (see Figure 3A). Indeed, participants with a salient health goal reported less favorable attitudes toward the granola bar product after viewing the warning label ($M = 4.04$, $SD = 1.31$) compared to those that did not see the warning label ($M = 4.77$, $SD = 1.15$; $F(1,391) = 18.21$, $p < 0.001$, $\eta_p^2 = 0.04$). Conversely, when the indulgent goal was salient, participants did not differentially respond to the two packaging versions ($M_{warning\_label\_present} = 4.26$, $SD = 1.24$ vs. $M_{warning\_label\_absent} = 4.55$, $SD = 1.17$; $F(1,391) = 2.76$, $p = 0.10$, $\eta_p^2 = 0.007$). These results lend support to H5a.

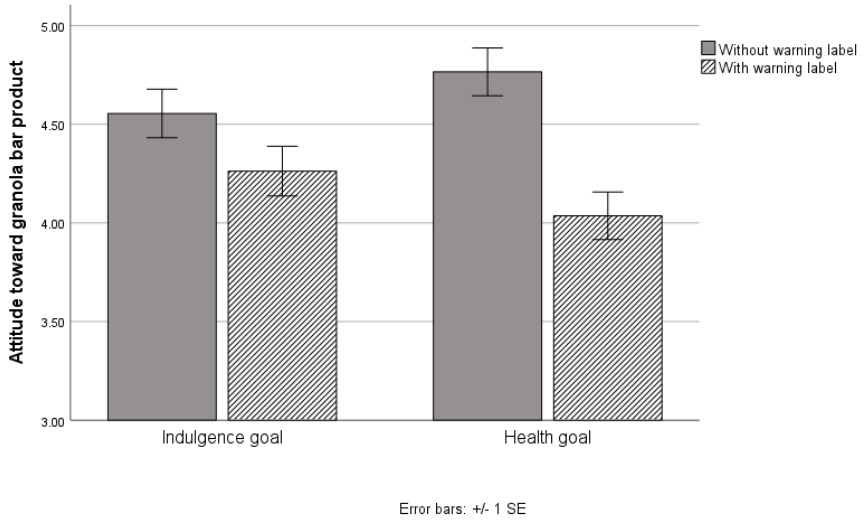


Figure 3A. Interaction effect (warning label x goal) on attitude toward the granola bar product

The second set of analysis also revealed a significant main effect of warning label on purchase intentions ($F(1,391) = 16.31$, $p < 0.001$, $\eta_p^2 = 0.04$), a non-significant main effect of goal on purchase intentions ($F(1,391) = 0.43$, $p = 0.52$, $\eta_p^2 < 0.001$), and a non-significant interaction effect ($F(1,391) = 0.29$, $p = 0.59$, $\eta_p^2 = 0.001$). A follow-up contrast analysis revealed that the main effect of the warning label is statistically significant across both goal conditions (see Figure 3B). Specifically, participants with a salient health goal reported lower purchase intentions toward the product with a warning label ($M = 3.30$, $SD = 1.56$) compared to no warning label ($M = 4.01$, $SD = 1.59$; $F(1,391) = 10.79$, $p = 0.001$, $\eta_p^2 = 0.027$). Participants with a salient indulgent goal reported a similar pattern of responses ($M_{warning\_label\_present} = 3.28$, $SD = 1.53$ vs. $M_{warning\_label\_absent} = 3.83$, $SD = 1.53$; $F(1,391) = 5.95$, $p = 0.015$, $\eta_p^2 = 0.015$). These results failed to support H5b.

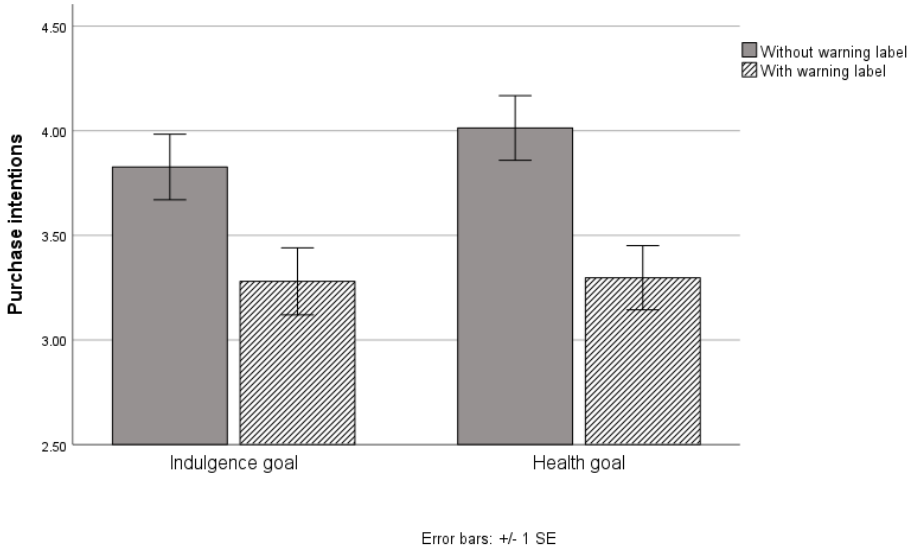


Figure 3B. Interaction effect (warning label x goal) on purchase intentions toward the granola bar product

Control variables. Three control variables – i.e., participants' granola bar eating habits, overall granola bar liking, and preoccupation with food healthiness correlated significantly with both

dependent variables (ps < 0.05). However, including these variables as covariates did not significantly change the results. Two-way ANOCOVAs revealed that the warning label x goal interaction effect on attitudes remained marginally significant (F(1,388) = 3.09, p = 0.079, η_p^2= 0.008), while the interaction effect on purchase intentions remained non-significant (F(1,388) = 0.12, p = 0.73, η_p^2 < 0.001).

Moderated mediation analysis (DV: attitude). To verify whether perceptions of healthiness mediated the observed interaction effect of warning label x goal on attitudes, a moderated mediation analysis was conducted using PROCESS (model 8, 5,000 bootstrap samples; Hayes, 2017). Warning label (0: absent, 1: present) served as the independent variable, goal (0: indulgent, 1: health) as the moderator, perceived healthiness as the mediator, and attitude as the dependent variable. The index of moderated mediation was however non-significant, even at a 90% confidence interval (β = -0.08, SE = 0.11, 90% CI = -0.26, 0.11).

