Using verbal protocol analysis to explore Canadian consumers’
comprehension of the Nutrition Facts table

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ABSTRACT

USING VERBAL PROTOCOL ANALYSIS TO EXPLORE CANADIAN CONSUMERS’ COMPREHENSION OF THE NUTRITION FACTS TABLE

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The current study compared participants’ ability to perform tasks using two nutrition labels: a control Nutrition Facts table of the current Canadian format (n=64), and an experimental label (n=64), identical to the control label with the exception of a footnote explaining how to interpret percent daily values. A 25% subset of participants answered questions using a think aloud technique, and data was analyzed using content analysis. The main outcome measured was ability to interpret percentages correctly, with ability to compare, define and manipulate information as secondary outcomes. No significant differences were seen in ability to perform tasks between the experimental and control conditions for any outcomes. As determined by chi square tests, higher performance was associated with higher education, being male, and report of previous Nutrition Facts table use. Verbal protocol analysis identified that interpretation of percentages was based on the meal, food type, and comparison to other foods.
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List of Abbreviations

%DV – Percent Daily Value
GDA – Guideline Daily Amount
NFEC – Nutrition Facts Education Campaign
NFt – Nutrition Facts table
NLEA – Nutrition Labeling Education Act
RDA – Recommended Daily Amount
TUL – Tolerable Upper Limit
WHO – World Health Organization
1.0 Introduction

Nutrition labelling is a population-based approach that, along with basic nutrition knowledge, interest, and confidence to consume a healthy diet, is said to contribute to consumers’ ability to make informed food choices (Cowburn & Stockley, 2005). Many countries have adopted a voluntary approach to nutrition labelling; however, Canada, along with the U.S., New Zealand and Australia, requires mandatory nutrition labels on almost all prepackaged foods (World Health Organization [WHO], 2004).

The Nutrition Facts table (NFt) is Canada’s unique nutrition label. The format closely resembles the U.S. Nutrition Facts panel, but varies greatly from other formats across the globe. Rates of nutrition label use are high, with 60-70% of Canadians reading the NFt on a regular basis to compare products and/or find information on nutrient content (CCFN, 2008; Health Canada, 2008). Despite high reported use, a review of research conducted by Health Canada in 2009 reported that Canadians misunderstood several components of the NFt, including percent daily value (%DV) and specific amounts of foods (Health Canada, 2010b). High levels of interest and motivation are essential to effectively understand the information provided in the NFt, and in Canada, both label readers and non-readers demonstrate low motivation (Health Canada, 2007). Therefore, NFt confusion is attributed to a lack of nutrition knowledge, and a lack of motivation to read nutrition labels among Canadians (Health Canada, 2010b).

Since the implementation of mandatory labeling in 2003, Health Canada has provided educational tools to consumers and educators to help increase nutrition label comprehension across the country (Health Canada, 2010b). The negative results of Health Canada’s 2009 review on NFt comprehension led to the Nutrition Facts Education
Campaign, which was launched in 2010 (Health Canada, 2010c). The campaign focused on the %DV component of the NFt and spread the main message that 5% DV or less “is a little” amount of a nutrient, and 15% DV or more “is a lot”. The campaign information could be found on food packages, in the media, and on the Health Canada website (Health Canada, 2010c).

To date, education has been the most widely used tool to combat low levels of NFt comprehension (Health Canada, 2010b). Considerations about changing the label format have not been documented publicly, despite the fact that additional information in the NFt could affect consumer understanding. Therefore, this research examined the effects of a new label format that includes the main message of the Nutrition Facts Education Campaign on nutrition label comprehension. A verbal protocol technique was used to provide additional data on where consumers have difficulty in their understanding.
2.0 Literature Review

2.1 The Purpose of Nutrition Labels

Obesity is a preventable condition defined as “abnormal or excessive fat accumulation that may impair health” (WHO, 2012). Obesity is caused when the amount of calories consumed exceeds the amount of calories expended. This imbalance is often achieved through a combination of diet and exercise, with an increase in energy dense foods and a decrease in physical activity. Therefore, nutrition plays a key role in development and prevention of obesity.

In 2008, global obesity statistics indicated that 1.4 billion adults were overweight, with 500 million being obese (WHO, 2012). In 2007, the Public Health Agency of Canada estimated that close to a quarter of Canadians were obese (Public Health Agency of Canada [PHAC], 2009). In Canada, increases in hypertension, type II diabetes, gallbladder disease, coronary artery disease, osteoarthritis, stroke, endometrial cancer, postmenopausal breast cancer, and colon cancer have been attributed to obesity (Luo et al., 2007). In 2005, obesity cost the Canadian healthcare system 4.3 billion dollars in direct and indirect costs (PHAC, 2009).

Nutrition labels have the potential to help public health agencies achieve their objectives of reducing and preventing rates of obesity by providing consumers with information on the nutritional properties of the foods they consume (WHO, 2004). Nutrition labels are also important for consumers who have, or are at risk of developing, chronic diseases including diabetes, high blood pressure, and stroke (Health Canada, 2011b). Consumers with chronic diseases are required to consume specialized diets, and the detailed information provided by the NFt aids in the consumption of these diets. For
example, people with high blood pressure are concerned with sodium intake, and the NFt provides information on the amount of sodium in a product. The NFt also offers the percentage daily value (%DV) for sodium, which allows a consumer to quickly decide whether a product is high or low in sodium (Health Canada, 2011b). In Canada, the general purpose of nutrition labels is to provide consumers with the tools to make informed choices about the foods they purchase and consume (Health Canada, 2010b).

### 2.2 An Introduction to Food Labelling in Canada

In Canada, food labels are intended to help consumers make healthy choices (Health Canada, 2010b). Nutrition labelling is a component of food labelling, and is an umbrella term including the Nutrition Facts table (NFt), the ingredient list, and optional health claims (Government of Canada, 2003). For the purpose of this study, the term nutrition labelling will refer only to the Nutrition Facts table. In January of 2003, amendments to Canadian Food and Drug Regulations resulted in mandatory nutrition labelling for most prepackaged foods, with the exception of fresh fruits and vegetables, raw, unground meat and poultry, raw fish and seafood, foods processed or prepared in-store, foods with low nutrient value such as coffee, and alcoholic beverages (Government of Canada, 2003). The amendments required most companies to include a mandatory NFt on their packages by December 2005, with a deadline of December 2007 for smaller companies to comply with the regulations (Government of Canada, 2003). Previous to 2003, nutrition labelling was voluntary in Canada, unless a health claim was being made (WHO, 2004).

### 2.3 Nutrition Facts Table Regulations

According to the Regulations Amending the Food and Drug Regulations (2003), a
Nutrition Facts table must contain 13 core items, with an additional 16 optional items. As seen in section B.01.401 of the Food and Drugs Act, the 13 core items include:

1) Serving of stated size, described as “Serving Size”, “Serving” or “Per the Serving”

2) Energy value, described in “Calories”, “Total Calories” or “Calories, Total”

3) Amount of fat, described as “Fat”, “Total Fat” or “Fat, Total”

4) Amount of saturated fatty acids, described as “Saturated Fat”, “Saturated Fatty Acids”, “Saturates” or “Saturated”

5) Amount of trans fatty acids, described as “Trans Fat”, “Trans Fatty Acids” or “Trans”

6) The sum of saturated and trans fatty acids

7) Amount of cholesterol, described as “Cholesterol”

8) Amount of sodium, described as “Sodium”

9) Amount of carbohydrate, described as “Carbohydrate”, “Total Carbohydrate” or “Carbohydrate, Total”

10) Amount of fibre, described as “Fibre”, “Fiber”, “Dietary Fibre” or “Dietary Fiber”

11) Amount of sugars, described as “Sugars”

12) Amount of protein, described as “Protein”

13) Amount of a) vitamin A, b) vitamin C, c) calcium and d) iron, described as a) “Vitamin A” or “Vit A”, b) “Vitamin C” or “Vit C”, c) “Calcium”, d) “Iron”

As seen in section B.01.402 of the Food and Drugs Act, additional information can include: serving per container, energy value described in “kilojoules” or “kJ”, energy value from fat, energy value from the sum of saturated and trans fatty acids, basis of the
percent daily values, energy conversion factors, and the amount of polyunsaturated fatty acids, omega-6 polyunsaturated fatty acids, omega-3 polyunsaturated fatty acids, monounsaturated fatty acids, potassium, soluble fibre, insoluble fibre, sugar alcohol, starch, vitamin D, E, K, thiamine, riboflavin, niacin, vitamin B6, folate, vitamin B12, biotin, pantothenic acid, phosphorus, iodide, magnesium, zinc, selenium, copper, manganese, chromium, molybdenum, and chloride.

Although specific regulations have been set in regard to font type, size, style, and spacing, multiple formats of the Nutrition Facts table have been approved. The standard label, including the standard, narrow standard, and bilingual standard formats, has been identified as the easiest and fastest to read and understand, and is therefore used on most products (Government of Canada, 2003). Only when there is not sufficient room for the standard label is a horizontal or linear label used. Canadian research and education has been geared towards the standard label format (Health Canada, 2010c).

Percent daily values are required for fat, saturated and trans fats (combined percentage), sodium, carbohydrate, fibre, vitamin A, vitamin C, calcium and iron. Protein does not have a %DV as most Canadians consume enough protein per day. There is also no %DV for sugar as there is no healthy target for sugar consumption in a healthy population. The %DV for cholesterol is optional for food companies.

2.4 Percent Daily Value (%DV)

Percentages on the NFt are a tool to help consumers determine whether the product has “a little” or “a lot” of a nutrient. Daily values are based on a 2,000 calorie diet for fats and carbohydrates. Daily values for vitamins and minerals are based on the Recommended Nutrient Intakes for Canadians from 1983, found in the Food and Drug
regulations (Health Canada, 2012). The highest maximum recommended amount of a nutrient for age and sex is the daily value used to calculate the percentage (see Table 2.0 for all daily values). For example, in 1983, the highest recommended intake of iron for any age or gender group was 14mg, and therefore, that is the daily value used to calculate the percentage on the NFt (Health Canada, 2012). Therefore, %DVs were not developed for one specific age or gender.

<table>
<thead>
<tr>
<th>Table 2.1</th>
<th>Daily values for nutrients in the Nutrition Facts table</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrient</strong></td>
<td><strong>Daily Value</strong></td>
</tr>
<tr>
<td>Fat</td>
<td>65 g</td>
</tr>
<tr>
<td>Saturated and trans fatty acids (summed total)</td>
<td>20 g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>300 mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>2400 mg</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>300 mg</td>
</tr>
<tr>
<td>Fibre</td>
<td>25 g</td>
</tr>
<tr>
<td>Sugars</td>
<td>no DV</td>
</tr>
<tr>
<td>Protein</td>
<td>no DV</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>1000 RE</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>60 mg</td>
</tr>
<tr>
<td>Calcium</td>
<td>1100 mg</td>
</tr>
<tr>
<td>Iron</td>
<td>14 mg</td>
</tr>
<tr>
<td>RE=retinol equivalents</td>
<td></td>
</tr>
<tr>
<td>Obtained from Health Canada, 2010</td>
<td></td>
</tr>
</tbody>
</table>

2.5 Nutrition Label Use

According to the Canadian Council of Food and Nutrition, the percentage of Canadians who usually or always read food labels is on the rise, from 47% in 2004 (Canadian Council of Food and Nutrition [CCFN], 2004) to 57% in 2008 (CCFN, 2008). Of this population, 71% are consulting the NFt (CCFN, 2008). Other commonly viewed food label aspects were: the ingredient list, total product weight, and health claims (CCFN, 2008). The remaining percentage of Canadians consults food labels sometimes (25%), only when purchasing a product for the first time (12%), or never read food labels (6%) (CCFN, 2008). Common reasons that Canadian consumers do not consult the NFt are a lack of time, interest, or the perception that consumers already know if a food is
healthy or unhealthy (Health Canada, 2008).

Self reported rates of nutrition label reading are also high globally. Eighty-two percent of New Zealand consumers claimed to read nutrition labels sometimes, usually, or always, which is the same percentage seen in Canada (Gorton, Mhurchu, Chen, & Dixon, 2008). The percentage of consumers reading nutrition labels is slightly lower in the U.S., with 61.6% of Americans indicating that they always, usually, or sometimes read nutrition labels (Ollberding, Wolf, & Contento, 2010). The lowest rate was seen in the European Union at 47% (Drichoutis, Lazaridis, Nayga, Kapsokefalou, & Chryssochoidis, 2008); however, mandatory nutrition labelling has not currently been implemented in the EU (Commission of the European Communities, 1990).

2.6 Differences in Nutrition Labelling Regulations Globally

Following the amendment of the Food and Drug Regulations, Health Canada marketed their nutrition labels as the most detailed in the world, while Bill Jeffery, Canada’s head of Centre for Science in the Public Interest, stated the new labels could be a world standard (Sibbald, 2003). However, nutrition labels differ greatly in content and format across the world. Canada, United States, Australia, New Zealand, Israel, Argentina, Brazil, Malaysia, Paraguay and Uruguay are all included in the minority of countries that require mandatory nutrition labelling on most products (WHO, 2004). Remaining countries have either voluntary nutrition labelling except when either a claim is made or when the food has special dietary purposes, or no regulations at all (WHO, 2004).

For countries that have implemented mandatory nutrition labelling, similarities and differences in the labels are evident. Canadian and U.S. labels have a similar format with
a few exceptions. The U.S. label, called the Nutrition Facts label, requires information on the number of servings per container unless the container is a single serving, and the number of calories specifically from fat (Food and Drug Administration [FDA], 1990). Additionally, U.S. labels must include a footnote stating, “Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs” (FDA, 1990). Following this statement, a table including requirements for total fat, saturated fat, cholesterol, sodium, total carbohydrate and dietary fiber based on both a 2,000 and 2,500 calorie diet is included (FDA, 1990). This information is optional in Canada.

Australia and New Zealand share a Nutrition Information panel that differs from the Canadian and American format greatly. The Nutrition Information panel does not include information on trans fat or dietary fibre, but all other nutrients are listed in both quantity per serving and quantity per 100g (Food Standards Australia New Zealand [FSANZ], 2011). Unlike Canadian labels, Australian and New Zealand labels also contain the number of servings per package. The most significant difference is the lack of percent daily values, and the addition of percentages in the ingredient list (FSANZ, 2011).

While the European Union has not implemented mandatory nutrition labelling unless a health claim has been made, a standardized format is required if a company chooses to include the label. According to the European Commission (1990), the label must be formatted as either Group 1, “the big 4”, or Group 2, “the big 8”. Group 1 must list energy value, protein, carbohydrate and fat, while Group 2 must list energy value, protein, carbohydrate, sugars, fat, saturates, fiber and sodium. If a nutrition claim is being made about sugar, saturates, fiber or sodium, the Group 2 format must be used. All
nutrition information is provided per 100 grams or milliliters and per serving. Percent daily values are not required on the label except for vitamins and minerals, but is optional for all other nutrients (Commission of the European Communities, 1990). If all nutrition information is provided on a label, other formats can be included on the package, such as the popular traffic light format. This additional information is not currently regulated. Despite the voluntary approach to nutrition labelling in the European Union, research has indicated that around 85% of packages contain back of package nutrition information, with Ireland, UK, and Netherlands all having 95% of their packages labelled (Bonsmann et al., 2010).

2.7 Attributes of Nutrition Label Readers

Globally, women are significantly more likely to read nutrition labels than men (CCFN, 2008; Drichoutis et al., 2008; Gorton et al., 2008; Higginson, Rayner, Draper, & Kirk, 2002a; National Institute of Nutrition [NIN], 1999; Neuhouser, Kristal, & Patterson, 1999; Satia, Galanko, & Neuhouser, 2005). Additionally, the majority of research indicates that consumers with higher education and higher incomes are significantly more likely to read nutrition labels (CCFN, 2008; Drichoutis, Lazaridis, & Nayga, 2005; Hess, Yanes, Jourdan, & Edelstein, 2005; Neuhouser et al., 1999; NIN, 1999; Satia et al., 2005). Young and middle-aged adults may be more likely to use nutrition labels than older adults (CCFN, 2008; Drichoutis et al., 2008). Additionally, Caucasian consumers may be more likely to be label readers (Dooley, Novotny, & Britten, 1998); however, high self reported rates of label use have been recorded in an African American population (Satia et al., 2005). Additional characteristics of label readers are people who have been on a diet (CCFN, 2008; Drichoutis et al., 2005; Gorton
et al., 2008; International Food Information Council Foundation [IFIC], 2008; NIN, 1999), are health conscious (CCFN, 2008; IFIC, 2008; Satia et al., 2005), or are the main grocery shopper in a household (CCFN, 2008; Drichoutis et al., 2005; IFIC, 2008; NIN, 1999). Interestingly, some research has also indicated that people who are obese are more likely to read nutrition labels (Neuhouser et al., 1999; Satia et al., 2005), however this is likely due to having specific dietary requirements from obesity related diseases rather than overall interest (NIN, 1999).

