

2014-01-01

# Investigating The Efficacy Of Traffic-Light Labeling For Nutrition Label Presentation

Mosi Staudt

*University of Texas at El Paso*, [midaneel@miners.utep.edu](mailto:midaneel@miners.utep.edu)

Follow this and additional works at: [https://digitalcommons.utep.edu/open\\_etd](https://digitalcommons.utep.edu/open_etd)



Part of the [Psychology Commons](#)

---

## Recommended Citation

Staudt, Mosi, "Investigating The Efficacy Of Traffic-Light Labeling For Nutrition Label Presentation" (2014). *Open Access Theses & Dissertations*. 1357.

[https://digitalcommons.utep.edu/open\\_etd/1357](https://digitalcommons.utep.edu/open_etd/1357)

This is brought to you for free and open access by DigitalCommons@UTEP. It has been accepted for inclusion in Open Access Theses & Dissertations by an authorized administrator of DigitalCommons@UTEP. For more information, please contact [lweber@utep.edu](mailto:lweber@utep.edu).

INVESTIGATING THE EFFICACY OF TRAFFIC-LIGHT LABELING FOR  
NUTRITION LABEL PRESENTATION

MOSI STAUDT DANE'EL

Department of Psychology

APPROVED:

---

Oswaldo Morera, Ph.D., Chair

---

Louis Brown, Ph.D.

---

Theodore V. Cooper, Ph.D.

---

Stephen Crites, Ph.D.

---

Charles H. Ambler, Ph.D.  
Dean of the Graduate School

Copyright ©

by

Mosi S. Dane'el

2014

## **Dedication**

I dedicate this to my mother, Dr. Kathleen A. Staudt, and my departed friend John “Eric” Johnson. Furthermore, I dedicate this to my other friends: Betina Gonzalez McCracken, Steven McCracken, Jennifer Moran, and Steven Randazzo.

INVESTIGATING THE EFFICACY OF TRAFFIC-LIGHT LABELING FOR  
NUTRITION LABEL PRESENTATION

by

MOSI STAUDT DANE'EL, BA

THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARTS

Department of Psychology

THE UNIVERSITY OF TEXAS AT EL PASO

DECEMBER 2014

### **Acknowledgements:**

To my committee for their time, efforts and advice. Thank you for your time. To my lab, the Judgment and Decision Making Lab, without your edits and advice this would not have been possible. Another to my friend Jennifer Moran who completed the materials for this project. Finally, to my research assistants - thank you for your time and effort to help complete this project.

*“You may delay, but time will not.” – Benjamin Franklin*

## **Abstract**

The rates of obesity and the number of overweight adults are increasing in the U.S. (Cohen, 2008). This increase is due, in part, to food over consumption (Cohen, 2008). Although nutrition labels are available for people to identify the amounts of nutrients in food, these labels are often difficult to understand (Cowburn & Stockley, 2002). To understand how people interpret nutrition labels, we conducted two studies with a total of 383 participants. For the first study, we developed and pilot tested two outcome measures for the second study. For the second study we examined how people interpret nutrition labels using a 2 (serving size) by 2 (labeling method) between-subjects design that resulted in four experimental conditions, where nutrition labels were defined as follows: (1) single-serving standard nutrition labels, (2) single-serving traffic light nutrition labels, (3) multiple-serving standard nutrition labels, and (4) multiple-serving traffic light nutrition labels. The first study had 76 participants. The second study had 307 participants. Controlling for participants' numeric ability and need for cognition, individuals in the traffic light nutrition label conditions did not show higher average Nutrition Label or Label Usage Survey scores than individuals in the standard label conditions. Participants in the single-serving conditions had higher Nutrition Label Survey and Label Usage Survey scores than participants in the multiple-serving conditions. Implications of the findings are discussed.

## Table of Contents

Acknowledgements.....	v
Abstract.....	vi
Table of Contents.....	vii
List of Tables.....	viii
List of Figures.....	ix
Manuscript Sections	
1. Introduction.....	1
2. Present Studies.....	9
3. Study 1 - Methods and Design.....	11
4. Study 1 – Results.....	14
5. Study 1 – Discussion.....	15
6. Study 2 – Methods and Design .....	16
7. Study 2 – Results.....	21
8. Study 2 – Discussion.....	24
List of References.....	33
Appendices.....	47
Curricula Vita.....	63



## **List of Tables**

Table 1 – Participant Characteristics.....	44
Table 2 – Hierarchical Regression for the Nutrition Label Survey.....	44
Table 3 – Hierarchical Regression for the Label Usage Survey.....	45
Table 4 – Correlation Matrix for all Predictors from both Regressions.....	46

## **List of Figures**

Figure 1 – Standard Nutrition Label.....	43
Figure 2 – Traffic-light label.....	43

## **Improving Nutrition Label Presentation Through the Use of Traffic-Light Labeling**

Obesity rates and the number of overweight people have become an epidemic in the United States. More than 33% of Americans are estimated to meet the criteria for obesity (Ogden, Carroll, Kit, & Flegal, 2012). Compared to Caucasians, Hispanics and other racial and ethnic minority groups are at greater risk for both obesity and being overweight (Office of Minority Health, 2012). Obesity is associated with the second most number of preventable causes of death and is expected to surpass smoking as the leading cause of death in the near future (Stein, 2012). Obesity is also related to various forms of cancer (National Cancer Institute, 2012), heart disease (American Medical Association, 2012), increased sensitivity to pain (Stone & Broderick, 2012), and Type II Diabetes (Centers for Disease Control and Prevention [CDC], 2012).