Discussion

The results of Study 2 validated that warning labels adversely impact consumer attitudes and purchase intentions toward reformulated products. Study 2 also examined whether goal salience (health vs. indulgence) moderates this observed effect. The interaction between warning labels and goal salience showed a marginally significant effect on attitudes. This suggests that while warning labels generally led to more negative attitudes toward reformulated products, their impact was more pronounced for consumers with a health goal, supporting H5a. However, the interaction effect on purchase intentions was non-significant, meaning that the impact of warning labels on purchase intentions did not vary significantly based on whether a health goal or indulgent goal was salient, thus not supporting H5b. Despite this, follow-up contrast analysis revealed that the deterrent effect of warning labels was stronger among those with a health goal.

Study 3

The main objective of Study 3 was to test whether product type (healthy vs. unhealthy) moderates the negative effects of warning labels on attitudes and purchase intentions (H6a and H6b). Specifically, we predicted that the effect will be more pronounced for healthy products given that such products are likely to focus consumers on health cues when making their food-related judgments and decisions (Van Herpen & Van Trijp, 2011). Conversely, we hypothesized that the effect will be attenuated for unhealthy products, which are likely to focus consumers' attention on sensory cues, such as taste (Papies et al., 2017). Second, while the previous studies only differentiated between the presence versus absence of a warning label, in Study 3 we examined whether the severity of the warning differentially impacts consumer responses (less severe warning label vs. more severe warning label). We hypothesize that people should distinguish between less severe and more severe warning labels when considering healthy products because, in such contexts, healthiness is likely to be at the forefront of one's attention, instigating more vigilance and focus on health cues. On the other hand, people might not pay attention to different levels of warning severity for unhealthy products that do not automatically prime healthiness (Bargh et al., 2001). To test these hypotheses, a 3 (warning label: less severe vs. more severe vs. absent) x 2 (product type: healthy vs. unhealthy) between-subject design was employed.

Methods

Six hundred and thirty-six U.S. participants were recruited from Amazon Mechanical Turk via the CloudResearch platform to complete a 10-minute online Qualtrics questionnaire in exchange for $1.00 USD. As in previous studies, participants who failed the attention check (N = 1), reported poor English proficiency (N = 1) or responded inadequately to the health goal

activation task (N = 17) were excluded from the analysis. In addition, one participant emailed the researcher, requesting to have their data removed. The final sample retained six hundred and sixteen participants (M_{age} = 40.80; SD = 12.36; 45.3% female).

Once participants consented to the study, they were first asked to reflect on and describe their food-related health goal. Note that only the health goal was primed across all participants in Study 3, as it is more likely to boost the warning label effects. After reading the same cover story as in the previous studies, participants were randomly assigned to view one of six stimuli. Product type was manipulated by either displaying an image of a relatively healthy Oats and Honey granola bar versus a relatively unhealthy Chocolate chips granola bar dipped in a chocolate coating. A between-subject pretest conducted among a MTurk sample[2] (N = 78) confirmed that the oat and honey granola is perceived as healthier (M = 4.84, SD = 1.35) than the chocolate granola bar (M = 3.15, SD = 1.72), $t(76) = 4.83$, $p < 0.001$, d = 1.09). The image of the packaging design changed slightly from previous studies, with the biggest change being the omission of the "Same great taste, but healthier" slogan since perceived tastiness does not seem to impact consumer responses. Further, warning label was manipulated by either including no warning label, a less severe warning label which featured the "high sugars" warning, or a more severe warning label which highlighted the "high fat," "high sugars," and "high sodium" warnings. See Appendix C for the complete stimuli.

After having carefully examined the product stimuli, participants were instructed to answer a series of questions. Perceived product tastiness (r = 0.87, $p < 0.001$), perceived product healthiness (r = 0.83, $p < 0.001$), attitude toward the granola bar (α = 0.98) and purchase intentions (α = 0.98) were measured using the same scales as in Study 2. After the attention

[2] Due to a technical glitch, no demographic data was collected.

check, similar manipulation recall questions as in Study 2 were included, asking participants what goal they initially reflected on (health versus indulgent), and whether they saw any warning labels on the granola bar products (no warnings, one warning, three warnings). Finally, similar control measures were included as in Study 2: participants' lay belief that healthy food is generally less tasty ($\alpha = 0.91$), participants' granola bar eating habits, participants' overall liking of granola bars, participants' current hunger levels, participants' overall preoccupation with food tastiness ($r = 0.87$, $p < 0.001$), participants' overall preoccupation with food healthiness ($r = 0.89$, $p < 0.001$), and finally, demographic information was collected.

Results

Manipulation checks. Before testing the hypotheses, two manipulation recall checks were conducted. The purpose of the first check was to determine if participants correctly remembered the goal they were initially asked to reflect on. In the current study, all participants were asked to describe their health goal. A frequency check established that 99.7% of participants correctly recalled that they reflected on their health goal. The objective of the second check was to verify if participants correctly reported the number of warnings on the granola bar packaging. A chi-square test revealed a significant difference among the three groups concerning how many warnings they recalled seeing ($\chi^2(4) = 609.63$, $p < .001$). Specifically, 96% of participants correctly recalled seeing zero warning labels, 67% correctly recalled seeing one warning label, and 69% of participants correctly recalled seeing three warning labels.

Main analysis. To test the moderation effect of product type (H6a and H6b), we conducted two-way ANOVAs on attitudes and purchase intentions. The first set of analysis revealed a significant main effect of warning label on attitude ($F(2,610) = 25.92$, $p < 0.001$, $\eta_p^2 = 0.08$), a significant main effect of product type on attitude ($F(1,610) = 18.37$, $p < 0.001$, $\eta_p^2 = 0.03$), and

importantly a marginally significant interaction effect on attitude ($F(2,610) = 2.53$, $p = 0.08$, $\eta_p^2 = 0.008$). Follow-up pairwise contrasts revealed that participants reported differentiated attitudes toward the granola bar product across the different warning label conditions regardless of product type (healthy product: $F(2,610) = 20.23$, $p < 0.001$, $\eta_p^2 = 0.06$; unhealthy product: $F(2,610) = 8.07$, $p < 0.001$, $\eta_p^2 = 0.03$). However, people seem to be more sensitive to the warning label information when evaluating healthy food products, as indicated by their varied reactions to one-warning versus three-warning labels ($M1\_warning = 4.14$, $SD = 1.58$, $M3\_warnings = 3.34$, $SD = 1.67$, $p < 0.001$). Conversely, participants considering the unhealthy granola bar did not exhibit differences in attitudes toward the one-warning versus three-warnings products ($M1\_warning = 3.36$, $SD = 1.54$, $M3\_warnings = 3.20$, $SD = 1.62$, $p = 0.46$). See Figure 4A. These results provide support for H6a.