2.8 Components of Nutrition Labels Sought by Consumers

When reading nutrition information it is common to only process part of the label (IFIC, 2008). In Canada, the most commonly reported reason to read food labels is to determine how much of a certain nutrient is in the food (CCFN, 2008), which is also consistent with the U.S. (IFIC, 2008). In Canada, fat content is the most consulted nutrient (23%), followed by calories (16%) and sugar content (12%). Secondary interests include sodium and fibre content (Health Canada, 2008). In Canada, trends in nutrition label use vary by region. For example, Ontarions are more likely to compare nutrition information of different foods than other regions of Canada, while people from Atlantic Canada are more likely to look for a specific nutrients content (CCFN, 2008).

In the U.S., research has indicated that macronutrient content in grams is the most used component of the Nutrition Facts panel, followed by serving size and calories (IFIC, 2008). Fat and energy are consulted often (Higginson et al., 2002a), while vitamins, minerals, and the daily value footnote on U.S. labels are not read often (IFIC, 2008). Americans were more likely to use gram information than %DV when looking at specific nutrients (IFIC, 2008). In the UK, a study conducted in supermarkets determined that
consumers were most likely to use nutrition information to compare products (69.4%), followed by nutrient content judgment (21.2%), rating overall health of product (5.9%), reviewing whether the health claims were accurate (2.2%), and viewing daily recommended value use (1.3%) (Higginson, Rayner, Draper, & Kirk, 2002b). This data is comparable to other countries in the area of %DV, but contrasts in the high use of the nutrition label to compare products. When UK consumers did consult a label for nutrient information, the most commonly consulted component was fat, followed by sugar, calories, salt, saturates, and additives (Grunert, Wills, & Fernandez-Celemin, 2010). As seen in other countries, consumers in New Zealand also do not consult the percent daily intake component of their nutrition label for vitamins and minerals often, when a consumer chooses to add this component (Gorton et al., 2008). Research from Croatia investigated differences between younger and older label readers, and determined that younger label readers did so out of curiosity, while older label readers did so to consume a healthy diet (Ranilovic & Baric, 2011).

Despite high percentages of self reported nutrition label use, the number of consumers who use labels to make informed purchases is likely inaccurate. Several studies on nutrition label use have used a technique called verbal protocol analysis, which is used to elicit verbal reports of participants’ thought sequences. This research has determined that although consumers access information on nutrition labels, many do not process the information any further (Higginson et al., 2002a; Higginson et al., 2002b). Therefore, the number of consumers who actually use nutrition labels to make informed purchasing decisions is likely much lower than reported.
2.9 Consumer Perceptions and Preferences of Nutrition Labelling

In 1999, the National Institute of Nutrition published a comprehensive review of Canadian nutrition labelling preferences. Although the report is dated, the labels used in the study were similar to the current Canadian labels, with the exception of the terms “Nutrition Information” and “Percent Recommended Daily Intake” replacing the current terms “Nutrition Facts table” and “Percent Daily Value”. This report indicated that the majority of Canadians had no criticisms about the format of the Nutrition Facts table (38%), while complexity (17%), misleading (8%) and insufficient (11%) information, and difficulty reading (9%) were commonly stated as areas for improvement. A more recent Canadian qualitative study indicated that although there was some mistrust in health claims, the Nutrition Facts table is generally a trusted source of nutrition information (Health Canada, 2007). As part of the 1999 National Institute of Nutrition study, participants were presented with two different Nutrition Facts table formats: nutrient information in grams alone, and information in grams and %DV. Canadians reported that the %DV component of the NFt was significantly more useful than having just grams alone (NIN, 1999). This contrasts with research from the UK and New Zealand that found that consumers did not prefer the %DV component of the food label and often found it confusing (Gorton et al., 2008; Higginson et al., 2002b).

The overall global findings on nutrition label preference indicate that consumers want labels that are simple, clear, and easy to use (CCFN, 2008; IFIC, 2008; Gorton, 2007). New Zealand consumers prefer colour coding and graphics to numbers, want labels with large font, and also value consistency (Gorton, 2007). Research from the UK has demonstrated that consumers preferred a traffic light system using the terms high,
medium, and low when referencing nutrients instead of percentages (Shannon, 1994). Research from New Zealand has also found support for the traffic light format, with the format being preferred over all other types of formats, including the current Nutrition Information panel used in Australia and New Zealand (Gorton et al., 2008).

Research from the United States has determined that consumers perceive nutrition labels to be a trustworthy source of nutrition information, and that the information presented is relevant to the health needs of Americans (IFIC, 2008). American consumers would however prefer larger font size to increase readability, household measures to help interpret serving size, and to have gram and %DV information presented in a columnar form whenever possible (IFIC, 2008).

2.10 Nutrition Label Comprehension

Nutrition label comprehension has been assessed in the literature two ways: self-reported comprehension and ability to perform tasks using nutrition labels.

2.10.1 Locating Information

Locating quantitative data on a nutrition label, such as asking for the amount of protein or saturated fat per serving, is performed well by most consumers. A U.S. study of both men and women determined that 91% of participants could correctly identify the amount of calories per serving located on a snack package (Pelletier, Chang, Delzell, & McCall, 2004). In a study looking at undergraduate and graduate students at two mid-western universities in the U.S., 91.5% of participants could correctly articulate the grams of fat in a product (Misra, 2007). Research by Byrd-Bredbenner (2000) has investigated several populations’ ability to locate nutrition information on a 5-point scale (a score of 5 indicates 5 of 5 questions were answered correctly, 0 of 5 would indicate 0 questions
answered correctly). Adult, American women could locate information well, with a score of 4.6 for label users and 4.5 for non-users. UK women aged 25-45 could also locate information well, scoring 4.65 when using the Nutrition Facts panel and 4.52 when using the EU format. Older women between the ages of 65-85 scored lower, with a total score of 3.9 (Byrd-Bredbenner & Kiefer, 2001).

A subset of participants scored slightly lower in ability to locate information. Ability to locate information was lower for participants using the New Zealand nutrition label. Research by Gorton, Ni Mhurchu, Chen and Dixon (2008) found that 69% of participants could correctly locate the amount of fat per 100g, and 65% could correctly identify the amount of sugar per serving (Gorton et al., 2008). Adolescents scored slightly lower than other populations as well, with research showing that 71% of male and female American adolescents could correctly identify serving size and the amount of total fat in a product (Hawthorne, Moreland, Griffin, & Abrams, 2006). Comprehension may also decrease with unfamiliar or complicated serving sizes. For example, only 66% of participants in a U.S. study could correctly identify the amount of fibre in 1 serving of candy, when 1 serving equaled 5 candies (Rothman et al., 2006).

Information on Canadian consumers’ understanding of nutrition labels is dated, with “Nutrition Labelling: Perceptions and Preferences of Canadians” being the most comprehensive report known. This report was published in 1999 before mandatory nutrition labelling in Canada, and although the nutrition label used in the study is almost identical to labels used today, because of the increase in nutrition interest over the last decade it is likely the data is no longer accurate. Despite its limitations, the report is the best and only piece of detailed literature exploring Canadians’ ability to locate and
manipulate nutrition label data. This research determined that in a diverse sample, Canadians could accurately communicate the amount of protein in a single serving 90% of the time, and the amount of fat in a single serving 85% of the time. No significant differences between English and French speaking Canadians were found (NIN, 1999). These numbers are comparable or slightly lower than American data, but may be underestimated due to the increase in nutrition interest since 1999.

2.10.2 Manipulating Quantitative Data

When consumers were asked to manipulate quantitative information on a label, which is often required to fully comprehend nutrition labels, the results often varied based on factors such as education level, gender, and use of nutrition label. Additionally, the complexity of the calculation was proportional to the percentage of correct responses. On average, consumers could manipulate simple calculations moderately well. A U.S. study that compared women who often read labels and who never read labels reported significant differences when participants were asked simple manipulation questions such as “How many servings of this food would you need to eat to get all the calcium you need in a day?” or “If you ate the whole package of this food, how much sugar would you get?” (Byrd-Bredbenner et al., 2001). On average, women who regularly read nutrition labels could correctly manipulate the information 96% of the time, with women who had graduated college scoring significantly higher than women with a high school education or less (Byrd-Bredbenner et al., 2001). In comparison, women who had never read a food label could only correctly manipulate information 66% of the time, independent of education level (Byrd-Bredbenner et al., 2001). Significant differences were also seen independent of education. For example, women who graduated college and read labels
regularly scored significantly higher (4.9 ± 0.4) than women who had graduated college and had never read a food label (3.7 ± 1.4) (Byrd-Bredbenner et al., 2001). A similar study, which scored UK women on a simple manipulation of EU and UK labels found that participants could correctly answer questions such as “If you were to eat the whole package, how much sugar would you consume?” approximately 60% of the time. There were no significant differences between participants who used the U.S. or the EU label to answer questions (Byrd-Bredbenner et al., 2000). Similar results were seen in a diverse U.S. sample of males and females, where 60% could correctly calculate the amount of carbohydrates in half a serving (Rothman et al., 2006).

In contrast to most studies examining numerical data manipulation on nutrition labels, which ask about amounts or percentages of nutrients, a U.S. study with a diverse sample, including both sexes, all ages, and different levels of education, asked participants “How many servings of this food would you need to get all of the carbohydrates you need in a day?” (Levy & Fein, 1998). Despite researchers simplifying the calculations by making the answers either 10 or 20 servings, only 20% of participants could correctly answer the question (Levy & Fein, 1998). Results were not significantly different based on gender or use of nutrition labels, but were significantly different based on age and education. The highest percentage of correct responses came from the ages 35-54, followed by 18-34 and then 55 years and older. College graduates scored significantly better than participants with some college, high school graduates, and participants with less than high school education, while participants with some college and high school graduates didn’t vary significantly but did score significantly better than participants with less than high school (Levy & Fein, 1998). Research indicates that
consumers often make calculation errors because they either did not consult the serving size information on the label, or used the percent daily value information incorrectly (Rothman et al., 2006). Current U.S. research has indicated that less than 50% of consumers read the serving size component of the nutrition label, which is likely why errors related to serving size are so high (Ollberding et al., 2010).

Comprehension decreased dramatically as the complexity of questions increased. When participants from a diverse U.S. sample were asked how many carbohydrates were in a whole bottle of pop with 2.5 servings per container, only 32% of participants answered correctly (Rothman et al., 2006). Another U.S. study looking at the ability of seniors and physicians to manipulate calcium information required participants to know the DRI for calcium to make the calculation. In this study, only 2 of the 37 seniors and 6 of the 20 physicians could correctly identify the amount of calcium in milligrams found in a container of yogurt when given information that a serving contained 45% of the daily calcium recommendation (Block & Peracchino, 2006).

Canadian consumers also had difficulty manipulating numerical data based on serving size. For example, when participants were asked how many carbohydrates were in a whole bottle of juice (300mL) with a serving size of 150mL, only 36% doubled the amount of carbohydrate shown per serving on the NFT (NIN, 1999). Providing information about the amount of servings per bottle, i.e. servings per bottle = 2, did not affect the results. The results of this study were similar or slightly better than studies from other countries that also looked at both genders (Rothman et al., 2006).

2.10.3 Terminology

Comprehension of nutrition label terminology varied greatly, depending on the
term. Fat and calories were generally understood the best by most Canadian consumers, while sugar, calcium, cholesterol, and protein are all understood well (NIN, 1999). Trans fat was the most misunderstood term for Canadians, with only 17% of participants identifying themselves as knowledgeable about the term (NIN, 1999). This term is likely even less understood by other countries, as it is only mandatory to label trans fats in the U.S. and Canada. The term “fat” was not completely understood by several participants in Abbott’s 1997 UK study, with 24% not knowing that fat was an essential nutrient. In the same study, it was determined that 33% of participants believed that “mg” meant millionth of a gram, instead of the correct meaning of milligram.

Not all consumers understand the differences between similar terms, such as sodium vs. salt, and calories vs. energy (NIN, 1999). A study of 400 adults from the UK determined that 88% of participants understood the relationship between salt and sodium (Abbott, 1997). Canadian research indicated that only 64% of Canadians understood that the terms calories and energy had the same meaning (NIN, 1999). Canadians linked the term “calories” to weight gain and fat intake, giving the term a more negative connotation in comparison to “energy” which was linked to terms like powerful (NIN, 1999).

Most consumers displayed confusion between the amount of a nutrient per package and the amount of a nutrient per serving. When looking at nutrition labels found on snack foods, 86% of participants in a U.S. study incorrectly identified the amount of calories per package as calories per serving (Pelletier et al., 2004). Even after prompting, 63% of participants could still not explain the difference between the terms (Pelletier et al., 2004). The inability to differentiate between the terms was seen more often in participants who had not completed high school, indicating a link to education (Pelletier
et al., 2004). This confusion was highlighted by a study of U.S. college students, where only 10.5% of participants could correctly describe what the term serving size meant (Misra, 2007).

Lastly, the %DV component of nutrition labelling is often not well understood. For Canadian consumers, a common misunderstanding is that instead of the percentage referring to a reference intake, the percentage relates to the product. Therefore, participants were often confused as to why the percent daily value did not add up to 100% (Health Canada, 2007). Canadian participants were also confused about the breakdown of fat and carbohydrate, and why the total did not equal 100% (Health Canada, 2007). The EU uses guideline daily amount (GDA) on their labels instead of %DV, and comprehension of the term varies across countries. When asked a multiple choice question about the correct definition of GDA, Sweden scored highest, with 65.3% of participants answering correctly. This was followed by the UK (61%), Germany (50.3%), Hungary (35.7%), Poland (29.5%), and France (26.8%) (Grunert, Fernandez-Celemin, Wills, Bonsmann, & Nureeva, 2010). In the UK, understanding of the percentage term on nutrition labels was high, with 87.5% of participants correctly defining the term RDA.

2.10.4 Interpreting %DV

Limited research has looked at participants’ ability to interpret %DVs. In 2011, Canadian data determined that only 26% of participants could correctly identify 28% DV of fibre as a lot of the nutrient (Health Canada, 2011a). Comprehension research has not focused on this component of nutrition label understanding.
2.11 Differences in Comprehension Between Label Formats

There is no “perfect” nutrition label, but comprehension levels vary slightly across different formats. In the study by Byrd-Bredbenner and colleagues (2000) of UK women, the EU and U.S. label were compared. When asked questions about the amount of protein or carbohydrate in a serving of food, there were no significant differences in the amount of correct responses based on each label. In fact, women from the UK could correctly answer nutrient content questions slightly more often when reading from the U.S. label (M=4.62 vs M=4.52), despite never seeing it before (Byrd-Bredbenner et al., 2000). Burton, Biswas and Netemeyer (1994) compared four different nutrition label formats across a range of dependent variables. They found a significant relationship between the inclusion of reference values and perceived understanding, but ultimately determined that no one label outperformed against the others. Levy, Fein and Schucker (1996) compared the comprehension levels of 1216 American adults across seven different formats of nutrition labels. Participants were tested on five tasks: comparing between products, judging healthfulness, verifying claims, calculating servings required to meet recommendations, and balancing nutrients for a daily diet. Results varied between questions and label formats, but overall, the authors recommend a label with a metric format and an interpretational aid, such as a daily recommended value list, adjectives, or grouped or bolded nutrients, as performance scores were higher with labels that included percentages (Levy, Fein & Schucker, 1996). Overall, the inclusion of %DV is recommended by researchers comparing labels.
2.12 Impact of Nutrition Labels on Diet

The impact of nutrition labels on diet has been studied using various methodologies, and overall, the use of nutrition labels has shown to have a positive impact on diet health. Observational studies have identified links between label reading and the consumption of a healthier diet. In a study of 1,450 American adults, results determined that label use was significantly associated with a decreased fat intake, suggesting that participants attempting to consume a low fat diet were either reading nutrition labels to do so or were more interested in health and therefore consumed a healthier diet. No relationship between fruit and vegetable consumption and nutrition label use was determined (Neuhouser, Kristal & Patterson, 1999). In a more recent nationally representative study of American adults, Ollberding, Wolf and Contento (2010) compared the diets of nutrition label users and non-users. Results indicated that nutrition label readers had significantly lower intakes of total energy, total fat, saturated fat, sugar, and fibre. In another U.S. study, researchers assessed diet healthiness on a 100-point Healthy Eating Index Scale. All aspects of nutrition labelling were examined, including the Nutrition Facts panel. Overall findings indicated that readers of the Nutrition Facts panel scored, on average, 4.5 times higher on the scale than non-readers. Interestingly, health claims produced the largest increase in score, with health claim readers scoring 6.1 higher on the scale than non-readers (Kim, Nayga & Capps, 2001). It has also been found that consumers who are less likely to choose the healthy option are also less likely to read the Nutrition Facts panel (Nayga, 1999).