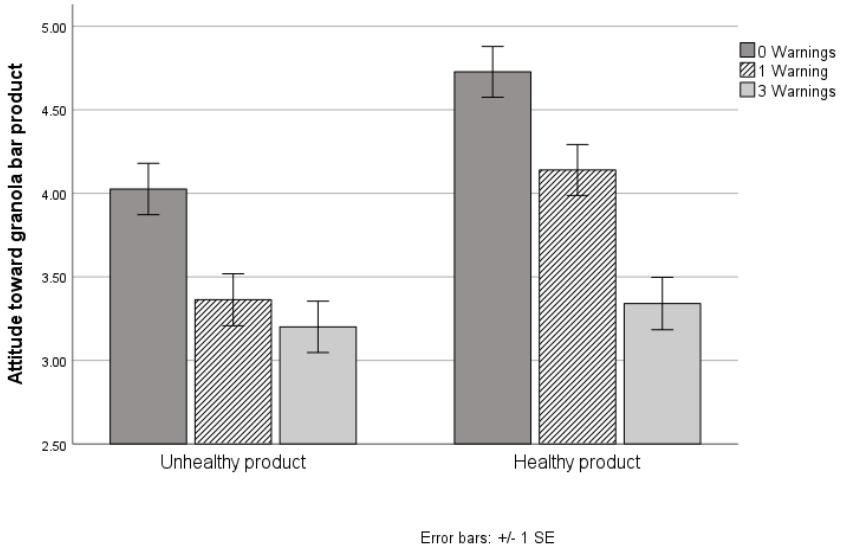


Figure 4A. Interaction effect (warning label x product type) on attitude toward the granola bar product.

Next, we re-ran a two-way ANOVA with purchase intentions as the dependent variable. The results revealed a significant main effect of warning label on purchase intentions ($F(2,610) = 13.52$, $p < 0.001$, $\eta_p^2 = 0.04$), a significant main effect of product type on purchase intentions

($F(1,610) = 10.57$, $p = 0.001$, $\eta_p^2 = 0.02$), and a significant interaction effect on purchase intentions ($F(2,610) = 5.12$, $p = 0.006$, $\eta_p^2 = 0.02$). Follow-up pairwise contrasts confirmed that participants reported differentiated purchase intentions towards the granola bar product across the three warning label conditions regardless of product type (healthy product: $F(2,610) = 12.86$, $p < 0.001$, $\eta_p^2 = 0.04$; unhealthy product: $F(2,610) = 5.60$, $p = 0.004$, $\eta_p^2 = 0.02$). As in the previous analysis, participants seemed to be sensitive to warning severity for healthy products ($M1\_warning = 3.56$, $SD = 1.80$, $M3\_warnings = 2.70$, $SD = 1.64$, $p < 0.001$), but not for unhealthy products ($M1\_warning = 2.57$, $SD = 1.70$, $M3\_warnings = 2.84$, $SD = 1.85$, $p = 0.28$). See Figure 4B. These results support H6b.

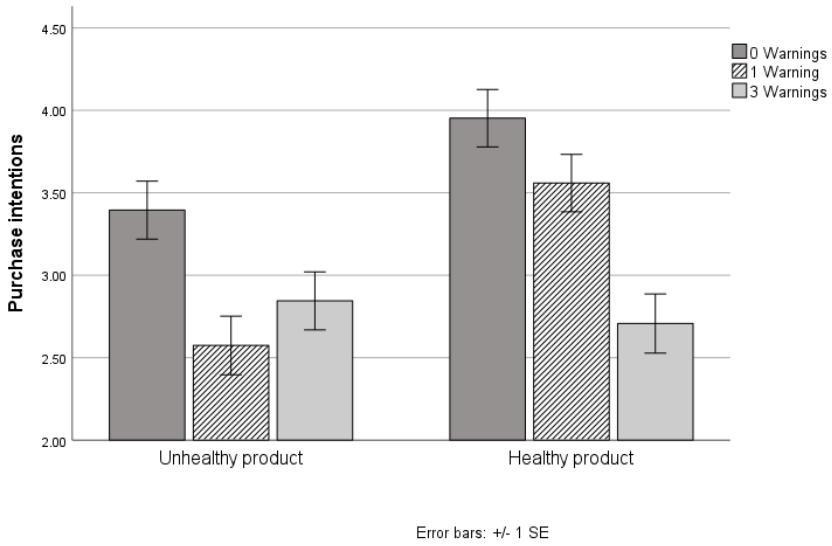


Figure 4B. Interaction effect (warning label x product type) on purchase intentions.

Control variables. Four control variables – i.e., participants' lay belief that healthy food is generally less tasty, participants' granola bar eating habits, overall granola bar liking and preoccupation with food healthiness, correlated significantly with both dependent variables (ps < 0.05). While the inclusion of the covariates made the interaction of warning label x product type non-significant for attitudes ($F(2,606) = 1.66$, $p = 0.19$, $\eta_p^2 = 0.005$), the pertinent mean contrasts

that supported H6a remained significant. The interaction effect remained significant for purchase intentions ($F(2,606) = 3.28$, $p = 0.038$, $\eta_p^2 = 0.01$).

Moderated mediation analyses. To verify whether perceptions of healthiness mediated the observed interaction effect of warning label x product type on attitudes and purchase intentions, moderated mediation analyses were conducted using PROCESS (model 8, 5,000 bootstrap samples; Hayes, 2017). First, the model included two dummy variables for the three warning label conditions (X_1: 0: one warning, 1: zero warnings, 0: three warnings; X_2: 0: one warning, 0: zero warnings, 1: three warnings) as the independent variable, product type (0: unhealthy, 1: healthy) as the moderator, perceived healthiness as the mediator, and attitude as the dependent variable. Note that the "one warning" condition served as the reference condition to which the other two warning conditions were compared to establish whether perceptions of healthiness explain participants' differentiated responses to the one- versus three-warnings stimuli for the healthy food product. To account for the fact that the interaction effect of warning labels x product type on attitude was marginally significant ($p = 0.08$), we ran the PROCESS model 8 at a 90% confidence interval. While the index of moderated mediation was non-significant for the X_1 contrast ($\beta = 0.11$, $SE = 0.23$, 90% CI = -0.27, 0.49), it was significant for the X_2 contrast ($\beta = -0.44$, $SE = 0.23$, 90% CI = -0.83, -0.05). We re-ran the moderated mediation analysis (PROCESS model 8, 5,000 bootstrap samples, 95% CI; Hayes, 2017) with purchase intentions as the dependent variable. Again, while the index of moderated mediation was non-significant for the X_1 contrast ($\beta = 0.11$, $SE = 0.24$, 95% CI = -0.29, 0.50), it was significant for the X_2 contrast ($\beta = -0.46$, $SE = 0.25$, 95% CI = -0.87, -0.06). These findings infer that perceptions of granola bar healthiness can at least partially explain why participants across the two product type conditions responded differently to the one- versus three-warning label product packaging.

Discussion

Study 3 investigated whether product type (healthy vs. unhealthy) moderates the effects of varying warning levels (0 warning, 1 warning, 3 warnings) on consumer attitudes and purchase intentions toward reformulated products. The results revealed significant main effects for warning labels and product type and a significant interaction between these variables.

The main effect of warning labels indicated that attitudes and purchase intentions became more negative as the number of warnings increased, highlighting the strong influence of warning severity on consumer reactions. Additionally, the main effect of product type revealed that consumer responses differed depending on whether the reformulated product was considered healthy or unhealthy. Generally, participants exhibited more favorable responses toward healthy products and more negative reactions toward unhealthy products.

The significant interaction effect demonstrated that the impact of warning labels varied depending on the product type. Specifically, consumers showed more negative attitudes and purchase intentions toward healthy products with increasing warnings, whereas they displayed relatively stable attitudes and purchase intentions toward warning labels on unhealthy products, supporting H6a and H6b. These findings validate that consumers are more vigilantly processing health cues on healthy (versus unhealthy) food products. A follow-up moderated mediation analysis revealed that perceptions of healthiness can at least partially explain participants' varied responses to the different warning labels across the two product categories.

General Discussion

This thesis aimed to examine the effectiveness of the new warning label introduced by the Canadian government, specifically for reformulated products. Study 1 demonstrated that the

presence of warning labels decreases consumer attitudes and purchase intentions toward reformulated products (H1a/b), and perceived healthiness mediates this negative effect (H2). Consistent with past research, these effects are likely associated with the design and functionality elements of warning labels, directing attention to the health risks associated with a product, which in turn affects attitudinal and behavioural responses (Campos-Nonato et al., 2022; Muller & Ruffieux, 2020). While we suggested that warning labels might prove to be less effective for reformulated products by serving to signal that the reformulation did not compromise taste, we found no evidence that warning labels facilitate favorable consumer reactions (H3a/b), nor that warning labels affect the perceived tastiness of reformulated food products (H4). Study 2 found that a salient health goal amplifies the negative impact of warning labels on attitudes toward reformulated products (H5a). Study 3 indicated that consumers showed heightened sensitivity to the warning labels when displayed on healthy products, where attitudes and purchase intentions became more negative as the severity of the warning increased (H6a/b).

Theoretical Contributions and Practical Implications

This research also makes several contributions to the literature on FOP labels. First, it adds to the body of literature examining the role of warning labels within the specific context of product reformulation. While substantial research focuses on the potential of FOP warning labels to drive product reformulation (Basto-Abreu et al., 2020; Crosbie et al., 2023; Ganderats-Fuentes & Morgan, 2023; Kanter et al., 2018; Machín et al., 2019; Quintiliano Scarpelli et al., 2020; Reyes et al., 2020), the current research examines how warning labels impact the reformulated products' consumer acceptance in the market.

Second, in today's food environment, where products high in nutrients linked to non-communicable diseases and obesity are prevalent, it is more important than ever to help

consumers make more informed health-related choices (Ares et al., 2018). The Canadian government is implementing a new warning label intervention to achieve its goal. Given the intervention's novelty, research on its effectiveness is limited. Existing studies present mixed results regarding the effectiveness of the warning label design recommended by Health Canada. However, these studies focused on identifying the optimal symbol for the label (e.g., magnifying glass, exclamation mark, use of red versus black color: Goodman et al., 2018; Health Canada, 2022; Mansfield et al., 2020), while our research focused on examining specific conditions under which the magnifying glass warning label – i.e., design approved by the Canadian government, demonstrates optimal effectiveness, as well as investigate the underlying mechanism driving this effect.

Third, beyond identifying a prevailing negative effect of warning labels on consumer responses to reformulated products, the current research also expands our understanding of why some FOP warning labels displayed on reformulated products work better than others. We found that the impact of warning labels was more profound when a health goal was salient, as well as when they are displayed on relatively healthy (versus unhealthy) products. These findings suggest that warning labels are more likely to be effective when health cues are prominent, focusing consumers' attention on the perceived healthiness of the reformulated products. This highlights the importance of aligning warning labels with consumers' health-oriented goals to enhance their efficacy in promoting healthier choices.

Fourth, the current research supports theories suggesting that stronger warnings elicit more negative reactions, aligning with the broader literature on fear appeal communication and consumer behavior (Tannenbaum et al., 2015). However, our findings revealed that the impact of warning label severity is not uniform across product types. For healthy products, more severe

warnings lead to increasingly negative responses, whereas for unhealthy products, warning severity has a negligible effect. Instead, while participants responded negatively to the presence of a warning label, they did not distinguish between a 1-warning versus a 3-warning label. This contributes to our understanding of how consumer attitudes and behaviors to the feared stimuli (i.e., warning label) are contextually moderated by product characteristics.

Finally, the current research adds insight into the trade-off between health and indulgence within the framework of warning labels and product reformulation. A notable contribution stems from testing of a potential unintended effect of warning labels. While some past research based on reactance theory (Brehm, 1966) – which posits that individuals experiencing a perceived threat to their freedom of choice may exhibit psychological reactance, motivating them to re-establish the threatened or eliminated freedom – has found evidence of a backfire effect in other domains, such as cigarette smoking (Hall et al., 2018), alcoholic beverages (Richards & Banas, 2015), and sugar-sweetened beverages (Hughner & Dumitrescu, 2024), the present research examines this potential backfire effect of warning labels within the food industry. Utilizing the lay theory that unhealthy foods are perceived as tastier (Raghunanthan et al., 2006), this research investigates whether warning labels might inadvertently lead to positive consumer responses, especially when an indulgent goal is salient, directing consumer focus toward the sensory and pleasurable aspect of food – i.e., the taste. There was no evidence found of warning labels stimulating positive consumer reactions, which supports the Canadian government's intervention for products marketed as reformulated.

The current research also offers valuable managerial and policy implications. From a regulatory perspective, promoting healthy choices by incorporating health cues that activate health goals could be beneficial. For example, implementing an interactive digital-basket

feedback app sponsored by Health Canada could prove effective. Such an app, which has been shown to convert information successfully into actionable behavior (Schruff-Lim et al., 2023), could use geolocation technology to allow consumers to scan products and receive suggestions for healthier alternatives available in their current store. Consistent with the findings of this thesis, the approach would be particularly beneficial for less healthy products that do not naturally prompt consumers to scrutinize warning labels. The app could feature personalized prompts tailored to activate health goals. Additionally, efforts could be directed at boosting the health motivation of consumers who typically prioritize indulgence, as health-conscious consumers are already more responsive to warning labels.