Longitudinal studies have looked at the relationship between nutrition label use and diet healthiness before and after the implementation of the Nutrition Labeling and
Education Act in 1994 with mixed results. Variyam and Cawley (2006) determined that in Caucasian women, the implementation of nutrition labels was associated with lower body weight and a lower probability of becoming obese. Balasubramanian and Cole (2002) found that the implementation of mandatory nutrition facts tables had no effect on recall efficiency or the amount of time spent viewing nutrition labels. They did, however, find differences before and after the NLEA in terms of consumer’s food choices, with consumers choosing low fat and low sodium options more often post NLEA.

Experimental studies have found direct relationships between nutrition label use and diet health. In a quasi-experimental study, Variyam (2008) investigated 24-hour recalls of approximately 10,000 participants and found that consumers who used the Nutrition Facts panel when purchasing products had significantly higher intakes of fibre and iron compared to label non-users. In a UK study of 299 female consumers, participants were randomly assigned to be offered cake with either no nutrition information, or nutrition information with either moderate or high fat and sugar levels. Participants exposed to nutrition labels with high sugar and fat content were significantly less likely to choose to consume the cake than participants with the label with moderate amounts of fat and sugar (Hassan, Shiu & Michaelidou, 2010). Overall, a variety of methodologies have determined that reading nutrition labels has a positive association with diet health.

2.13 Educational Strategies

Health Canada has provided nutrition label education since the first NFt booklet was developed in 1993. In 2003, after the decision was made to make nutrition labelling mandatory in Canada, a Nutrition Labelling Toolkit for Educators was provided for over
8000 Dietitians to encourage high levels of comprehension among Canadians (Health Canada, 2010b). The toolkit included several resources, including a Get the Facts booklet, ready-to-use presentations, posters, and handouts, all designed to help Canadians understand how to use nutrition labels. Additionally, an Interactive Nutrition Label and Quiz was designed in 2006, and information on the Nutrition Facts table was included in the revised Canada’s Food Guide in 2007 (Health Canada, 2010b). Despite the educational attempts, a review of Canadian studies on label understanding in 2009 determined that Canadians needed additional help to fully understand how to use nutrition labels correctly (Health Canada, 2010b).

In 2010, Health Canada publicized the launch of the Nutrition Facts Education Campaign (Health Canada, 2010c). The campaign was developed to help Canadians make informed food choices by increasing their understanding of the Nutrition Facts table, with a focus on the %DV component. The campaign appeared on food packages, in stores, and in national media including television and online. The main message of the Nutrition Facts Education Campaign was clear and easy to understand: “5% DV or less is a little of a nutrient, and 15% DV or more is a lot of a nutrient. Nutrients you may want more of are: Calcium, Iron, Fibre, Vitamin A, and Vitamin C. Nutrients you may want less of are: Fat, Saturated

Figure 2.1: 5 and 15 rule

Health Canada, 2012
and trans fat, and Sodium” (see Figure 2.0) (Health Canada, 2012). In addition to providing information on how to interpret %DV, the campaign directed Canadians to the nutrition labelling educational component of the Health Canada website (Health Canada, 2012). The website provides a %DV fact sheet, interactive tools, and general information about how to use %DVs and how they were developed.

2.14 Verbal Protocol Analysis

When consumers are making a decision, researchers are interested in how the end result was formed. It is possible to train participants to verbalize their thought processes when problem solving or decision-making. However, it is important that while the verbalizations are being made, the thought process does not change. In order for the verbalizations to be valid and nonreactive, two parts are needed: a theoretical framework is required that outlines how participants are able to verbalize their thoughts without changing the content in their process, and tasks that can be reproduced and repeated are needed to compare participants’ answers both when verbalizations are to be made and when they are not (Schylte-Mechlenbeck, Kuhberger, & Ranyard, 2011). Behaviorist John Watson theorized that while people problem-solved, their thoughts were accompanied by “inner speech” to help solve the problem, but the words acted as support and were not verbalized. Therefore, thinking aloud while problem solving is simply verbalizing the inner speech that would have remained unspoken (Schylte-Mechlenbeck et al., 2011). The following passage is from Schulte-Mechlenbeck, Kuhberger, and Ranyard (2011), and provides an example of a repeatable task that someone skilled in math could be asked 2 weeks apart. A person could be asked what the answer to 36 multiplied by 24 is.
Week 1: “OK, 36 times 24, um, 4 times 6 is 24, 4 carry the 2, 4 times 3 is 12, 14, 144, 0, 2 times 6 is 12, 2, carry the 1, 2 times 3 is 6, 7, 720, 720, 144 plus 720, so it would be 4, 6, 864”

Week 2: “36 times 24, 4, carry the - no wait, 4, carry the 2, 14, 144, 0, 36 times 2 is 12, 6, 72, 720 plus 144, 4, uh, uh, 6, 8, uh, 864”

In this example, the participant is verbalizing their thoughts without changing the process to arrive at a correct answer.

McGuinness and Ross (2003) define verbal protocol analysis (VPA) as “a method for collecting and analyzing verbal data about cognitive processing”. VPA analyzes information in the short-term memory, as this information is consciously accessible for participants to verbalize (Newell & Simon, 1972). The process involves training participants to “think aloud” while answering questions, and researchers then make detailed records of the verbal report (McGuiness & Ross, 2003). Previous studies on nutrition label comprehension have utilized VPA to determine the thought process that participants undergo when performing nutrition label tasks. In these studies, participants are often required to make calculations or problem solve. Previous studies have utilized VPA to obtain a deeper understanding of how participants make sense of the information presented to them. Studies using this technique have determined that although consumers may look at the information, they may not use it or understand it (Higginson, 2002a; Higginson, 2002b). Overall, verbal protocol analysis allows the researcher to understand how a participant came to a particular conclusion, instead of just knowing the conclusion.

2.15 Summary

The majority of Canadians are reading nutrition labels, with self-reported rates
ranging from 60-70% reading the NFt on a regular basis (CCFN, 2008; Health Canada, 2008). While use is high, several aspects of the NFt are not well understood, including %DV and some terminology (Health Canada, 2007; NIN, 1999). No one format of nutrition label is recommended, but despite comprehension issues with %DV, it is still a recommended component of the NFt by researchers (Burton, Biswas and Netemeyer 1994; Levy, Fein & Schucker, 1996). Nutrition labels are an important component of the public health agenda, as they have the ability to positively affect the healthiness of Canadian consumers’ diet.
3.0 Rational and Study Objectives

3.1 Rational

Since mandatory nutrition labelling was implemented in 2003, Health Canada has conducted research on nutrition label comprehension with disappointing results (Health Canada, 2010b). To date, there have been no known published peer reviewed studies investigating Canadians’ understanding of the Nutrition Facts table, specifically with a focus on the %DV component. Improving consumers’ understanding of %DV was a main goal of the Nutrition Facts Education Campaign implemented in 2010, and therefore, %DV comprehension may be at an all time high in Canada now that the campaign is complete.

No one label format has been considered the gold standard, however, an interpretational aid, such as %DV, has been recommended (Levy, Fein & Schucker, 1996). The current Canadian NFt format already includes %DV, but comprehension scores could still be improved (Health Canada, 2010b). The main message of the Nutrition Facts Education Campaign was: “5% DV or less is a little of a nutrient, and 15% DV or more is a lot of a nutrient. Nutrients you may want more of are: Calcium, Iron, Fibre, Vitamin A, and Vitamin C. Nutrients you may want less of are: Fat, Saturated and trans fat, and Sodium”. This study implemented an experimental NFt with this additional message added as a footnote. Comprehension scores were compared between the experimental label and control label (standard Canadian NFt). Additionally, it is not well understood where consumers go awry in their NFt comprehension. Therefore, this study used verbal protocol analysis, or a “think aloud” technique, to obtain additional information on consumer comprehension.
3.2 Research Objectives

The study had 2 primary research objectives:

1) To determine the impact of an enhanced NFt (NFt + NFEC footnote) on NFt task performance

2) To explore the thought process that participants undergo when answering questions using the NFt.

Secondary research objectives were:

1) To collect up-to-date information on nutrition label use.

2) To examine the influence of sample characteristics on NFt use and comprehension.
4.0 Methodology

4.1 Study Design

This mixed methods study utilized a between subjects experimental design. Participants were randomly assigned to either the experimental or control condition. Participants in the control condition answered questions using a mock nutrition label that followed the same format as the current Canadian NFt (see Appendix A). Participants in the experimental condition were given an enhanced label to answer questions (see Appendix B). A 25% subset of participants was asked to answer nutrition label task questions using a verbal protocol technique (see Figure 4.1). The University of Guelph Research Ethics Board provided human subjects approval (see Appendix C).

4.2 Sample and Recruitment

In total, 128 participants from the Guelph area completed the study, with 64 participants in each condition (see Figure 4.1). Participants were recruited online from kijiji.ca and thecannon.ca (see Appendix D) and from flyers posted around the City of Guelph in coffee shops, stores and laundry mats (see Appendix E). Originally it was believed that the posting on thecannon.ca would be viewed by students and faculty of the University, however, after receiving replies from students only, the advertisement was removed after 3 days in an attempt to obtain a diverse sample.

Eligible study participants were between the ages of 19-54, primary grocery shoppers, and fluent in English. The 19-54 age range was chosen because it was the target age of the Nutrition Facts Education Campaign in 2010. A telephone or email conversation was conducted with all participants to confirm eligibility before the study began. Participants were informed that they would receive a 25$ gift card to either a
coffee chain (Tim Hortons) or a major supermarket chain (Presidents Choice) as an incentive for participating in the study. After eligibility was confirmed, participants were booked for 30-45 minute appointments either on the University of Guelph campus or in a quiet coffee shop.

Ability to interpret percentages was the main outcome of interest for this study, and therefore was used to calculate sample size. Recent literature has suggested that 74% of Canadians interpret percentages incorrectly (Health Canada, 2011a). Due to the exploratory nature of the study, no previous literature was available to report what a significant effect would be, and therefore the research team considered 50% of participants interpreting percentages correctly as a significant finding. Therefore, a change of 26% in the number of participants who interpreted percentages correctly would be considered a significant effect. Assuming percentage comprehension in the control group and the intervention group of 50% and 74% respectively, with a two-sided significance of 0.05 and a power of 0.8, a total of 128 participants or 64 participants per group was required, as determined by G*Power statistical software.
4.3 Label Design

Previous research has determined that Canadians have difficulty understanding the % Daily Value component of the Nutrition Facts table (NIN, 1999). In 2010, Health Canada launched the Nutrition Facts Education Campaign in hopes of increasing Canadian consumers’ understanding of the Nutrition Facts table, with a focus on % Daily Value. The main message of the campaign was that 5% DV or less is “a little” of a nutrient, and 15% DV or more is “a lot” of a nutrient. Nutrients you may want more of are: Calcium, Iron, Fibre, Vitamin A, and Vitamin C. Nutrients you may want less of are: Fat, Saturated and trans fat, and Sodium.

Two labels were designed for this study: a control label and an experimental label. Both mock labels contained the exact same nutrition information and were developed partially based on Dempster’s WholeGrain 12 grain bagels (Dempter’s, n.d.). Canadian
nutrition labelling standards were followed, and the information on each label included: Serving Size, Calories, Fat (total, saturated, and trans), Cholesterol, Sodium, Carbohydrate (including total, fibre, and sugars), Proteins, Vitamins A and C, Calcium, and Iron (Government of Canada, 2003). The control label followed the current format required in Canada, while the experimental label contained the additional footnote of the main message of the Nutrition Facts Education Campaign (see Figure 4.2).

**Figure 4.2: Control and Experimental Label (respectively)**

4.4 Data Collection Tool

A data collection tool was developed based on a previous questionnaire from Health Canada (Health Canada, 2007) and previous research from Mackison, Wrieden and Anderson (2010), who did validity and reliability testing on a tool that assessed consumer understanding, use and perceptions of nutrition labels. The final questionnaire
was comprised of four sections, of which Sections 1-3 were analyzed for this study (see Appendix F). Section 4 collected information on nutrition label education and was analyzed for a separate undergraduate thesis project.

Section 1 included demographic questions, such as age, education level, frequency of nutrition label use, and interest in nutrition. Section 2 investigated use and self-reported understanding of the Nutrition Facts table. Section 3 included nutrition knowledge questions to measure nutrition label comprehension and could be answered using the mock bagel NFt. Section 3 measured the main outcome variable, interpret, or participants’ ability to correctly interpret a percentage as a high, moderate, or low amount of a nutrient. Secondary outcome variables measured in Section 3 included: ability to define %DV, ability to correctly compare between products, and ability to mathematically manipulate information on the NFt.

The Office of Nutrition Policy and Promotion reviewed the questionnaire before pre-testing occurred. A purposive sample (n=10) representing a variety of ages, education levels, and both genders was recruited to pre-test the data collection tool before data collection began to discover readability, comprehension, or content issues with the questionnaire before administering it to the larger group. Wording was changed to increase readability, but no content related questions were altered.

4.5 Data Collection Procedure

Three research assistants were involved with collecting data: two graduate students, the author and RA1, and one undergraduate student, RA2. Before data collection began, the author trained the RAs extensively on how to properly administer the questionnaire. The author demonstrated the proper way to administer the data
collection tool while the RAs observed, followed by the RAs administering the questionnaire on each other while the author observed for proper technique. The author also trained RA1 on how to train and probe participants completing Section 3 of the questionnaire using the verbal protocol technique. RA2 conducted the last 14 interviews and did not do any with participants using the verbal protocol technique. In total, the author conducted 66 interviews, RA1 conducted 48 interviews, and RA2 conducted 14 interviews.

Questionnaires were printed, numbered 1-128, and labelled A for the control group and B for the experimental group using a random number generator (www.random.org). Questionnaires were then stored in the author’s office and RAs were instructed to use them in sequential order. The author and RA1 conducted 10 interviews each before beginning verbal protocol analysis on the 25% subset of participants. This was done to insure that the author and RA1 were completely comfortable with the data collection procedures before beginning verbal protocol analysis with the participants. The 25% subset was collected early on in the data collection stage because during the practice session, which was conducted prior to questionnaire administration, if participants could not effectively articulate their thoughts, they would not be included in the VPA subsample. Therefore, in the event that several participants would not be eligible for this component, participants in the later stages of data collection could be used.