Such a policy approach is grounded in social psychological principles, integrating both negative and positive elements to influence attitudes and behaviors effectively (Strahan et al., 2002). While the primary function of the labelling system is to alert the public to packaged foods high in nutrients of concern and foster a negative attitude towards overconsumption, complementing this with a positive aspect that highlights the benefits of healthier food choices would contribute to a more wholesome outlook.

For managers seeking to market food products that feature the warning label, it is advisable to redirect consumer focus toward indulgent cues, such as taste, while recognizing that this might not completely mitigate the negative warning label effects. These products might benefit from the implementation of other proven promotional strategies, such as highlighting convenience (Ahmad & Anders, 2012) or securing optimal eye-level product placement (Nordfält et al., 2014; Seva et al., 2011).

Limitations and Future Research

In our research, the negative warning label effects on attitudes and purchase intentions toward reformulated products were driven by health perceptions (H1 and H2). They prevailed over the alternative hypotheses, which proposed positive effects stemming from taste perceptions (H3 and H4). One possible explanation for this outcome is that we focused solely on granola bars, a product that is commonly identifiable as relatively healthy (Kosicka-Gębska et al., 2024; Sharma et al., 2014). Additionally, granola bars are widely regarded as functional food items, primarily valued for their convenience as a readily accessible energy source rather than for their hedonic properties (Gill et al., 2022). The effects predicted in H3 and H4 might be more pronounced for products that are objectively less healthy and consumed primarily for hedonic purposes, such as ice cream and bacon, where consumers already expect high levels of sugar, saturated fats and/or sodium. Such products are more likely to instinctively focus attention on taste; and in such cases, the warning label would serve as reassurance that the ice cream or bacon still tastes great. Future research could investigate a broader range of products across various product categories, where consumer expectations about product characteristics may differ.

Study 2 did not support H5b, as participants showed uniform directional sensitivity to the warning label, irrespective of whether they were primed with a health or indulgence goal. One possible explanation relates to the undergraduate sample used in the study. Given that young people generally report a solid health-conscious relationship with food, prioritize healthy ingredients, monitor their diet closely, track calorie intake, and engage in weight-loss diets (Euromonitor International, 2024), their responses may have been ultimately driven by their inherent health motivation rather than by the specific goal priming. Thus, goal priming, particularly indulgence goal priming, might have been more effective at mitigating the warning

label effects with a less health-conscious demographic. Future research should investigate more closely the specific conditions under which indulgent goals may attenuate the effects of warning labels.

Another limitation of this paper is its primary focus on warning labels that highlight high sugar content. The findings may have differed if the labels had focused on the other nutrients of concern, namely saturated fat or sodium. Research suggests that young consumers exhibit varying levels of concern for different nutrients. Specifically, while evidence indicates that young consumers are acutely attentive to sugar (Prada et al., 2021) and fat content (Landry et al., 2020), they may be less concerned with sodium, potentially reducing the impact of "high sodium" FOP warning labels. In contrast, sodium levels may be of greater concern to older consumers (Szakos et al., 2020). Future research should investigate how the effectiveness of warning labels might vary depending on the nutrient highlighted (e.g., saturated fats, sugars, sodium) and the specific consumer segments targeted.

The current research was limited to an online hypothetical study, which may not fully capture real-world shopping conditions or how shoppers interact with and use labels in-store. For example, the study included a brief cover story about the product's reformulation – an element that may be difficult to apply in a real-world context. Even if consumers were somehow informed about the reformulation, they might be distracted or fail to notice it. Further, the study examined the impact of FOP warning labels by presenting participants with a very simplified stimulus, devoid of the typical cues found in a retail environment, such as nutritional labels, other FOP and BOP information, brand names, and competing products. This controlled environment may have amplified the observed effects of the warning labels. Future research should aim to validate these findings in a more realistic field study setting.

Conclusion

The Canadian Government is implementing cost-effective measures to prevent non-communicable diseases and obesity by implementing the FOP warning label. Overall, this research supports the new Canadian warning label as an effective tool for guiding consumers toward healthier choices.

References

Adasme-Berríos, C., Aliaga-Ortega, L., Schnettler, B., Sánchez, M., Pinochet, C., & Lobos, G. (2020). What dimensions of risk perception are associated with avoidance of buying processed foods with warning labels? *Nutrients, 12*(10), 2987.

Ahmad, W., & Anders, S. (2012). The value of brand and convenience attributes in highly processed food products. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, *60*(1), 113-133.

Alonso-Dos-Santos, M., Quilodrán Ulloa, R., Salgado Quintana, A., Vigueras Quijada, D., & Farias Nazel, P. (2019). Nutrition labeling schemes and the time and effort of consumer processing. *Sustainability, 11*(4), 1079.

An, R., Shi, Y., Shen, J., Bullard, T., Liu, G., Yang, Q., ... & Cao, L. (2021). Effect of front-of-package nutrition labeling on food purchases: A systematic review. *Public Health, 191*, 59-67.

Andrews, J. C., Netemeyer, R., Burton, S., & Kees, J. (2021). What consumers actually know: The role of objective nutrition knowledge in processing stop sign and traffic light front-of-pack nutrition labels. *Journal of Business Research*, *128*, 140-155.

Arrúa, A., Machín, L., Curutchet, M. R., Martínez, J., Antúnez, L., Alcaire, F., ... & Ares, G. (2017). Warnings as a directive front-of-pack nutrition labelling scheme: comparison with the Guideline Daily Amount and traffic-light systems. *Public health nutrition, 20*(13), 2308-2317.

Ares, G., Antúnez, L., Curutchet, M. R., Galicia, L., Moratorio, X., Giménez, A., & Bove, I. (2021). Immediate effects of the implementation of nutritional warnings in Uruguay: awareness, self-reported use and increased understanding. *Public Health Nutrition, 24*(2), 364-375.

Ares, G., Varela, F., Machin, L., Antúnez, L., Giménez, A., Curutchet, M. R., & Aschemann-Witzel, J. (2018). Comparative performance of three interpretative front-of-pack nutrition labelling schemes: Insights for policy making. *Food Quality and Preference, 68*, 215-225.

Bandeira, L. M., Pedroso, J., Toral, N., & Gubert, M. B. (2021). Performance and perception on front-of-package nutritional labeling models in Brazil. *Revista de Saúde Pública*, *55*, 19.

Banna, J. C., Gilliland, B., Keefe, M., & Zheng, D. (2016). Cross-cultural comparison of perspectives on healthy eating among Chinese and American undergraduate students. *BMC Public Health, 16*, 1-12.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: nonconscious activation and pursuit of behavioral goals. *Journal of personality and social psychology*, *81*(6), 1014.