Data collection began on December 7th, 2011 and was complete on January 27th, 2012. Participants were first identified as in either the VPA group or non-VPA group, verbally told whether their interview would be digitally recorded (only required for the VPA group) and then read the letter of information and read and signed the consent (see
Appendix G). Participants in the non-VPA group self administered Sections 1, 2 and 4, and were told to stop when they reached Section 3. During Section 3, the interviewer provided the participant with the mock bagel nutrition labels and asked questions based on the labels. For participants in the VPA group, a “think aloud” practice session was conducted before the questionnaire was administered. Verbal protocol technique was explained to the participants, and as suggested by Campanelli (1997), to practice thinking aloud, participants were told “try to visualize the place where you live, and think about how many doors there are in that place. As you count up the doors, tell me what you are seeing and thinking about”. After the participant was comfortable using the technique, they began self administering the questionnaire for Sections 1 and 2. During Section 3, the digital recorder was turned on and the interviewer began administering the questionnaire using the mock labels. If the RA was unable to understand how the participant got from point A to point B, they would probe for the participant to think aloud more fully. After Section 3 was complete, the recorder was turned off and the participant continued on with Section 4. All participants were then given their gift certificates.

4.6 Data Analysis

4.6.1 Statistical Analysis

All statistical analyses were conducted using SPSS version 19.0. A $p$ value of $< 0.05$ indicated statistical significance. Descriptive statistics were used to explore group demographics and psychographics, with both counts and percentages being reported. Chi-square tests were used to test for significant differences in demographic variables at baseline between the control and experimental groups. Frequencies were calculated for
physiographic variables and nutrition label comprehension scores. Chi-square was used to test for significant associations between sample characteristics (demographics and psychographics) and NFt use and comprehension. Chi-square tests were conducted to test for significant differences between groups for the outcome variables interpret, define, compare, and manipulate, as the outcomes were dichotomous (correct or incorrect). Cohen’s kappa was calculated to determine intercoder reliability for the content analysis.

4.6.2 Content Analysis

Content analysis was used to understand the thought process undergone by participants when answering questions about the NFt. A Post positivist paradigm was adopted (Popper, 1959) and the content analysis process suggested by Krippendorff (2004) was conducted for the analysis. Krippendorff (2004) discusses how content analysis can be used with interview data to explore the thoughts that manifest during discussion. Four stages were completed: sampling, unitizing, recording/coding, and producing a visual representation. During the sampling phase, interview transcripts were reviewed to determine that all were suitable to be analyzed. During the unitizing phase, the sampling unit, or each transcript, was read and then selected for inclusion in the analysis. Categorical distinctions, or in the case of the present study, the primary and secondary outcomes, were unitized. Based on the categorical distinctions, original recording/coding units, or “the units that are distinguished for separate description, transcription, recording or coding” were identified and marked (Krippendorff, 2004, p. 99). During the recording/coding phase, transcripts were read again thoroughly and coding units were interpreted and converted into categories. Final categories were labelled, clearly defined and recorded to provide to a second coder. During the final step,
categories were organized into a visual representation of the data to summarize the findings using the computer program Lucidchart. Tabulation of categories was conducted so that occurrences could be quantified, and quotations from categories were highlighted to support the data.

4.6.3 Intercoder Reliability

Holsti (1969) argues that in content analysis, “if research is to satisfy the requirement of objectivity, measures and procedures must be reliable”. To calculate intercoder reliability, a second coder was trained using the previously defined categories. Five transcripts were randomly selected to represent 15% of the total data. Cohen’s kappa was selected over other methods, such as percent agreement, because the statistic takes chance agreement into account, is stringent, and the kappa table provides a graphic representation of agreement (Bakeman & Gottman, 1986). Cohen’s kappa was calculated for each outcome by creating an agreement matrix and entering the data into SPSS (Bakeman & Gottman, 1986). Kappas ranged from 0.655-1.000 for all categorical distinctions, indicating at least substantial agreement between coders and significant reliability (Landis & Koch, 1977). All Kappa statistics are presented in Appendix H.
5.0 Results

5.1 Sample Characteristics

Demographics for all participants (n=128) are presented in Table 5.1. The sample was compared to demographic statistics from the 2006 census for Guelph, Ontario, obtained from the City of Guelph 2011 Community Profile. A total of 128 individuals participated in the study, with 101 women (78.9% of the sample) and 27 men (21.1% of the sample) included in the analysis. Age ranged from 19 to 54 years of age, with the majority of participants falling into the 19-30 age category. Compared to the City of Guelph Community Profile, the study sample was slightly more educated. In total, 28.9% of the study participants had completed high school or less, and 71.1% had completed some college/university or were a college/university graduate. Results from the Guelph Community Profile showed that about half the population (47.9%) had high school or less (“no certificate, diploma or degree” or “high school certificate”) and 52.1% had some sort of trades, college or university education (“apprenticeship/trades”, “college, CEGEP or other non-university certificate”, “university certificate or diploma below the bachelor degree” or “university degree”). Of note, the Community Profile did not take individuals who were in the process of completing their education into consideration, which would likely decrease the percentage of people in the “high school certificate” category, further increasing the comparability of the study sample to the City of Guelph from 2006. When looking at employment status, 58.6% of participants were working, but a large proportion of students also participated (28.7%). The majority of participants were making less than $20,000 a year (39.1%), comparable to 34.8% of the population making under $20,000 from the City of Guelph Community Profile. The majority of participants did not have an
individual (including themselves) in their household with a medical condition (87.5%) or following a specialized diet (75.0%). Lastly, 22.7% of the study population had visited a dietitian in their lifetime.

When examining differences between the control and experimental group at baseline, results indicated that there were no statistically significant differences for age ($\chi^2(2, N=125)=0.99, p=0.610$), sex ($\chi^2(1, N=128)=1.17, p=0.279$), education ($\chi^2(2, N=128)=1.89, p=0.389$), employment ($\chi^2(2, N=125)=.01, p=0.997$), income ($\chi^2(3, N=128)=3.13, p=0.372$), medical condition ($\chi^2(1, N=128)=2.57, p=0.109$), specialized diet ($\chi^2(1, N=127)=1.38, p=0.240$), and dietitian visit ($\chi^2(1, N=128)=0.40, p=0.526$).
<table>
<thead>
<tr>
<th></th>
<th>Overall (n=128)</th>
<th>Control Group (n=64)</th>
<th>Experimental Group (n=64)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-30</td>
<td>103 (82.4%)</td>
<td>53 (84.1%)</td>
<td>50 (80.6%)</td>
</tr>
<tr>
<td>30-42</td>
<td>11 (8.8%)</td>
<td>4 (6.3%)</td>
<td>7 (11.3%)</td>
</tr>
<tr>
<td>43-54</td>
<td>11 (8.8%)</td>
<td>6 (5.5%)</td>
<td>5 (8.1%)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>27 (21.1%)</td>
<td>11 (17.2%)</td>
<td>16 (25.0%)</td>
</tr>
<tr>
<td>Female</td>
<td>101 (78.9%)</td>
<td>53 (82.8%)</td>
<td>48 (75.0%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed high school or less</td>
<td>37 (28.9%)</td>
<td>19 (29.7%)</td>
<td>18 (28.1%)</td>
</tr>
<tr>
<td>Some college/university</td>
<td>44 (34.4%)</td>
<td>25 (39.1%)</td>
<td>19 (29.7%)</td>
</tr>
<tr>
<td>College/university graduate</td>
<td>47 (36.7%)</td>
<td>20 (31.3%)</td>
<td>27 (42.2%)</td>
</tr>
<tr>
<td><strong>Employment Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>75 (58.6%)</td>
<td>37 (57.8%)</td>
<td>38 (59.4%)</td>
</tr>
<tr>
<td>Student</td>
<td>38 (28.7%)</td>
<td>19 (29.7%)</td>
<td>19 (29.7%)</td>
</tr>
<tr>
<td>Other (retired, homemaker)</td>
<td>12 (9.4%)</td>
<td>6 (9.4%)</td>
<td>6 (9.4%)</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under $20,000</td>
<td>50 (39.1%)</td>
<td>27 (42.2%)</td>
<td>23 (35.9%)</td>
</tr>
<tr>
<td>$20,000-$80,000</td>
<td>37 (28.9%)</td>
<td>14 (21.9%)</td>
<td>23 (35.9%)</td>
</tr>
<tr>
<td>$80,000+</td>
<td>14 (10.9%)</td>
<td>8 (12.5%)</td>
<td>6 (9.4%)</td>
</tr>
<tr>
<td>Don’t know/prefer not to answer</td>
<td>27 (21.1%)</td>
<td>15 (23.4%)</td>
<td>12 (18.8%)</td>
</tr>
<tr>
<td><strong>Household medical condition?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16 (12.5%)</td>
<td>11 (17.2%)</td>
<td>5 (7.8%)</td>
</tr>
<tr>
<td>No</td>
<td>112 (87.5%)</td>
<td>53 (82.8%)</td>
<td>59 (92.2%)</td>
</tr>
<tr>
<td><strong>Household member on specialized diet?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32 (25.0%)</td>
<td>19 (29.7%)</td>
<td>13 (20.3%)</td>
</tr>
<tr>
<td>No</td>
<td>95 (75.0%)</td>
<td>45 (70.3%)</td>
<td>50 (78.1%)</td>
</tr>
<tr>
<td><strong>Visited a dietitian?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>29 (22.7%)</td>
<td>16 (25.0%)</td>
<td>13 (20.3%)</td>
</tr>
<tr>
<td>No</td>
<td>99 (77.3%)</td>
<td>48 (75.0%)</td>
<td>51 (79.7%)</td>
</tr>
</tbody>
</table>

Psychographics for all participants (n=128) are presented in Table 5.2. The self-rated overall health of the sample was fairly high, with 50% rating their health as either “excellent” or “very good”. Despite over half of the population reporting at least very good health, the sample statistics were somewhat lower than statistics from the Guelph Health Profile for the Wellington-Dufferin-Guelph Health Unit, where 64.9% rated their
health as either “excellent” or “very good”. When specifically looking at diet healthiness, most participants indicated their diet was either very good or good (80.4%), with only 5.5% of participants indicating their diet was “excellent”. Interest in nutrition was high, with 49.2% of the sample being “very interested”, and another 48.4% being “somewhat interested”. Self-rated nutrition knowledge was also fairly high, with 26.6% of the sample considering themselves “very knowledgeable”, and 64.8% considering themselves “somewhat knowledgeable”.

<table>
<thead>
<tr>
<th>Table 5.2</th>
<th>Psychographic Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-Reported Overall Health</strong></td>
<td>(n=128)</td>
</tr>
<tr>
<td>Excellent</td>
<td>16 (12.5%)</td>
</tr>
<tr>
<td>Very good</td>
<td>48 (37.5%)</td>
</tr>
<tr>
<td>Good</td>
<td>50 (39.1%)</td>
</tr>
<tr>
<td>Fair</td>
<td>13 (10.2%)</td>
</tr>
<tr>
<td>Poor</td>
<td>1 (0.8%)</td>
</tr>
<tr>
<td><strong>Self-Reported Healthiness of Diet</strong></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>7 (5.5%)</td>
</tr>
<tr>
<td>Very good</td>
<td>41 (32.0%)</td>
</tr>
<tr>
<td>Good</td>
<td>62 (48.4%)</td>
</tr>
<tr>
<td>Fair</td>
<td>17 (13.3%)</td>
</tr>
<tr>
<td>Poor</td>
<td>1 (0.8%)</td>
</tr>
<tr>
<td><strong>Nutrition Interest</strong></td>
<td></td>
</tr>
<tr>
<td>Very interested</td>
<td>63 (49.2%)</td>
</tr>
<tr>
<td>Somewhat interested</td>
<td>62 (48.4%)</td>
</tr>
<tr>
<td>Not very interested</td>
<td>3 (2.3%)</td>
</tr>
<tr>
<td><strong>Self-Reported Nutrition Knowledge</strong></td>
<td></td>
</tr>
<tr>
<td>Very knowledgeable</td>
<td>34 (26.6%)</td>
</tr>
<tr>
<td>Somewhat knowledgeable</td>
<td>83 (64.8%)</td>
</tr>
<tr>
<td>Not very knowledgeable</td>
<td>10 (7.8%)</td>
</tr>
</tbody>
</table>
Psychographic characteristics were collapsed and recoded to explore differences between groups while not violating the chi-square rule of having no cells with an expected count of less than 5 (Field, 2005). The following variables were collapsed: overall health (1=excellent/very good; 2=good/fair/poor), self reported diet healthiness (1=excellent/very good; 2=good/fair/poor), nutrition interest (1=very interested; 2=somewhat/not interested), and self reported nutrition knowledge (1=very knowledgeable; 2=somewhat/not knowledgeable).

When examining differences between the control and experimental group at baseline, results indicated that there were no statistically significant differences for overall health ($\chi^2(1, N=128)=0.50, p=0.480$), self reported diet healthiness ($\chi^2(1, N=128)=0.00, p=1.000$), nutrition interest ($\chi^2(1, N=128)=0.28, p=0.596$), and self reported nutrition knowledge ($\chi^2(1, N=127)=0.00, p=0.957$).

5.2 Nutrition Label Use

5.2.1 NFt use when purchasing a new food product

Participants were asked how often they used the Nutrition Facts table when purchasing a food product for the first time (see Figure 5.1) and in general (see Figure 5.2). When purchasing a food product for the first time, over 90% of the sample indicated that they “always”, “often” or “sometimes” used the NFt. Therefore, rates of nutrition label use were very high, with less than 10% of the sample indicating they “rarely” or “never” used the NFt when purchasing a food product for the first time. NFt use when purchasing a product for the first time was not significantly different between the control and experimental groups ($\chi^2(1, N=128)=1.47, p=0.225$).
5.2.2 Sample Characteristics and NFt use when purchasing a new food product

NFt use with new products was recoded into label users and non-users (1=always/often/sometimes; 0=rarely/never) and associations between sample characteristics and use were investigated. Sample characteristics explored were: age, gender, education, employment, income, presence of medical condition in household, specialized diet in household, dietitian visit, self-rated health, self-rated diet health, nutrition interest, self-rated nutrition knowledge and nutrition label use. Of the demographic variables, age was collapsed and recoded (1=19-36; 2=37-54) to not violate the chi-square rule of having no cells with an expected count of less than 5 (Field, 2005). Collapsed and recoded psychographic variables were used in this analysis. Statistically significant results and the frequency of observed vs. expected are presented in Table 5.3.

Gender, nutrition interest, healthiness of diet, overall health, and nutrition knowledge were all significantly associated with NFt use when purchasing a food product for the first time. Females used the NFt with new products significantly more often than males ($\chi^2(1, N=128)=6.65, p=.010$). Participants who were very interested in nutrition
used the NFt with new products significantly more often than participants who were somewhat or not very interested in nutrition ($\chi^2(1, N=128)=8.86, p=.003$). Participants who described the healthiness of their diet as excellent or very good used the NFt with new products significantly more often than participants who rated the healthiness of their diet as either good, fair, or poor ($\chi^2(1, N=128)=7.95, p=.005$). Participants who self-rated their overall health as either excellent or very good used the NFt with new products significantly more often than participants who self-rated their overall health as either good, fair, or poor ($\chi^2(1, N=128)=9.20, p=.002$). Lastly, participants who self-rated themselves as very knowledgeable used the NFt with new products significantly more often than participants who self-rated themselves as somewhat or not very knowledgeable ($\chi^2(1, N=127)=4.85, p=.028$).
### Table 5.3
Sample characteristics and NFt use when purchasing a new product

<table>
<thead>
<tr>
<th>Variable (n=128)</th>
<th>% NFt Users</th>
<th>p value(^a)</th>
<th>#Observed</th>
<th>#Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>94.1</td>
<td>.010*</td>
<td>95</td>
<td>91.5</td>
</tr>
<tr>
<td>Male</td>
<td>77.8</td>
<td></td>
<td>21</td>
<td>24.5</td>
</tr>
<tr>
<td><strong>Nutrition Interest</strong></td>
<td></td>
<td>.003*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very interested</td>
<td>98.4</td>
<td></td>
<td>62</td>
<td>54</td>
</tr>
<tr>
<td>Somewhat/not very interested</td>
<td>83.1</td>
<td></td>
<td>54</td>
<td>58.9</td>
</tr>
<tr>
<td><strong>Healthiness of Diet</strong></td>
<td></td>
<td>.005*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/very good</td>
<td>100.0</td>
<td></td>
<td>48</td>
<td>43.5</td>
</tr>
<tr>
<td>Good/fair/poor</td>
<td>85.0</td>
<td></td>
<td>68</td>
<td>72.5</td>
</tr>
<tr>
<td><strong>Overall Health</strong></td>
<td></td>
<td>.002*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/very good</td>
<td>98.4</td>
<td></td>
<td>63</td>
<td>58</td>
</tr>
<tr>
<td>Good/fair/poor</td>
<td>82.8</td>
<td></td>
<td>53</td>
<td>58</td>
</tr>
<tr>
<td><strong>Nutrition Knowledgeable</strong></td>
<td></td>
<td>.028*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very knowledgeable</td>
<td>100.0</td>
<td></td>
<td>34</td>
<td>30.8</td>
</tr>
<tr>
<td>Somewhat/not very knowledgeable</td>
<td>87.1</td>
<td></td>
<td>81</td>
<td>84.2</td>
</tr>
</tbody>
</table>

\(^*p\leq0.05\) (bolded)  
\(^a\) p values obtained using chi-square test

#### 5.2.3 General NFt use

When examining NFt use in general, rates of non-use were slightly higher than NFt use with a new product, with 17.2% of participants indicating they “rarely” or “never” used the label during daily life. Of these participants, 8 said they usually buy the same product so they are already familiar with the products nutrient composition, 4 preferred to get their nutrition information from other sources, 4 was just not interested, 3 wouldn’t know what to do with the information, 2 thought it was hard to understand, 1 thought the information was not consistent from one product to another, and 1 for “other” reasons. Usage rates were still fairly high, with over 80% of the sample using the NFt regularly. General NFt use was not significantly different between the control and experimental groups ($\chi^2(1, N=128)=0.00, p=1.000$).
5.2.4 Sample characteristics and general NFt use

All associations between sample characteristics and general NFt use were explored. General NFt use was recoded into label users and non-users (1=always/often/sometimes; 0=rarely/never).