Basto-Abreu, A., Torres-Alvarez, R., Reyes-Sánchez, F., González-Morales, R., Canto-Osorio, F., Colchero, M. A., ... & Barrientos-Gutierrez, T. (2020). Predicting obesity reduction after implementing warning labels in Mexico: A modeling study. *Plos medicine*, *17*(7), e1003221.

Baumeister, R. F., Schmeichel, B. J., & Vohs, K. D. (2007). Self-regulation and the executive function: The self as controlling agent. *Social psychology: Handbook of basic principles*, *2*, 516-539.

Bhattacharya, S., Bera, O. P., & Shah, V. (2022). Consumers' perception about front of package food labels (FOPL) in India: A survey of 14 states. *Frontiers in Public Health, 10*, 936802.

Bodenlos, J. S., & Wormuth, B. M. (2013). Watching a food-related television show and caloric intake. A laboratory study. *Appetite, 61*, 8-12.

Bowen, D. J., Tomoyasu, N., Anderson, M., Carney, M., & Kristal, A. (1992). Effects of expectancies and personalized feedback on fat consumption, taste, and preference. *Journal of Applied Social Psychology, 22*(13), 1061-1079.

Bredahl, L. (2001). Determinants of consumer attitudes and purchase intentions with regard to genetically modified food–results of a cross-national survey. *Journal of consumer policy*, *24*(1), 23-61.

Brehm, J. W. (1966). A theory of psychological reactance. Oxford, United Kingdom: Academic Press.

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality–social, clinical, and health psychology. *Psychological Bulletin, 92*(1), 111-135.

Chan, E., & Zhang, L. S. (2022). Is this food healthy? The impact of lay beliefs and contextual cues on food healthiness perception and consumption. *Current Opinion in Psychology, 46*, 101348.

Clark, J. E. (1998). Taste and flavour: their importance in food choice and acceptance. *Proceedings of the nutrition society*, *57*(4), 639-643.

Clarke, N., Pechey, E., Mantzari, E., Blackwell, A. K., De-Loyde, K., Morris, R. W., ... & Hollands, G. J. (2020). Impact of health warning labels on snack selection: An online experimental study. *Appetite, 154*, 104744.

Campos-Nonato, I., Cervantes-Armenta, M. A., Pacheco-Miranda, S., Quezada-Sánchez, A. D., Contreras-Manzano, A., Barquera, S., & Vargas-Meza, J. (2022). Perception and understanding of guideline daily amount and warning labeling among Mexican adults during the law modification period. *Nutrients*, *14*(16), 3403.

Crosbie, E., Gomes, F. S., Olvera, J., Patiño, S. R. G., Hoeper, S., & Carriedo, A. (2023). A policy study on front–of–pack nutrition labeling in the Americas: emerging developments and outcomes. *The Lancet Regional Health – Americas*, *18*, 100400.

de Alcantara, M., Ares, G., & Deliza, R. (2022). How Do Nutritional Warnings Work on Commercial Products? Results From a Hypothetical Choice Experiment. *Frontiers in Nutrition*, *9*, 921515.

De Temmerman, J., Heeremans, E., Slabbinck, H., & Vermeir, I. (2021). The impact of the Nutri-Score nutrition label on perceived healthiness and purchase intentions. *Appetite, 157*, 104995.

Devia, G., Forli, S., Vidal, L., Curutchet, M. R., & Ares, G. (2021). References to home-made and natural foods on the labels of ultra-processed products increase healthfulness perception and purchase intention: Insights for policy making. *Food Quality and Preference, 88*, 104110.

Euromonitor International. (2024, June 10). *Consumer Lifestyles in Canada: Country Report*. Retrieved from Passport GMID database.

Fenko, A., Lotterman, H., & Galetzka, M. (2016). What's in a name? The effects of sound symbolism and package shape on consumer responses to food products. *Food Quality and Preference, 51*, 100-108.

Fishbach, A., & Ferguson, M. J. (2007). The goal construct in social psychology. In *Social psychology: Handbook of basic principles* (pp. 490-515). Guilford Press.

Furst, T., Connors, M., Sobal, J., Bisogni, C., & Falk, L. W. (2000). Food classifications: Levels and categories. *Ecology of Food and Nutrition, 39*(5), 331-355.

Ganderats-Fuentes, M., & Morgan, S. (2023). Front-of-Package Nutrition Labeling and Its Impact on Food Industry Practices: A Systematic Review of the Evidence. *Nutrients, 15*(11), 2630.

Gao, F., Costanza, E., & Schraefel, M. C. (2012, September). "Honey = sugar" means unhealthy: investigating how people apply knowledge to rate food's healthiness. In *Proceedings of the 2012 ACM Conference on Ubiquitous Computing* (pp. 71-80).

Gill, A., Meena, G. S., & Singh, A. K. (2022). Snack bars as functional foods: A review. *Pharma Innovation Journal*, *11*(3), 1324-1330.

Goodman, S., Vanderlee, L., Acton, R., Mahamad, S., & Hammond, D. (2018). The impact of front-of-package label design on consumer understanding of nutrient amounts. *Nutrients*, *10*(11), 1624.

Gregory, J. B., Beck, J. W., & Carr, A. E. (2011). Goals, feedback, and self-regulation: Control theory as a natural framework for executive coaching. *Consulting Psychology Journal: Practice and Research, 63*(1), 26.

Gressier, M., Swinburn, B., Frost, G., Segal, A. B., & Sassi, F. (2021). What is the impact of food reformulation on individuals' behaviour, nutrient intakes and health status? A systematic review of empirical evidence. *Obesity Reviews*, *22*(2), Article e13139.

Howlett, E. A., Burton, S., Bates, K., & Huggins, K. (2009). Coming to a restaurant near you? Potential consumer responses to nutrition information disclosure on menus. *Journal of Consumer Research, 36*(3), 494-503.

Hall, M. G., Sheeran, P., Noar, S. M., Boynton, M. H., Ribisl, K. M., Parada Jr, H., ... & Brewer, N. T. (2018). Negative affect, message reactance and perceived risk: how do pictorial cigarette pack warnings change quit intentions? *Tobacco control*, *27*(e2), Article e136-e142.

Harris, J. L., Bargh, J. A., & Brownell, K. D. (2009). Priming effects of television food advertising on eating behavior. *Health Psychology, 28*(4), 404.

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.

Health Canada. (2016). *Toward Front-of-Package Nutrition Labels for Canadians.* Government of Canada. https://www.canada.ca/en/health-canada/programs/front-of-package-nutrition-labelling/consultation-document.html

Health Canada. (2022). *Front-of-package nutrition symbols* (Publication No. H164-259-2022). https://publications.gc.ca/collections/collection_2023/sc-hc/H164-259-2022-eng.pdf

Health Canada. (2024). *Nutrition labelling: Front-of-package nutrition symbol.* Government of Canada. https://www.canada.ca/en/health-canada/services/food-nutrition/nutrition-labelling/front-package.html

Hughner, R. S., & Dumitrescu, C. (2024). The effectiveness of sugar-sweetened beverage warning labels: An examination of consumer reactance and cost of compliance. *Journal of Business Research, 182*, 114812.