Overall health was the only characteristic that was significantly associated with general NFt use \( \chi^2(1, N=128)=5.49, p=.019 \). Participants with self-rated excellent or very good overall health (90.6%) were significantly more likely to be general NFt users than participants with self-rated good, fair, or poor overall health (75.0%). Participants with self-rated excellent or very good overall health used the NFt more often than expected (58.0 vs. 53.0), while participants with self-rated good, fair, or poor health used the NFt less often than expected (48.0 vs. 53.0).

5.3 Reasons for Reading Nutrition Labels

Nutrition information found on the NFt “always” affected participants purchasing behavior 14.1% of the time, “often” 38.3%, “sometimes” 34.4%, and “rarely” 3.9% of the
Reasons that participants “always” or “often” used the NFt were: to see if a food has a little or lot of a nutrient you may want less of, such as sodium or fat (75.8%), to compare similar types of foods with each other, such as cookies (63.3%), to see if a food has a little or lot of the nutrients you may want more of, such as fibre or calcium (57.8%), to determine the caloric content of the food (56.2%), to figure out how much of a food you should eat (26.5%), to compare different types of food with each other, such as cookies vs. ice cream (24.2%), and to see if the advertising on the package is true (22.7%).

The most commonly “always” or “often” viewed components of the NFt were: total fat (68.8%), trans fat (64.1%), calories (62.5%), saturated fat (61.0%), and sodium (57.0%). The least commonly “always” or “often” viewed components were: iron (34.3%), carbohydrate (32.0%), calcium (28.9%), cholesterol (23.5%), Vitamin C (22.7%), and Vitamin A (15.6%).

In addition to the NFt, participants also looked at other components of the food package, including: best before date (88.3%), ingredient list (71.1%), nutrient claims, such as high in fibre (57.8%), total product size (46.1%), health/better choice slogan, symbol or logo, such as health check (35.9%), country of origin (32.0%), health claims, such as may reduce cholesterol (31.3%), whether the product was organic (30.5%), and food allergen information (11.7%).

5.4 Self-Reported NFt Comprehension

Self-reported understanding of NFt terms was rated on a 7-point likert scale from 1 (Do Not Understand) to 7 (Completely Understand). The most understood terms were:
sodium ($M=6.07, SD=1.07$), calories ($M=6.05, SD=1.22$), fibre ($M=5.98, SD=1.23$), fat ($M=5.94, SD=1.07$), calcium ($M=5.91, SD=1.21$), and sugar ($M=5.91, SD=1.23$). The least understood terms were: saturated fat ($M=5.49, SD=1.41$), trans fat ($M=5.45, SD=1.38$), energy ($M=4.97, SD=1.69$), and cholesterol ($M=4.93, SD=1.54$).

When asked overall how easy or difficult it was to understand how to use specifically the %DV component of the NFt, participant answers ranged from 1=very difficult to 7=very easy to understand ($M=5.67, SD=1.46$).

### 5.5 Impact of Condition on Performance on NFt Tasks

Differences between groups for the main outcome: interpret and secondary outcomes: compare, define, and manipulate were calculated to determine if additional information on the NFt (experimental condition) improved nutrition label understanding.

#### 5.5.1 Main outcome: interpret

Whether participants could correctly interpret 5% fat as a low amount of a nutrient was coded as a binary variable (0=incorrect; 1=correct). All outcomes between groups are presented in Table 5.4. No significant differences were seen in ability to interpret percentages between the groups, with 71.9% of the experimental group answering correctly vs. 68.8% of the control group ($\chi^2(1, N=128)=0.15, p=.699$).

#### 5.5.2 Secondary outcome: compare

Participants’ ability to correctly compare between two products and choose the product with the lowest amount of sodium was coded as a binary variable (0=incorrect; 1=correct). No significant difference were seen in ability to correctly compare, with 98.4% of the experimental group comparing correctly vs. 100% of the control group ($\chi^2(1, N=128)=1.01, p=.315$).
5.5.3 Secondary outcome: define

Participants’ ability to correctly define the term %DV was coded as a binary variable (0=incorrect; 1=correct). No significant differences were seen between groups, with 82.8% of the experimental group defining correctly vs. 85.9% of the control group ($\chi^2(1, N=128)=0.24, p=.626$).

5.5.4 Secondary outcome: manipulate

Participants’ ability to mathematically manipulate information on the NFt was coded as binary variable (0=incorrect; 1=correct). Two questions assessed participants’ ability to correctly manipulate. The first question: “If you consumed half a bagel, what percentage of your daily recommended value of iron would you consume?” was not answered significantly different between groups, with 98.4% of the experimental group answering correctly vs. 100% of the control group ($\chi^2(1, N=128)=1.008, p=.315$). The second question: “How many servings of this product would you have to eat in order to get all of the fibre you need in one day?” was not answered significantly different between groups, with 87.5% of the experimental group answering correctly vs. 84.4% of the control group ($\chi^2(1, N=128)=0.26, p=.611$).
Table 5.4
Contingency table for task performance between groups

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Experimental</th>
<th></th>
<th>Control</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expected</td>
<td>Observed</td>
<td>Expected</td>
<td>Observed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpret (Q26)</td>
<td>45.0 (70.3)</td>
<td>46 (71.9)</td>
<td>45.0 (70.3)</td>
<td>44 (68.8)</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(1)=0.15, p=.699$</td>
</tr>
<tr>
<td>Compare (Q27)</td>
<td>63.5 (99.2)</td>
<td>63 (98.4)</td>
<td>63.5 (99.2)</td>
<td>64 (100)</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(1)=1.01, p=.315$</td>
</tr>
<tr>
<td>Define (Q28)</td>
<td>54.4 (85.0)</td>
<td>53 (82.8)</td>
<td>54.4 (85.0)</td>
<td>55 (85.9)</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(1)=0.23, p=.626$</td>
</tr>
<tr>
<td>Manipulate (Q29)</td>
<td>63.5 (99.2)</td>
<td>63 (98.4)</td>
<td>63.5 (99.2)</td>
<td>64 (100)</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(1)=1.01, p=.315$</td>
</tr>
<tr>
<td>Manipulate (Q30)</td>
<td>55.0 (85.9)</td>
<td>56 (87.5)</td>
<td>55.0 (85.9)</td>
<td>54 (84.4)</td>
<td></td>
<td></td>
<td></td>
<td>$\chi^2(1)=0.26, p=.611$</td>
</tr>
</tbody>
</table>

5.6 Overall Performance on NFt Tasks

The experimental label was not associated with any improvement in NFt task performance score. Because both labels contained the same information aside from the footnote, NFt task performance was analyzed for the total group. Content analysis was conducted on the think aloud data obtained from 32 participants to supplement quantitative data on NFt comprehension. In addition to the previous outcomes, an additional question labelled sodium requirement was analyzed qualitatively.

5.6.1 Interpret

Complete content analysis findings for interpret are illustrated in Figure 5.3. Overall, 70.3% of the total sample was able to correctly interpret 5% DV as a low amount of fat. For participants who correctly chose 5% DV to be low, most did not have the knowledge that 5% was the cutoff to consider a nutrient to be a small amount. Most participants subjectively thought that 5% seemed low, and therefore, picked the correct option. Others considered 5% low because the mock label was specifically for a bagel. For example, several participants said that a bagel would likely be a whole meal, and
therefore 5% fat would be low for a whole meal. Others said it would depend on the food product, such that for a bagel 5% would be low but for another product, such as an apple, 5% might be moderate or high. One participant looked at multiple nutrients, such as fat, cholesterol, and sugar to answer the question. Several participants used a comparison to determine whether 5% DV was a low, moderate or high amount of fat. For example, a participant said:

“I was looking at some nuts yesterday and if you ate 50 nuts, it was 42% of your daily requirement of fat, so I would say bagels are low because the bagel just gives you 5% of your daily value”. (Participant 18)

A small proportion of participants (12.5%, or 2 of 16) with the experimental label discussed viewing the footnote related to %DV, and subsequently answered the question correctly. Therefore, although a significant difference was not seen between groups for ability to interpret, the label did positively influence a small proportion of participants in the experimental group.

For participants who thought 5% DV was a moderate amount of fat, many of the same reasons were chosen. Participants again said that their answer was a subjective guess, it was dependent on the type of food, or compared to other foods to determine that 5% DV was a moderate amount of fat. One participant said it was dependent on the type of fat. Participants in both the moderate and low category indicated they knew how much fat to eat per day, and then viewed the amount of fat and compared it to their recommendation. Overall, no think aloud participants chose high, and only one participant chose the “don’t know” option, saying:

“I really don’t know. I don’t usually pay attention a whole lot to whether it is high
in fat or not” (Participant 65).

Figure 5.3: Think aloud categories for interpreting the %DV of fat

5.6.2 Compare

Complete content analysis findings for compare are illustrated in Figure 5.4.

When asked to compare between two products to determine which one had the lowest amount of salt, all participants using the think aloud technique chose the correct answer and 99.2% of the total sample answered correctly. Participants most often consulted the amount of sodium in milligrams, followed by both milligrams and %DV, and least consulted was %DV only. For example, a participant answered by saying:

Product B. I looked at the sodium content and it was only 160mg compared to 340mg in Product A. (Participant 17).
Only 3 participants indicated that they looked at the serving size of both products to determine whether they were the same before they compared the sodium content. The following is an example of a participant who consulted the serving size, milligrams, and %DV to answer the question correctly:

_P9: Product B._

_**Interviewer:** Why did you say that?_  

_P9: Because the sodium content is about 50% of what it is in product A for the same size._  

_**Interviewer:** So what specifically are you looking at for sodium?_  

_P9: 340mg, 14% on product A, and 160mg, 7% on product B._

Other nutrients that were consulted in addition to sodium were: potassium, calcium, cholesterol, and protein.

**Figure 5.4: Think aloud categories for comparing different amounts of sodium content between two labels**
5.6.3 Define

Complete content analysis findings for define are illustrated in Figure 5.5. Participants were asked “what does percent daily value mean? For example, it says 20% DV for fibre, so what does that mean to you?”. Percent daily value is a complicated term, but in total, 85.2% of all participants could correctly articulate the broad definition. At 84.4%, approximately the same percentage of think aloud participants answered correctly. A commonly articulated correct broad definition resembled the components of the definition from Participant 17, who said:

“Okay, so the percent of the total recommended intake for an average person in a day”. (Participant 17).

Some participants went beyond the broad definition, adding that %DVs were set by Health Canada or the Government, were for the average person, and were the maximum amount of a nutrient recommended per day. Again, only a small amount of participants (4 of 32) considered serving size and that %DVs are calculated only for the serving size presented on the label. Interestingly, many participants conducted a calculation to help explain the definition of %DV. For example, Participant 52 said:

“Um, well I think it takes an average...um the average of how much the average person needs. So that obviously is just an estimation of how much you will need but the average person needs approximately 5 times that amount so I guess 25 grams of fibre a day and so if you eat this one bagel, you I guess get 20% of your daily intake assuming you are an average person”. (Participant 52)
Participants who could not define %DV correctly thought that it was a percentage of calories to consume, or that it was based on AMDR’s. For example, Participant 14 said:

“That chart that I remember from Health Canada when I was younger, I mean it has probably changed since then, but you are supposed to have so much of each, I think maybe this is a percentage of that value. So, if this is a carbohydrate you should have 50% a day, maybe it is 40%, I don’t know”. (Participant 14)

Another participant indicated that the percentage was a minimum or maximum, depending on the nutrient, saying:

“I mean fibre is one of the good things. I mean, if you go 120% no one is going to…It’s more of a, it’s a guideline. But that’s 20% of the amount of fibre that you should be taking in. A minimum amount. Doesn’t seem to explain. The sodium is going to be a maximum amount, of 100%, but fibre is going to be the minimum amount”. (Participant 15).

One participant guessed a component of the definition, while another simply stated that she/he did not know what %DV meant.
5.6.4 Manipulate

Complete content analysis findings for manipulate are illustrated in Figures 5.6 & 5.7. When answering what %DV of iron would be consumed in half a bagel, all participants using the think aloud technique answered correctly, compared to 99.2% of the total sample. Participants first looked at the %DV of 10% and divided it in half. Twenty of 32 participants looked at the serving size before doing the calculation to confirm that a serving was indeed a whole bagel, while the remaining 12 assumed the serving size of 1 bagel.
When considering the total sample answering the second question: “How many servings of this product would you have to eat in order to get all of the fibre you need in one day?”, 85.9% answered correctly. Looking specifically at think aloud participants, a higher proportion answered correctly at 93.8%. The majority of think aloud participants answered this question by finding the %DV of 20 and multiplying it by 5 to equal 100%. One participant converted back to the grams of fibre required, saying:

“That’s the 20% there and so that’s 1/5th of your daily requirement. So 5 times 5 grams is 25 grams of fibre” (Participant 55).

Of the participants who could not correctly do the math, either a mathematical error was made or the participant did not know that enough information was provided on the label to make the calculation. For example, Participant 59 said:

“I’m trying to remember how much fibre some one eats in a day, but, I can’t remember”. (Participant 59).
5.6.5 Sodium Requirements

In Section 3 of the questionnaire, participants were asked “True, False, or don’t know: You should try to get 100% of the Daily Value for sodium everyday”. Originally, this question was to be included in the quantitative analysis, but after conducting the content analysis, Q25 was deemed invalid. The original quantitative analysis results for this question determined that 80% of participants answered “false”, while 20% answered “true” or “don’t know”. False was originally coded as correct, as the %DV is calculated based on 2400mg of sodium per day, which is above the TUL for sodium of 2300mg per day (Health Canada, 2004). Content analysis determined that of the participants who selected “false”, many actually thought that an individual should get 100% DV per day. For example, several participants thought sodium consumption would balance out over time, including Participant 59 who said:

“I don’t believe that you should always get 100% of everything every day because you can compensate throughout the week. So on certain days you would have more and other days you would have less”. (Participant 59).
Other participants paid special attention to the wording of the question, which asked if you should try to get 100%. Participants knew that sodium was in many products, with one participant saying:

“I feel like it is really easy to get 100% so I really don’t even worry about it”. (Participant 65).

Lastly, one participant who chose false indicated that sodium was not required by the body at all.

There were several participants who answered true because they believed that 100% DV was the aim for sodium. One participant said:

“If you’re getting the recommended daily allowance then I think that because it has been evaluated by the medical community. Your body functions at its optimum level when you get the recommended daily allowance.” (Participant 62)

Therefore, in addition to participants who believed 100% DV to be the goal for sodium intake per day, there were several participants who answered false who also believed that 100% DV was ideal. The real percentage of total participants who answered this question incorrectly is likely much higher than 20%, as 46.9% of participants in the think aloud group did not answer correctly.

Several participants knew that 100% DV for sodium was not required for optimal health, with 2 participants actually knowing that the %DV was based on a maximum amount. Many participants knew that sodium was an essential nutrient, but that 100% DV wasn’t required for optimum health, including Participant 15 who said:

“You should have some salt in your diet, but you shouldn’t necessarily have to go for 100%”. (Participant 15).
Other participants mentioned sodium’s negative portrayal in the media, with one participant saying:

“Can I say about the media and stuff? I don’t know, I just feel like there is a pressure to decrease sodium intake. So I don’t know, for sodium maybe the values should be lower.” (Participant 12).

Participants who were unsure about how much sodium was recommended were conflicted with different pieces of information, including Participant 68 who said:

“I would say don’t know I guess, just because I don’t know whether you should get that much everyday, or whether it should be averaged, or whether that is the most you should get.” (Participant 68).

Compared to all of the questions asked, this question was answered the poorest by participants, with just over 50% answering correctly.
5.7 Sample Characteristics and NFt Task Performance

The experimental label did not influence participants’ ability to correctly interpret, compare, define or manipulate. Therefore, demographics and psychographics were explored to determine whether certain demographic characteristics influenced task performance outcomes. Compare and Q29 of manipulate were not considered for this analysis as only one participant scored incorrectly for both outcomes. Statistically and clinically significant results are presented in Table 5.5.

5.7.1 Interpret

There was a statistically significant association between gender and the ability to correctly interpret %DV ($\chi^2(1, N=128)=5.66, p=.017$). In total, 88.9% of males answered correctly compared to 65.3% of females. Fewer females correctly interpreted (66.0) compared to expected (71.0), and more males correctly interpreted (24.0)
compared to expected (19.0). There was also a statistically significant association between education and ability to correctly interpret %DV ($\chi^2(2, N=128)= 6.11, p=.047$). In total, 83.0% of participants who had graduated from college or university correctly interpreted, compared to 65.9% with some college/university, and 59.5% with high school or less. Participants with a high school education or less correctly interpreted fewer times than expected (22.0 vs. 26.0), while participants who were college or university graduates correctly interpreted more often than expected (39.0 vs. 33.0).

There was a trend between nutrition interest and ability to correctly interpret %DV ($\chi^2(1, N=128)= 3.31, p=.069$), however, this finding was not statistically significant. Fewer somewhat or not very interested participants correctly interpreted (41.0) compare to expected (45.7), and more very interested participants correctly interpreted (49.0) compared to expected (44.3). In total, 77.8% of very interested participants correctly interpreted compared to 63.1% of somewhat or not very interested participants.

5.7.2 Define

There were no statistically significant relationships between participant characteristics and ability to correctly define %DV. However, there was a trend between education and ability to correctly define ($\chi^2(2, N=128)= 4.83, p=.089$). In total, 93.6% of participants who had graduated from college or university correctly defined the term, compared to 79.5% with some college/university, and 78.4% with high school or less. There was also a trend towards NFt use and ability to correctly define %DV, with 86.8% of NFt users defining correctly compared to 72.7% of NFt non-users ($\chi^2(1, N=128)= 2.73, p=.098$). Fewer NFt non-users correctly defined than expected (16.0 vs. 18.6), and more
NFt users correctly defined than expected (92.0 vs. 84.9). There was also trend between self-rated nutrition knowledge and ability to correctly define %DV ($\chi^2(1, N=127) = 3.01, p=.083$). Fewer somewhat or not very knowledgeable participants correctly defined than expected (76.0 vs. 79.1), and more very knowledgeable participants correctly interpreted that expected (32.0 vs. 28.9). In total, 94.1% of very knowledgeable participants correctly defined compared to 81.7% of somewhat or not very knowledgeable participants. Neither trend was statistically significant.

5.7.3 Manipulate

There was a statistically significant association between education and ability to correctly manipulate mathematical information on the NFt ($\chi^2(2, N=128)= 8.89, p=.012$). In total, 95.7% of participants who had graduated from college or university correctly manipulated, compared to 86.4% with some college/university, and 73.0% with high school or less. Participants with a high school education or less correctly manipulated fewer times than expected (27.0 vs. 31.9), while participants who were college or university graduates correctly manipulated more often than expected (45.0 vs. 40.4). There was also a statistically significant association between NFt use and ability to correctly manipulate mathematical information on the NFt ($\chi^2(1, N=128)= 3.84, p=.050$). In total, 88.7% of participants who were NFt users correctly manipulated, compared to 72.7% of participants who were NFt non-users. NFt non-users correctly manipulated fewer times than expected (16.0 vs. 18.9), while NFt users correctly manipulated more often than expected (94.0 vs. 91.1).

There was a trend between diet health and ability to correctly manipulate ($\chi^2(1, N=128)= 2.09, p=.149$). In total, 91.7% of participants with self-reported excellent or
very good diets correctly manipulated, compared to 82.5% of participants with good, fair, or poor diets. Fewer participants with a good, fair, or poor diet correctly manipulated than expected (66.0 vs. 68.8), and more participants with an excellent or very good diet correctly manipulated than expected (44.0 vs. 41.3). The trend was not statistically significant.
Table 5.5
Sample characteristics and performance on NFt tasks

<table>
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<tr>
<th>Variable (n=128)</th>
<th>Interpret</th>
<th>Define</th>
<th>Manipulate</th>
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\(p \leq 0.05\) (bolded)

\(^a\)p values obtained using chi-square test

5.8 Sample Characteristics and Female NFt Task Performance

Because the study sample was predominantly female (78.9%) and the main outcome interpret was significantly associated with gender, the sample was condensed into only female participants (N=101) and demographic characteristics were further explored.

Statistically and clinically significant findings are presented in Table 5.6.

5.8.1 Interpret

For female participants, there was a significant association between nutrition interest and ability to correctly interpret %DV \((\chi^2(1, N=101)= 5.17, p=.023)\). In total,
female participants who were very interested in nutrition could correctly interpret 75.0% of the time, compared to 53.3% of female participants who were somewhat or not very interested in nutrition. Fewer female participants who were somewhat or not very interested in nutrition were able to correctly interpret than expected (24.0 vs. 29.4), while more female participants who were very interested in nutrition were able to correctly interpret than expected (42.0 vs. 36.6).

There was a trend between education and ability to correctly interpret %DV for females ($\chi^2(2, N=101)= 5.76, p=0.056$). Overall, 78.8% of female participants with a completed college/university education correctly interpreted compared to 50.0% of female participants with a high school education or less. Fewer female participants with a high school education or less were able to correctly interpret than expected (15.0 vs. 19.6), while more female participants who were college/university graduates were able to correctly interpret than expected (26.0 vs. 21.6). There was also a trend between age and ability to correctly interpret ($\chi^2(1, N=101)= 2.37, p=0.124$). Overall, 88.9% of female participants aged 37-54 correctly interpreted compared to 63.3% of female participants aged 19-36. Fewer female participants aged 19-36 were able to correctly interpret than expected (57.0 vs. 59.1), while more female participants aged 37-54 were able to correctly interpret than expected (8.0 vs. 5.9). Neither trend was statistically significant, however education was approaching significance ($p=0.056$).

5.8.2 *Define*

For female participants, there was a significant association between education and ability to correctly define %DV ($\chi^2(2, N=101)= 7.05, p=0.029$). Overall, 97.0% of female participants with a completed college/university education correctly defined compared to
73.3% of female participants with a high school education or less. Fewer female participants with a high school education or less were able to correctly interpret than expected (22.0 vs. 25.0), while more female participants who were college/university graduates were able to correctly interpret than expected (32.0 vs. 27.4).

There was a trend between nutrition knowledge and ability to correctly define for females ($\chi^2(1, N=100)= 2.78, p=.096$). Overall, 93.3% of female participants who self-rated themselves as very knowledgeable in nutrition aged correctly defined compared to 80.0% of female participants who were somewhat or not very knowledgeable. Fewer female participants who were somewhat or not very knowledgeable were able to correctly define than expected (56.0 vs. 58.8), while more female participants who were very knowledgeable were able to correctly define than expected (28.0 vs. 25.2). There was also a trend between NFt use and ability to correctly define for females ($\chi^2(1, N=101)= 2.82, p=.093$). Overall, 85.9% of female participants who were NFt users correctly defined, compared to 68.8% of NFt non-users. Fewer non-users were able to correctly define than expected (11.0 vs. 13.3) while more NFt users were able to correctly define than non-users (73.0 vs. 70.7). Neither trend was statistically significant.

5.8.3 Manipulate

For females specifically, there was a significant association between education and ability to correctly manipulate mathematical information on the NFt ($\chi^2(2, N=101)= 7.08, p=.029$). In total, 93.9% of females with a completed college/university education could correctly manipulate, compared to 70% of females with a high school education or less. Fewer females with a high school or less education correctly manipulated than
expected (21.0 vs. 25.2), while more females who were college or university graduates correctly manipulated than expected (31.0 vs. 27.8).

There was a trend between NFt use and ability to correctly manipulate for females ($\chi^2(1, N=101)= 3.39, p=.066$). Overall, 87.1% of female participants who were NFt users correctly manipulated, compared to 68.8% of NFt non-users. Fewer non-users were able to correctly define than expected (11.0 vs. 13.5) while more NFt users were able to correctly define than non-users (74.0 vs. 71.5). The trend between NFt use and ability to correctly manipulate for females was approaching significance ($p=0.066$).

**Table 5.6**
Sample characteristics and performance on NFt tasks for females

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<th>Manipulate</th>
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<td>NS</td>
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$^a p \leq 0.05$ (bolded)
$^p$ $p$ values obtained using chi-square test
6.0 Discussion

This was the first study to look at the impact of an enhanced NFt on Canadian consumers’ comprehension of nutrition labels. This study contributes to the growing body of nutrition label research by providing new data on nutrition label use and comprehension. The data obtained through verbal protocol analysis provides material for an in depth investigation into common errors made when reading the NFt. The major findings of this study were that: 1) an enhanced NFt with an additional footnote from the NFEC did not improve consumers’ ability to interpret %DV, compare between products, define %DV, or manipulate quantitative information, 2) consumers interpret %DV based on food products and comparisons, and not on the 5% and 15% rule articulated during the NFEC, 3) consumers are consulting %DV and actual amounts of nutrients, 4) consumers can manipulate simple quantitative information found on the NFt well, and 5) most consumers are able to correctly define the broad meaning of %DV, but have trouble applying %DV in relation to consumption.

6.1 Interpreting %DV

Overall, approximately 30% of participants were unable to interpret 5% DV of fat as a low amount of fat. Previous Canadian research determined that 74% of participants were unable to correctly interpret 28% of fibre as a lot of fibre (Health Canada, 2011a). Therefore, in the study population, ability to correctly interpret percentages was much higher than Canadian results from the previous year. There are several reasons why this change in comprehension could have occurred. First, 6.3% of the total group who used the think aloud technique, or 2 of 16 participants in the experimental think aloud group, indicated that they read the NFEC footnote on the experimental label that indicated that
5% or less of a nutrient was a low amount. Although ability to interpret percentages correctly was not significantly different based on whether the participant had access to this footnote on the mock NFt, it is evident that the footnote aided a small proportion of participants. Additionally, it is possible that interpreting percentages is different based on the whether the percentage is low, moderate or high. Due to the high number of participants who indicated their interpretation of the %DV was a subjective guess, it is clear that many consumers do not have actual knowledge about what is considered a low, moderate, or high amount of a nutrient. Lastly, the two study populations were slightly different. The Health Canada study was comprised of 1504 adults over the age of 18, with 655 of these participants being between the ages of 19-54. The current study sample was comprised of 128 adults between 19-54. Both study samples were primary grocery shoppers. Due to the larger sample size obtained by Health Canada, it is possible that their results are more nationally representative, while the current study is more representative of the Guelph area.

Perhaps the most interesting finding from this question is that many participants did not consider percentages the same across food products. Many people indicated that 5% was a low amount of a nutrient, not because of the value, but because it was specific to a bagel. In terms of NFt comprehension, this finding is not ideal. For example, if a product such as chips contained 17% DV for fat, a consumer may think this is good because it is “low for chips”. In contrast, if a vegetable contained 17% fibre, consumers may consider this low “for a vegetable”. Overall, these findings showcase the importance of the overall message of the NFEC. It is important that consumers learn how to properly
interpret percentages independent of the type of food product, as this is how the percentages were intended to be used.

An additional finding from this section is that consumers are using the %DV to compare between product types. As previously discussed, one participant spoke about comparing the percentage of fat in the bagel to nuts that were previously consumed, and how the nuts were much higher in fat. While consumers may not be accurately classifying nutrients as low, moderate, or high, this finding indicates that consumers are at least using %DVs correctly to compare between foods. They are also consulting components of the NFt that provide information on nutrients that consumers may want less of, such as fat, further indicating that consumers are using nutrition labels to make healthier choices.

6.2 Using the NFt to Compare Between Products

Nutrition labels were mandated to help consumers make healthy food choices, and being able to compare between products to choose the healthier option is a large component of this objective. In the current study, when participants were asked to choose the best product for someone trying to lower their salt intake, 99.2% of participants were able to choose the product with the lowest sodium. This high percentage is an extremely positive finding, as it demonstrates consumers’ understanding of the relationship between salt and sodium, and that consumers can effectively use nutrition labels to make healthier choices. A less positive finding is that only 9.4% of participants using the think aloud technique viewed the serving size of the two products to ensure that they were the same before comparing. While %DVs can still be used to compare between products that do not have the same serving size, it is important for consumers to view this section before
they compare to be aware of differences that will influence the %DVs of all other nutrients in the NFt.

The low percentage of consumers looking at the serving size was surprising, as previous current Canadian research indicated that serving size was a well understood and commonly noticed component of the NFt for English consumers (Health Canada, 2007). Canadian research conducted in the late 1990’s determined that 42% of consumers did not look at serving size when comparing between products (NIN, 1999). Low rates of serving size consultation is a troubling finding, as understanding and using serving size is an important step in understanding how to use the NFt as a whole. All %DVs are based on the serving size, and if consumers are not reading this component of the NFt then they may not be actually consuming the recommended percentage of the nutrient they believe to be consuming. Serving size was not a focus of the NFEC, despite its importance in relation to %DV. Adding information about the importance of consulting the serving size in the NFt to the Health Canada nutrition labelling website could positively affect %DV comprehension. The importance of serving size should also be considered during the development of the next educational campaign for nutrition label reading.

Data from the comparison question also provided information on what aspect of the NFt was consulted when seeking information about a specific nutrient. Consistent with previous literature, actual amount (mg for sodium) was the most consulted component, with 46.9% of participants viewing the amount of mgs when comparing between products. The number of participants consulting the %DV component when comparing between products may be on the rise, with 37.5% of participants viewing it in addition to amount, and 15.6% viewing it independently. During Health Canada’s
qualitative study, very few participants discussed comparing products using the %DV (Health Canada, 2007). In the current study, with 53.1% of participants using %DV as an independent value or a complementary value to actual amount, it is evident that the study population is using the %DV component of the NFt somewhat frequently.

6.3 Manipulating Quantitative Information in the NFt

Overall, participants were very skilled at answering questions that required mathematical manipulations. For the first and easier manipulation question, “If you consumed half a bagel, what percentage of your recommended daily value of iron would you consume?”, only one participant, or 0.8% of the study population, answered incorrectly. Interestingly, 37.5% of think aloud participants did not consult the serving size information to confirm that 1 bagel was the serving size, and simply assumed that half the bagel would be half a serving. Therefore, if a serving size of less than 1 bagel was used, scores for this question could have been much lower, and current results should be interpreted with caution. This issue raises the importance of logical serving sizes on food products. If many consumers are not consulting the serving size on food packages, it is important that food companies use a serving size that is realistic so that information is somewhat useable for consumers.