Hwang, J., Lee, K., & Lin, T. N. (2016). Ingredient labeling and health claims influencing consumer perceptions, purchase intentions, and willingness to pay. *Journal of Foodservice Business Research*, *19*(4), 352-367.

Ikonen, I., Sotgiu, F., Aydinli, A., & Verlegh, P. W. (2020). Consumer effects of front-of-package nutrition labeling: An interdisciplinary meta-analysis. *Journal of the Academy of Marketing Science, 48*, 360-383.

Ingham's. (n.d.). *Ingham's amazing chicken tenders.* https://inghams.com.au/products/inghams-airmazing-chicken-tenders-400g-2/

Jensen, J. D., & Sommer, I. (2017). Reducing calorie sales from supermarkets–'silent' reformulation of retailer-brand food products. *International Journal of Behavioral Nutrition and Physical Activity*, *14*, 1-14.

Kanter, R., Vanderlee, L., & Vandevijvere, S. (2018). Front-of-package nutrition labelling policy: global progress and future directions. *Public Health Nutrition, 21*(8), 1399-1408.

Kellogg's. (n.d.-a) *Kellogg's Special K Lower Sugar.* https://www.kelloggs.co.nz/en_NZ/products/special-k-lower-sugar-honey-blossom-flavoured.html

Kellogg's. (n.d.-b) *Kellogg's Special K Oats & Honey.* https://www.kelloggs.com/me/en-kw/products/special-k/special-k-oats-and-honey.html

Khandpur, N., Sato, P. D. M., Mais, L. A., Martins, A. P. B., Spinillo, C. G., Garcia, M. T., ... & Jaime, P. C. (2018). Are front-of-package warning labels more effective at communicating nutrition information than traffic-light labels? A randomized controlled experiment in a Brazilian sample. *Nutrients*, *10*(6), 688.

Kombanda, K. T., Margerison, C., Booth, A., & Worsley, A. (2022). How young adults in Australia classify foods as healthy and unhealthy. *Appetite*, *175*, 106060.

Kosicka-Gębska, M., Sajdakowska, M., Jeżewska-Zychowicz, M., Gębski, J., & Gutkowska, K. (2024). Consumer Perception of Innovative Fruit and Cereal Bars—Current and Future Perspectives. *Nutrients*, *16*(11), 1606.

Krishna, A., & Elder, R. S. (2021). A review of the cognitive and sensory cues impacting taste perceptions and consumption. *Consumer Psychology Review, 4*(1), 121-134.

Landry, M. J., Olvany, J. M., Mueller, M. P., Chen, T., Ikeda, D., Sinclair, D., ... & Policastro, P. (2020). Faith in fat: A multisite examination of university students' perceptions of fat in the diet. *Nutrients*, *12*(9), 2560.

Lay's. (n.d.). *Lay's lightly salted potato chips.* https://www.lays.com/products/lays-lightly-salted-potato-chips#

Liem, D. G., & Russell, C. G. (2019). The influence of taste liking on the consumption of nutrient rich and nutrient poor foods. *Frontiers in nutrition*, *6*, 174.

Lima, M., Ares, G., & Deliza, R. (2018). How do front of pack nutrition labels affect healthfulness perception of foods targeted at children? Insights from Brazilian children and parents. *Food Quality and Preference*, *64*, 111-119.

Machín, L., Curutchet, M. R., Giménez, A., Aschemann-Witzel, J., & Ares, G. (2019). Do nutritional warnings do their work? Results from a choice experiment involving snack products. *Food Quality and Preference*, *77*, 159-165.

Mansfield, E. D., Ibanez, D., Chen, F., Chen, E., & de Grandpré, E. (2020). Efficacy of "high in" nutrient specific front of package labels—a retail experiment with Canadians of varying health literacy levels. *Nutrients*, *12*(10), 3199.

Mai, R., & Hoffmann, S. (2015). How to combat the unhealthy = tasty intuition: The influencing role of health consciousness. *Journal of Public Policy & Marketing*, *34*(1), 63-83.

Mai, R., Symmank, C., & Seeberg-Elverfeldt, B. (2016). Light and pale colors in food packaging: When does this package cue signal superior healthiness or inferior tastiness? *Journal of Retailing*, *92*(4), 426-444.

Mazzonetto, A. C., Fernandes, A. C., de Souza, A. D., Rodrigues, V. M., Scapin, T., Uggioni, P. L., ... & Proença, R. P. D. C. (2022). Front-of-pack nutrition labels: perceptions and preferences of Brazilian adult consumers. *British Food Journal*, *124*(11), 3888-3906.

Muller, L., & Ruffieux, B. (2020). What makes a front-of-pack nutritional labelling system effective: the impact of key design components on food purchases. *Nutrients*, *12*(9), 2870.

Nordfält, J., Grewal, D., Roggeveen, A. L., & Hill, K. M. (2014). Insights from in-store marketing experiments. *Shopper marketing and the role of in-store marketing, 11*, pp. 127-146. Emerald Group Publishing Limited.

Onyeaka, H., Nwaiwu, O., Obileke, K., Miri, T., & Al-Sharify, Z. T. (2023). Global nutritional challenges of reformulated food: A review. *Food science & nutrition*, *11*(6), 2483-2499.

Papies, E. K., Stroebe, W., & Aarts, H. (2017). Pleasure in the mind: Restrained eating and spontaneous hedonic thoughts about food. In *The goal conflict model of eating behavior* (pp. 42-56). Routledge.

Prada, M., Godinho, C. A., Garrido, M. V., Rodrigues, D. L., Coelho, I., & Lopes, D. (2021). A qualitative study about college students' attitudes, knowledge and perceptions regarding sugar intake. *Appetite*, *159*, 105059.

Quintiliano Scarpelli, D., Pinheiro Fernandes, A. C., Rodriguez Osiac, L., & Pizarro Quevedo, T. (2020). Changes in nutrient declaration after the food labeling and advertising law in Chile: a longitudinal approach. *Nutrients*, *12*(8), 2371.

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy = tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, *70*(4), 170-184.

Richards, A. S., & Banas, J. A. (2015). Inoculating against reactance to persuasive health messages. *Health communication*, *30*(5), 451-460.