The second and more difficult manipulate question “How many servings of this product would you have to eat in order to get all of the fibre you need in one day?” was also answered well. In total, 86.0% of all participants answered this question correctly. Think aloud participants who answered incorrectly either could not do the math correctly, or did not believe they had the information required to do the calculation. The math error consisted of a participant calculating that $20 \times 4 = 100$ instead of 80. This could be due to
low numeracy skills, or could also be the effect of answering a math question under pressure for a research assistant. Of note for this question, it was unclear whether participants used the serving size to complete the calculation from the think aloud verbalizations, as they may not have mentioned it due to the fact that they had already consulted the component for previous questions.

6.4 Defining %DV

Health Canada’s (2007) main consensus on %DVs is that consumers have difficulty understanding the term. Canadian research has determined that consumers are often confused as to who the percentages are based on, and why the breakout items under “fat” and “carbohydrate” do not add up to 100%. If consumers are asking these questions, then it clear that there is still some confusion about %DVs. However, this does not necessarily mean that consumers do not understand the broad context of the term well enough to apply the information to making healthy choices. In the current study, when asked, “What does %DV mean? For example, if I said that a product had 20% DV for fibre, what would that mean to you?” 85.2% of participants could correctly articulate the broad definition of the term, or that %DV was the percentage of the daily recommended intake for a nutrient. Some participants elaborated that it was based on the average person or that it was determined by previous research, but this knowledge is arguably not required to use %DVs effectively. Therefore, it may not be appropriate to say that Canadians do not understand the %DV term, but that some consumers only understand the broad context of the term.

Overall, the majority of the study population could articulate the broad definition during an open-ended question, and many actually supplied more in-depth knowledge on
The main area of confusion for participants was what the percentages were based on. Instead of correctly articulating that percentages are based on recommended nutrient intakes, some participants believed that they were based on a percentage of calories or AMDRs. Consumers were also confused as to whether the recommendation was a minimum, average, or maximum recommendation. The questions and confusions that consumers raise in terms of %DV are complicated and require an in-depth knowledge of the nutrition labelling process to fully understand. For example, whether the percentages are based on a minimum, average, or maximum recommendation is not common knowledge. For a person to fully understand that %DVs are based on the highest recommended amount of a nutrient, a consumer would have to research the topic on the Health Canada website. Therefore, for consumers to fully understand the %DV term, they must be motivated to seek information outside of what is presented by media campaigns such as the NFEC. Additionally, it is not surprising that consumers have questions about how percentages were developed and calculated as this information would also require motivation to visit the Health Canada website, and previous research has found that motivation to learn how to read nutrition labels is low (Health Canada, 2007). If consumers are asking questions about who percentages are calculated for and how they were developed, as was found by Health Canada in 2007, this may indicate that consumers are looking for more in-depth information on nutrition labelling, and providing this information on the nutrition labelling website is the first step to educating consumers further. Providing this additional information in future campaigns may further help Canadians to understand and effectively use the %DV component of the NFt by increasing the number of consumers that have exposure to the message. To increase the
breadth of this message, this additional and more advanced information should also be incorporated into the current nutrition labelling school curriculum.

Canadian research from 1999 on %DV (previously labelled %RDI) suggests that %DV comprehension has increased greatly over the past decade (NIN, 1999). When consumers were asked questions on the concept, 20% of participants were unable to offer any meaning for the term, compared to 3.1% from the current study. Additionally, common misunderstandings from 1999, such as that the term referred to the amount of nutrient within the product (NIN, 1999), were not articulated in the current study. Therefore, it is possible that the NFEC in conjunction with an increase in nutrition interest and the Health Canada nutrition labelling website may have had a positive impact on %DV comprehension over time.

6.5 Applying %DV to Sodium

Despite most participants understanding the broad context of %DV, some participants were lacking detailed knowledge of the concept. As previously discussed, this does not necessarily mean that %DVs cannot be use effectively, as the results determined that participants could still compare between products to choose the healthier option. An exception to this statement surrounds sodium, in that consumers need to understand more detailed information about %DVs to judge sodium percentages correctly. The %DV for sodium is 2400 mg per day, as the value was the highest recommendation for any age and gender from the 1983 Recommended Nutrient Intakes for Canadians (Health Canada, 2012). The TUL, or the maximum daily intake unlikely to cause adverse health effects, for sodium is 2300 mg per day (Health Canada, 2010a). The AI for sodium, or the amount that is “expected to meet or exceed the needs of most
individuals in a specific life stage and gender group”, is far less than the TUL at 1500mg per day (Health Canada, 2010a). Therefore, it is important for consumers to understand that the %DV for sodium is based on a value even higher than the maximum recommended intake of the nutrient, and not the AI.

Results from this study determined that very few participants knew %DVs were based on maximum recommendations. Using data obtained from the verbal protocol technique, it was determined that of the study population, 40.6% of participants believed that the average person should consume 100% DV for sodium everyday. Statistics from 2004’s Canadian Community Health Survey indicated that over 99% of males in each age category exceeded the AI for sodium, while 97% of females in each age category exceeded the AI (Health Canada, 2004). If consumers believe that 2400mg is the required amount of sodium per day, then it is not surprising that such a high percentage of the Canadian population is consuming amounts above the AI. If Canadian consumers are aiming to consume 100% DV for sodium each day, the health implications will be damaging. High blood pressure is a major risk factor for CVD, and accounts for 62% of strokes and 49% of coronary heart disease worldwide (He & MacGregor, 2009). Stroke, left ventricular hypertrophy, and renal disease have also been associated with a high salt diet, independent of blood pressure (He & MacGregor, 2009).

The fact that sodium is calculated based on a value higher than the TUL is very important information that has not been articulated to Canadian consumers during the Nutrition Facts Education Campaign or any other educational campaigns. This information is also not a highlight of the Health Canada nutrition labelling website. While the NFEC did include information that sodium may be a nutrient that consumers want
less of, the information is not detailed enough and may leave consumers confused. This confusion was seen in two participants from the current study (see Figure 5.8) who spoke about the conflicting information on sodium. On one hand, many participants knew that sodium was an essential nutrient required for health, but participants were also likely to say that sodium was a “bad” nutrient, or that it had a negative media image. Therefore, the importance of education focusing on sodium should not be overlooked. Overall, the message that %DV for sodium is based on a value higher than the maximum recommendation should be articulated clearly to consumers by Health Canada.

6.6 Nutrition Label Use

Nutrition label use has increased over the past decade, with the frequency of consumers who often or always read the NFt increasing from 40% in 1999 (NIN, 1999) to 54.7% in the current study. In a Canadian study from 2008, researchers looked at food label use, which includes the NFt, ingredient list, and nutrition claims. In total, 57% of consumers usually or always read food labels (CCFN, 2008). Taking into consideration that the current study only asked about NFt use, it is likely that rates of food label use in the current study are consistent, or higher, than findings from 2008. It is important to note that the current study was not a nationally representative sample, while the CCFN study was comprised of 2003 participants with weighted representation from all provinces and territories.

In the current study, females with high education were most likely to use the NFt. This is consistent with previous research on nutrition label use (CCFN, 2008; Drichoutis et al., 2008; Gorton et al., 2008; Higginson, Rayner, Draper, & Kirk, 2002a; NIN, 1999; Neuhouser, Kristal, & Patterson, 1999; Satia, Galanko, & Neuhouser, 2005). Participants
with higher self-rated nutrition interest, healthiness of diet, overall health and nutrition knowledge were also more likely to use the NFr, consistent with previous findings that nutrition label users are health conscious (CCFN, 2008; IFIC, 2008; Satia et al., 2005). The current study did not repeat previous findings that nutrition label users were more likely to be on a specialized diet or have higher incomes (CCFN, 2008; Drichoutis et al., 2005; Gorton et al., 2008; IFIC, 2008; NIN, 1999).

When asked how often information on the NFr affected purchasing behaviour, the most common response was “often”, with 38.3% of participants reporting that the NFr often influenced their food purchases. An additional 14.1% of participants indicated that NFr information “always” affected purchasing behaviour, supporting the finding that nutrition labels have the ability to improve diet quality. While diet quality was not directly measured in this study, results from this study indicate that the information found in the NFr has the ability to change consumers’ purchasing behaviour, resulting in possible diet healthfulness changes.

Results determined that consumers were “always” or “often” looking at labels to find amounts of nutrients consumers may want less of, such as sodium or fat (75.8%), more often than looking for nutrients that consumers may want more of, such as fibre or calcium (57.8%). Additionally, the most commonly “always” or “often” viewed components of the NFr were total fat, trans fat, calories, saturated fat and sodium, while the least commonly always or often viewed components were iron, calcium, Vitamin C and Vitamin A. Therefore, the current study population may be more interested in limiting the consumption of “bad” nutrients than increasing consumption of positive nutrients.
While lowering consumption of fat and sodium will have positive health effects, increasing beneficial nutrients will also have positive health impacts. For example, a daily 200 mg consumption of vitamin C from fruits and vegetables has been linked to lower rates of oral cavity, esophagus, stomach, colon, and lung cancer (Levine, Rumsey, Daruwala, Park, & Wang, 1999). Canadian nutrient intakes from 2004 highlight the importance of also focusing on positive nutrients. For Vitamin A, 44.3% of adult males and 35.8% of adult females were not meeting the EAR for age and gender (Health Canada, 2004). For Vitamin C, 22.5% of adult males and 16.7% of adult females were not meeting the EAR for age and gender (Health Canada, 2004). For calcium, the percentage of Canadians meeting the AI ranged from 53% for 19-30 years old to 10% in adults over 70 years of age. For females, 30% of 19-30 year olds were meeting the AI for calcium, with all other age groups falling below 30% (Health Canada, 2004). Promoting vitamins and minerals shifts the focus of nutrition from a negative to a positive light. Overall, it is important for educators and health professionals to continue promoting decreased intakes of fats and sodium while also promoting increased intakes of vitamins and minerals.

6.7 Strengths and Limitations of Current Study

The current study contains several strengths. The mixed methods approach provided quantitative data on nutrition label comprehension, while the qualitative data provided an in depth look at the process that consumers undergo when answering NFt questions. Therefore, instead of simply presenting percentages of how many consumers’ answered questions wrong, the researchers could pinpoint where participants went wrong in their thinking. This information can be used to tailor future nutrition label education.
This study was also the first in Canada to look at the impact of an experimental label on various components of NFt comprehension. Additionally, the use of verbal protocol analysis allowed the researchers to obtain data on NFt comprehension that has previously not been documented.

Research assistants were extensively trained on data collection techniques, which was extremely important for collecting the think aloud data obtained from verbal protocol analysis. Participants were also trained on how to verbalize their thoughts prior to data collection to ensure that they could articulate their thought processes while answering nutrition label questions.

A limitation of the current study is that the data collection tool was not tested for validity or reliability. No valid and reliable tool exists for collecting information on Canadian NFt comprehension, and therefore, a questionnaire was developed for the study. Questions were taken from a previously validated questionnaire measuring U.S. comprehension, but could not be used in entirety because of the differences in nutrition labelling between countries. The Office of Nutrition Policy and Promotion reviewed the questionnaire and the verbal protocol technique acted as a validity check. An additional limitation of the current study is the sample size. Testing for differences in dependent variables between the two conditions was the main focus of the study, and therefore, the sample size was calculated based on this research question. However, after determining that no differences in comprehension existed, the researchers began viewing the sample as a whole, which is when the associations between sample characteristics and comprehension and use became of interest. Using logistic regression to examine predictors of nutrition label comprehension and nutrition label use was not possible as the
statistical technique requires a minimum of 50 cases per predictor variable (Aldrich & Nelson, 1984). Therefore, a chi-square test was conducted to look at the relationship between demographic characteristics and comprehension instead of logistic regression. Lastly, the generalizability of the study is limited due to high percentage of student and highly educated participants. Although the sample was representative of the Guelph area, with the exception of being slightly more educated, it is not a nationally representative, and therefore results cannot be extrapolated to other areas of Canada.

6.8 Future Research

Future research should focus on the serving size component of the NFt. As determined by think aloud data, many consumers were not consulting the serving size component of the NFt when answering questions. Therefore, future research should implement a less familiar serving size to determine the impact of this on nutrition label comprehension. When comparing between products, different serving sizes should be used to determine if a) consumers look at serving size, and b) consumers can correctly compare between products when servings sizes are different. Additional research on serving size consultation and understanding will complement %DV research as percentages are based on serving size.

Research on %DV should continue to explore consumers’ ability to interpret percentages correctly. High, moderate, and low percentages should be explored to determine whether differences in ability to interpret exist between the levels.

Lastly, additional research needs to focus on %DV in relation to sodium. Whether consumers believe that 100% DV is the nutritional target for sodium should be tested with a larger, nationally representative sample to determine what percentage of
Canadians may be aiming to consume sodium values above the TUL. Whether consumers understand the implications of long-term excess sodium intake or are aware of what the sodium intake targets are could also be of interest to health care professionals.
7.0 Conclusions and Implications

The main objectives of the current study were to examine the impact of an experimental NFt containing information from 2010’s Nutrition Facts Education Campaign on nutrition label comprehension. Verbal protocol analysis was implemented to obtain information on where participants go wrong in their thought processes when answering questions about nutrition labels.

Overall, adding additional information to the NFt did not positively affect participants’ performance on tasks related to interpreting percentages, comparing between products, defining %DV, and manipulating quantitative data. Therefore, changing the current Canadian format of the NFt may not be the answer to improving nutrition label comprehension. Verbal protocol analysis determined that participants had a broad understanding of %DV, but that an in-depth knowledge of the term was limited. Consumers did not understand that percentages were based on a maximum recommendation for sodium, and therefore, many participants were aiming to consume 100% DV for sodium daily. Some participants also had difficulty interpreting percentages as a high, moderate, or low amount of a nutrient. No knowledge of the 5% and 15% rule was articulated, and many participants interpreted percentages based on food products or compared to other food types. Lastly, serving size was frequently not consulted when answering questions about %DV.

Overall, Health Canada should continue to provide education on nutrition labelling with a focus on the %DV component, as changing the label format was not an effective means of increasing comprehension. While the current message of the NFEC is clear and simple, it may be over simplified and leave consumers with questions. The
nutrition labelling website should continue to provide detailed information on how %DV's were developed and calculated, and this more detailed information should be articulated to consumers during the next nutrition label education campaign. The Health Canada nutrition labelling website should also be updated with more detailed information on %DV in regards to sodium and the importance of trying to consume under 100% DV for the specific nutrient. Lastly, the website and future educational campaigns should focus on the importance of consulting serving sizes when comparing between products, and when determining how much of a specific nutrient is in a product.
8.0 References


Dooley, D.A., Novotny, R., & Britten, P. (1998). Integrating research into the undergraduate nutrition curriculum: Improving shoppers’ awareness and


which information is looked at? Nutrition & Food Science, 32(3), 92-99.


Lang=E&Tab=1&Geo1=HR&Code1=3566&Geo2=PR&Code2=35&Data=Rate&SearchText=Wellington-DufferinGuelph%20Health%20Unit&SearchType=
Contains&SearchPR=01&B1=All&Custom=


9.0 Appendices

Appendix A: Control Labels

![Bloomsbury 1 Bagels Label](image)

<table>
<thead>
<tr>
<th>Bloomsbury 1 BAGELS</th>
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<tbody>
<tr>
<td>6 BAGELS TOTAL</td>
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<tr>
<td>NET WT 21 OZ (600 GRAMS)</td>
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</tbody>
</table>

![Bambry 1 Bagels Label](image)

<table>
<thead>
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<th>Bambry 1 BAGELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 BAGELS TOTAL</td>
</tr>
<tr>
<td>NET WT 21 OZ (600 GRAMS)</td>
</tr>
</tbody>
</table>
Appendix B: Experimental Labels

Bloomsbury 2 BAGELS

5 BAGELS TOTAL
NET WT 21 OZ (500 GRAMS)

Bambry 2 BAGELS

6 BAGELS TOTAL
NET WT 21 OZ (500 GRAMS)
Appendix C: Ethics Certificate

<table>
<thead>
<tr>
<th>UNIVERSITY OF GUELPH</th>
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</thead>
<tbody>
<tr>
<td>RESEARCH ETHICS BOARD</td>
</tr>
<tr>
<td>Certification of Ethical Acceptability of Research Involving Human Participants</td>
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</tbody>
</table>

| APPROVAL PERIOD: | November 8, 2011 to November 8, 2012 |
| REB NUMBER: | 11SE041 |
| TYPE OF REVIEW: | Delegated Type 1 |
| RESPONSIBLE FACULTY: | JUDY SHEESHKA |
| DEPARTMENT: | Family Relations & Applied Nutrition |
| SPONSOR: | N/A |
| TITLE OF PROJECT: | Using Cognitive Testing to Explore Canadian Consumers’ Comprehension of the Nutrition Facts Table |

The members of the University of Guelph Research Ethics Board have examined the protocol which describes the participation of the human subjects in the above-named research project and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement.

The REB requires that you adhere to the protocol as last reviewed and approved by the REB. The REB must approve any modifications before they can be implemented. If you wish to modify your research project, please complete the Change Request Form. If there is a change in your source of funding, or a previously unfunded project receives funding, you must report this as a change to the protocol.

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Responsible Faculty, the safety of the participants, and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-council Policy Statement requires that ongoing research be monitored by, at a minimum, a final report and, if the approval period is longer than one year, annual reports. Continued approval is contingent on timely submission of reports.

Membership of the Research Ethics Board: B. Beresford, Ext.; F. Caldwell, Physician; K. Cooley, Alt. Health Care; J. Clark, PoliSci (alt); J. Devlin, OAC; J. Dwyer, FRAN; M. Dwyer, Legal; D. Dyck, CBS; D. Emslie, Physician (alt); H. Gilmour, Legal (alt); G. Holloway, CBS (alt); B. Ferguson, CME (alt); S. Henson, OAC (alt); L. Kuczynski, Chair; J. Minogue, EHS; I. Newby-Clark, Psychology (alt); L. Niel, OVC (alt); A. Papadopoulos, OVC; B. Power, Ext.; L. Robinson, CBS; V. Shalla, SOAN (alt); L. Son Hing, Psychology; J. Srbely, CBS (alt); T. Turner, SOAN; E. van Duren, CME.

Approved: per Chair, Research Ethics Board

Date: ______________________
Appendix D: Online Recruitment Advertisement

Researchers from the University of Guelph are looking for participants to complete a 1 hour questionnaire on nutrition labelling! We are looking for participants between the age of 19-54, and who are primary grocery shoppers. We only require 1 hour of your time, and all participants will be given a 25$ gift certificate.

If you are interested, please email Laura at french@uoguelph.ca or call 519-824-4120 x 54470 for more information.

This project has received approval from the University of Guelph Research Ethics Board #11SE041
Researchers at the University of Guelph are looking for participants to complete a questionnaire on nutrition labelling

We are looking for participants who are:

1. 19-54 years of age
2. The primary grocery shopper in their household

We will require approximately 25-40 minutes of your time. If you are interested, please e-mail french@uoguelph.ca or call 519-824-4120 ext 54479 for more information.

A $25 gift certificate will be given to all participants.

Contact Information:

Judy Sheeshka, PhD, RD  
Family Relations and Applied Nutrition  
University of Guelph  
519-824-4120 ext 54479  
jsheeshk@uoguelph.ca

Laura French, BASc, MSc student  
Family Relations and Applied Nutrition  
University of Guelph  
french@uoguelph.ca

This project has received approval from the University of Guelph Research Ethics Board  
# 11SE041
Appendix F: Data Collection Tool

Using Cognitive Testing to Explore Canadian Consumers’ Comprehension of the Nutrition Facts Table

Section I. Demographics

1. Are you the primary grocery shopper in your household?
   Yes 1 (CONTINUE)
   No 2 (DO NOT CONTINUE)

2. Part A: Are you currently between the age of 19-54?
   Part B: If yes, what is your current age: ________

3. What is your sex?
   Male 1
   Female 2

4. What is the highest level of school/education that you have completed?
   Did not complete high school 1
   High school graduate 2
   Post-secondary education: vocational, technical, college 3
   Post-secondary Diploma: vocational, technical, college 4
   Undergraduate education, no Degree 5
   Undergraduate education, Degree 6
   Postgraduate Degree 7

5. Which of the following categories BEST describes your current employment status?
   Part A: Working less than 35 hours per week 1
   Working more than 35 hours per week 2
   Not working 3
   Part B: Self-employed 4
   Unemployed, but look looking for work 5
   A student attending school full-time 6
   A student attending school part-time 7
   Retired 8
   Not in workforce (e.g. full-time homemaker, not employed and not currently looking for work) 9
   Other – do not specify 10

6. How many people live in your household?
   1 1
   2 2
   3 3
   4 4
7. How would you rate the overall healthiness of your diet?
   Very good 1
   Good 2
   Neither good or bad 3
   Bad 4
   Very bad 5

8. How would you rate your overall health?
   Very good 1
   Good 2
   Neither good or bad 3
   Bad 4
   Very bad 5

9. Does a member of your household have a medical condition that is taken into consideration when grocery shopping?
   Yes 1
   No 2

10. How would you rate your knowledge of nutrition?
    Very knowledgeable 1
    Knowledgeable 2
    Neither knowledgeable or unknowledgeable 3
    Unknowledgeable (know little about nutrition) 4
    Very unknowledgeable (know nothing) 5

11. Have you ever visited a Dietitian or other nutrition professional?
    Yes 1
    No 2

12. How interested are you in nutrition?
    Very interested 1
    Interested 2
    Neither interested or uninterested 3
    Uninterested 4
    Very uninterested 5

13. Which of the following categories best describes your total annual household income?
    That is, the total income of all persons in your household combined, before taxes?
    Under $20,000 1
    $20,000 to just under $40,000 2
    $40,000 to just under $60,000 3
    $60,000 to just under $80,000 4
    $80,000 to just under $100,000 5
| $100,000 and above | 6 |
| Prefer not to answer | 7 |
Section II. Use and Self-Reported Understanding of the Nutrition Facts Table.

14. How often do you use the Nutrition Facts table when you purchase a food product for the first time?
   - Always 1
   - Often 2
   - Sometimes 3
   - Rarely 4
   - Never 5

15. How often do you use the Nutrition Facts table?
   - Always 1
   - Often 2
   - Sometimes 3
   - Rarely 4
   - Never 5

   If you answered Always, Often, or Sometimes, continue to question 16.
   If you answered Rarely or Never, skip to question 19.

16. How often do you use the Nutrition Facts table for the following reasons?
    Always  Often  Sometimes  Rarely  Never

   To see if a food has a little or lot of the nutrients you may want less of, such as fat or sodium

   To see if a food has a little or lot of the nutrients you may want more of, such as fibre or calcium

   To determine the caloric content of the food

   To compare similar types of foods with each other (e.g. brand of cookies)

   To compare different types of foods with each other (e.g. cookies vs. ice cream)

   To see if the advertising on the package is true

   To figure out how much of a food you should eat
17. When looking at the Nutrition Facts table on prepackaged foods, which specific components of the label do you look for?

<table>
<thead>
<tr>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of food</td>
<td>Number of calories</td>
<td>Total fat</td>
<td>Saturated fat</td>
<td>Trans fat</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Sodium</td>
<td>Carbohydrate</td>
<td>Sugars</td>
<td>Fibre</td>
</tr>
<tr>
<td>Protein</td>
<td>Vitamin A</td>
<td>Vitamin C</td>
<td>Iron</td>
<td>Calcium</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
</tr>
</tbody>
</table>

18. Based on the previous answer, why do you look at those specific components of the Nutrition Facts table?
19. What are the following reasons that you rarely or never consult the Nutrition Facts table?

I usually buy the same product so I am familiar with the nutrition information 1
It takes too long to read 2
I prefer getting nutrition information from other sources 3
I am just not interested 4
It is hard to read 5
It is hard to understand 6
I really don’t know what to do with the information 7
The information is not presented in the same way from one produce to another 8
It is not always on products 9
Other: 10

20. In addition to the Nutrition Facts table, what, if any, additional information on the package do you look for?

Ingredient list 1
Best before date 2
Total size of product 3
Nutrient claims (i.e. high in fibre) 4
Health claims (i.e. may reduce cholesterol) 5
Healthy/better choice slogan, symbol or logo (i.e. health check) 6
Country product was made/produced in 7
Information on food allergens 8
Other: 9
None of the above 10

21. How often does the nutrition information found on the Nutrition Facts table affect your purchasing behaviour?

Always 1
Often 2
Sometimes 3
Rarely 4
Never 5

22. Please rate your understanding of the following terms found on the Nutrition Facts table.

<table>
<thead>
<tr>
<th></th>
<th>Do Not Understand</th>
<th>Understand Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Component</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-----------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sodium</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Fibre</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sugars</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Protein</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Energy</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Calcium</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Iron</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

23. Do the following beverages have a Nutrition Facts table?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottled Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Drink</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcoholic Beverage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

24. Are there any foods or beverages that you have noticed don’t have a Nutrition Facts table, but that they think should have the table? (PROBE: fresh meats, deli foods, alcohol, fruits and vegetables?)
Section III. Interpreting the Nutrition Facts table. The following questions are based on the Nutrition Facts table(s) provided for you. Please use the think aloud technique while answering the open ended questions. As discussed in the consent form, the following six questions will be digitally recorded. You may reference Product A to answer any of the following questions.

25. True or False: You should try to get 100% of the Daily Value for sodium every day.
   - True
   - False
   - Don’t know

26. Looking at Product A (depending on condition, either Label 1A or 2A), is this product:
   - High in fat
   - Moderate in fat
   - Low in fat
   - Don’t know
   (If answered correctly, interviewer will ask how the participant knew the correct answer, probe for Health Canada campaign)

27. Looking at Products A & B (depending on condition, either Labels 1A & 1B OR 2A & 2B), which product do you think would be the best option for someone who was trying to reduce their risk of blood pressure by lowering their salt intake?
   - Product A
   - Product B
   - Don’t know

28. What does % Daily Value (%DV) mean? For example, if a label said that a product contained 21% DV for fibre, what does that mean to you? (open ended question)

29. If you consumed one bagel, what percentage of your daily recommended value of fat would you consume? (open ended question)

30. How many servings of this product would you have to eat in order to get all of the fibre you need in one day?

Digital recording is now complete. The think aloud technique is not required for the following questions:
31. **True or False:** You should try to get 100% of the Daily Value for calcium every day.
   - ☐ True
   - ☐ False
   - ☐ Don’t know

32. **True or False:** You can use the % Daily Value in the Nutrition Facts table to compare foods?
   - ☐ True
   - ☐ False
   - ☐ Don’t know

33. **Looking at Product A** (depending on condition, either Label 1A or 2A), please indicate how easy or difficult it is to understand how to use the % Daily Value to choose foods.

<table>
<thead>
<tr>
<th>Very easy to understand</th>
<th>Very difficult to understand</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>


Section IV. Nutrition Facts Table Education

34. Do you recall seeing a commercial about how to use the Nutrition Facts table on television?
   Yes 1
   No 2
   I don’t watch television 3
   I don’t know 4

35. Do you recall seeing information about how to interpret the % Daily Value component of the Nutrition Facts table on food packages?
   Yes 1
   No 2
   I don’t know 3

36. Do you recall seeing the website address to Health Canada’s nutrition labelling webpage on food packages?
   Yes 1
   No 2
   I don’t know 3

37. If you saw a commercial directing you to the website “healthcanada.gc.ca/dailyvalue” to help you learn how to use the percent daily value portion of the Nutrition Facts table, how likely would you be to visit the website?
   Very Likely 1
   Likely 2
   Neither Likely or Unlikely 3
   Unlikely 4
   Very Unlikely 5

38. How would you prefer to receive education about the Nutrition Facts table from Health Canada?
   On packages 1
   On television 2
   On the internet 3
   In person (i.e. grocery store) 4
   Other: 5

Thank you for participating!
Appendix G: Letter of Information and Consent Form

LETTER OF INFORMATION ABOUT THE RESEARCH STUDY:
Using Cognitive Testing to Explore Canadian Consumers’ Comprehension of the Nutrition Facts Table.

You are asked to participate in a research study conducted by Drs. Judy Sheeshka and Jess Haines of the Department of Family Relations and Applied Nutrition, Dr. Karen Finlay of the Department of Marketing and Consumer Studies, Laura French of the Department of Family Relations and Applied Nutrition, and Monica Bashaw of the Department of Family Relations and Applied Nutrition, and Joanne Clark of Population Medicine, at the University of Guelph.

If you have any questions or concerns about the research, or would like to know the results of the research, please feel free to contact Dr. Judy Sheeshka at (519) 824-4120 x 54479, jsheeshk@uoguelph.ca, or Laura French at 289-244-2891, french@uoguelph.ca.

PURPOSE OF THE STUDY

The goal of this study is to explore how Canadian consumers, aged 19 to 54 years of age and who are the primary grocery shoppers in their households, understand the Nutrition Facts table.

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

1. sign and date a consent form
2. complete an interviewer administered paper-and-pencil questionnaire (approx. 15-20 min)

A random sub-set of 25% of participants (32 people) will be asked to also complete a short set of questions that will be digitally recorded (approximately 10-15 min).

POTENTIAL RISKS AND DISCOMFORTS

If you feel uncomfortable you may withdraw at any time and for any reason without penalty. You do not have to answer any question that makes you feel uncomfortable, and all information is kept completely confidential.
POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

The purpose of this study is to explore how Canadian consumers understand information presented on the Nutrition Facts table. Participants will be directed to Health Canada’s Nutrition Facts Education Campaign website after completion, which may increase Canadians’ ability to make informed food choices by increasing understanding of the Nutrition Facts table.

PAYMENT FOR PARTICIPATION

You will not receive payment for participating in this study. However, you will be given a $25 gift certificate to Tim Hortoon’s or President’s Choice after completion, as a thank-you gift.

CONFIDENTIALITY

Every effort will be made to ensure confidentiality of any identifying information that is obtained in connection with this study.

A confidential ID number will be used on the questionnaire; your name will not appear anywhere on the questionnaire. Completed questionnaires will be stored in a locked filing cabinet in Dr. Sheeshka’s locked lab on campus. All questionnaires will be shredded after the data is analyzed. Digital recordings will be transcribed and then erased; transcriptions will be shredded.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. Should you volunteer to take part, you are free to withdraw at any time without penalty. You may refuse to answer any questions and still complete the study. Once you have submitted your questionnaire, you may still withdraw from the study by contacting one of the researchers.

RIGHTS OF RESEARCH PARTICIPANTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have questions regarding your rights as a research participant, contact:

Research Ethics Coordinator
University of Guelph
437 University Centre
Guelph, ON N1G 2W1

Telephone: (519) 824-4120, ext. 56606
E-mail: sauld@uoguelph.ca
Fax: (519) 821-5236
SIGNATURE OF RESEARCH PARTICIPANT

I have read the information provided for the study “Using Cognitive Testing to Explore Canadian Consumers' Comprehension of the Nutrition Facts Table.” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

____________________________________
Name of Participant (please print)

____________________________________
Signature of Participant                      Date

SIGNATURE OF WITNESS

____________________________________
Name of Witness (please print)

____________________________________
Signature of Witness                      Date
## Appendix H: Cohen’s Kappa Statistics for Intercoder Reliability

<table>
<thead>
<tr>
<th>Variable</th>
<th>Kappa Statistic</th>
<th>$p$ value</th>
<th>Interpretation$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Requirement</td>
<td>.800</td>
<td>.000</td>
<td>Almost perfect agreement</td>
</tr>
<tr>
<td>Interpret</td>
<td>.655</td>
<td>.000</td>
<td>Substantial agreement</td>
</tr>
<tr>
<td>Compare</td>
<td>1.000</td>
<td>.000</td>
<td>Almost perfect agreement</td>
</tr>
<tr>
<td>Define</td>
<td>.644</td>
<td>.000</td>
<td>Substantial agreement</td>
</tr>
<tr>
<td>Manipulate (Q29)</td>
<td>1.000</td>
<td>.025</td>
<td>Almost perfect agreement</td>
</tr>
<tr>
<td>Manipulate (Q30)</td>
<td>1.000</td>
<td>.025</td>
<td>Almost perfect agreement</td>
</tr>
</tbody>
</table>

$^a$Interpretations based on Landis & Koch, 1977