Reyes, M., Smith Taillie, L., Popkin, B., Kanter, R., Vandevijvere, S., & Corvalán, C. (2020). Changes in the amount of nutrient of packaged foods and beverages after the initial implementation of the Chilean Law of Food Labelling and Advertising: A nonexperimental prospective study. *PLoS medicine*, *17*(7), Article e1003220.

Schifferstein, H. N., Fenko, A., Desmet, P. M., Labbe, D., & Martin, N. (2013). Influence of package design on the dynamics of multisensory and emotional food experience. *Food Quality and Preference*, *27*(1), 18-25.

Sagaceta-Mejía, J., Tolentino-Mayo, L., Cruz-Casarrubias, C., Nieto, C., & Barquera, S. (2022). Understanding of front of package nutrition labels: Guideline daily amount and warning labels in Mexicans with non-communicable diseases. *PLoS One*, *17*(6), Article e0269892.

Schruff-Lim, E. M., Van Loo, E. J., van Kleef, E., & van Trijp, H. C. (2023). Turning FOP nutrition labels into action: A systematic review of label+ interventions. *Food Policy*, *120*, 102479.

Scrinis, G., & Monteiro, C. A. (2018). Ultra-processed foods and the limits of product reformulation. *Public health nutrition*, *21*(1), 247-252.

Seva, R. R., Go, K., Garcia, K., & Grindulo, W. (2011). Predictive Model of Attention in Viewing Selected Grocery Products. *DLSU Business & Economics Review*, *21*(1), 97-110.

Siegrist, M., Leins-Hess, R., & Keller, C. (2015). Which front-of-pack nutrition label is the most efficient one? The results of an eye-tracker study. *Food Quality and Preference*, *39*, 183-190.

Silva, L. M., & Costa, M. (2022). How front-of-package nutrition labels affect consumer decision-making in the context of obesity prevention. *Obesity Reviews, 23*(8), Article e13353.

Sharma, C., Kaur, A., Aggarwal, P., & Singh, B. (2014). Cereal bars—A healthful choice a review. *Carpathian Journal of Food Science & Technology*, *6*(2), 29-36.

Song, J., Brown, M. K., Tan, M., MacGregor, G. A., Webster, J., Campbell, N. R., ... & He, F. J. (2021). Impact of color-coded and warning nutrition labelling schemes: A systematic review and network meta-analysis. *PLoS medicine*, *18*(10), Article e1003765.

Strahan, E. J., White, K., Fong, G. T., Fabrigar, L. R., Zanna, M. P., & Cameron, R. (2002). Enhancing the effectiveness of tobacco package warning labels: a social psychological perspective. *Tobacco control*, *11*(3), 183-190.

Szakos, D., Ózsvári, L., & Kasza, G. (2020). Perception of older adults about health-related functionality of foods compared with other age groups. *Sustainability*, *12*(7), 2748.

Taillie, L. S., Hall, M. G., Popkin, B. M., Ng, S. W., & Murukutla, N. (2020). Experimental studies of front-of-package nutrient warning labels on sugar-sweetened beverages and ultra-processed foods: a scoping review. *Nutrients*, *12*(2), 569.

Tal, A., & Wansink, B. (2015). An apple a day brings more apples your way: Healthy samples prime healthier choices. *Psychology & Marketing*, *32*(5), 575-584.

Talati, Z., Norman, R., Pettigrew, S., Neal, B., Kelly, B., Dixon, H., ... & Shilton, T. (2017). The impact of interpretive and reductive front-of-pack labels on food choice and willingness to pay. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(171), 1-10.

Tannenbaum, M. B., Hepler, J., Zimmerman, R. S., Saul, L., Jacobs, S., Wilson, K., & Albarracín, D. (2015). Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychological bulletin*, *141*(6), 1178.

Temple, N. J., & Fraser, J. (2014). Food labels: a critical assessment. *Nutrition*, *30*(3), 257-260.

Temple, N. J. (2020). Front-of-package food labels: A narrative review. *Appetite*, *144*, 104485.

Tórtora, G., Machín, L., & Ares, G. (2019). Influence of nutritional warnings and other label features on consumers' choice: Results from an eye-tracking study. *Food research international*, *119*, 605-611.

Vargas-Meza, J., Jáuregui, A., Pacheco-Miranda, S., Contreras-Manzano, A., & Barquera, S. (2019). Front-of-pack nutritional labels: Understanding by low-and middle-income Mexican consumers. *PLoS One*, *14*(11), Article e0225268.

Van Herpen, E., & Van Trijp, H. C. (2011). Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. *Appetite*, *57*(1), 148-160.

Wang, J., Xue, Y., & Liu, T. (2023). Consumer motivation for organic food consumption: Health consciousness or herd mentality. *Frontiers in Public Health*, *10*, 1042535.

White, K., Lin, L., Dahl, D. W., & Ritchie, R. J. (2016). When do consumers avoid imperfections? Superficial packaging damage as a contamination cue. *Journal of Marketing Research*, *53*(1), 110-123.

World Health Organization. (2020). *Manual to develop and implement front-of-pack nutrition labelling: guidance for countries on the selection and testing of evidence-informed front-of-pack nutrition labelling systems in the WHO European Region* (No. WHO/EURO: 2020-1569-41320-56234). World Health Organization. Regional Office for Europe.

Ye, N., Morrin, M., & Kampfer, K. (2020). From glossy to greasy: The impact of learned associations on perceptions of food healthfulness. *Journal of Consumer Psychology*, *30*(1), 96-124.

Appendix A: Study 1 stimuli

A renowned brand has reformulated their product to make it healthier. Accordingly, they have changed their packaging. They are currently seeking consumer opinions about the new product and packaging. Please carefully examine the image provided below. Pay close attention to all the information provided on the packaging. Once you are ready, click on "next" to answer a few questions gauging your evaluation of the new product and packaging.

no warning label stimuli

warning label stimuli ("high sugar" warning highlighted)

Appendix B: Study 2 goal activation task

Health goal activation task:

Please take a moment to think about a **health food-related goal** you have. This could be a fitness target, a specific dietary objective, or any aspiration related to improving your well-being through food choices. Once you have your health goal in mind, please describe it in a few sentences.

Indulgent goal activation task:

Please take a moment to think about an **indulgent food-related goal** you have. This could be a dream dining experience, a favorite dish you'd love to enjoy, or a familiar comfort food that you fantasize about. Once you have your indulgent goal in mind, please describe it in a few sentences.

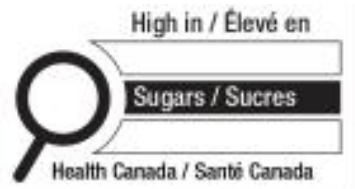
Appendix C: Study 3 stimuli

Close up pictures:

Healthy granola bar packaging

Unhealthy granola bar packaging

one-warning label



three-warning labels