Eating excessive amounts of high calorie, fatty foods are one of the three components of obesity (Body Mass Index, Obesity Class [BMI, O. C.], 1998). Consuming excessive amounts of calories causes weight gain (CDC, 2011). Regulating nutrition intake, coupled with an exercise routine, is essential to maintaining a healthy weight (National Institutes of Health [NIH], 1998). Still, even though nutrition labels are located on most packaged food, many people are not aware of either the nutritional content or the appropriate serving sizes for the food they are eating.

Nutrition labels are the only piece of health information readily available on packaged food to inform individuals about nutrient intake for food (see Figure 1 for an example of a standard nutrition label). The Food and Drug Administration (FDA) created nutrition labels to provide a daily recommended amount of calories, fat, sodium, and other nutrients called the Daily Value for healthy consumption (FDA, 2011). The Daily Value is the percentage of recommended nutrients by the FDA and is located to the right of each nutrient amount on the

nutrition label. The Daily Value can be used as a tool for individuals to regulate nutrient intake and inform them about the foods they eat. Thus, nutrition labels provide the amounts of calories, fat, sugar, salt, and other nutrients within the food along with the recommended serving size.

Prior research has found consistent results concerning the relationship between the use of nutrition labels and BMI (Loureiro, Yen, & Nayga, 2012). The Body Mass Index (BMI) is one way to determine whether an individual is overweight or obese, and is frequently used as an outcome variable in research assessing nutrition. The BMI is calculated by dividing an individual's weight (in pounds) by the square of height (in inches) and multiplying the result by 703 (CDC, 2011). Underweight is defined as having a BMI below 18.5. Normal weight is defined as having a BMI between 18.5 and 24.9. Overweight is defined as having a BMI ranging from 25 to 29.9 (Obesity and Overweight, 2012). Obesity is defined as having a Body Mass Index (BMI) above 30 (Obesity and Overweight, 2012).

Nutrition label use is associated with lower BMI and greater nutrient intake. Loureiro, Yen, and Nayga (2012) investigated the impact of nutritional label usage on weight for 25,640 participants. Using data from the National Center for Statistics from its National Health Interview Survey in 1998, they found nutrition label use predicted lower BMI scores. They also found gender differences, such that men that used nutritional labels had a slight decrease in BMI and women that used nutritional labels had a greater decrease in BMI. Guthrie, Fox, Cleveland, and Welse (1995) found that nutrition label use was positively associated with vitamin C intake and negatively associated with cholesterol.

#### *Numeracy and Presenting Numerical Information*

One explanation for the difficulties individuals have in using nutrition labels may be related to numerical ability (numeracy). The primary information on nutrition labels is numbers,

and most individuals have difficulty calculating and interpreting numerical information (Reyna, Nelson, Han, & Dieckmann, 2009). Nutrition labels contain different types of numerical information such as amount of serving sizes, percentages and proportions (see Figure 1), which may confuse consumers. For example, a study by Lipkus, Samsa, and Rimer (2001) concluded that many college students (who either had a high school education or a GED) have difficulty calculating percentages and proportions. In a study specific to reading nutrition labels, Rothman et al. (2006) found that only about half of their participants were able to answer a survey correctly about the information on nutrition labels. When participants were questioned about specific parts of the nutrition label (i.e., fat, calories, sodium, and sugar), only 32% to 60% of participants could correctly answer those questions. Further, these researchers found that scores on the Wide Range Achievement Test (Wilkinson, 1993)—a measure of numeracy—were positively related to scores on the nutrition label survey. Rothman and colleagues' findings suggest that numeracy is associated with the ability to use and process information in a standard nutrition label.

Numeracy may also be associated with how well people use information regarding serving sizes and daily value percentages. Certain foods contain nutrition labels with multiple serving sizes. Those labels require people to correctly calculate their intake nutrition. In a study of Type I and Type II diabetics, Cavanaugh et al. (2008) found that only 44% of participants could accurately calculate the number of total grams of carbohydrates in a bag of potato chips. Levy, Patterson, Kristal and Lee (2000) found that most people could not correctly interpret the Daily Value percentages on nutrition labels with multiple servings. The findings of these studies suggest that people cannot easily use or interpret the whole nutrition label, or even parts of it. If the current nutrition label format is not effective, it may be necessary to change the format to aid

individuals using nutrition labels to make informed decisions. As a visual aid, nutrition labels could be graphically changed to assist to aid individuals.

Visual aids, such as using bar graphs and pie charts, could be used to help people interpret numerical information. Sprague et al. (2011) examined a sample of 205 American Indians and asked participants to select a type of cancer with the greatest risk and the benefit plan with the least risk. These authors found that risk information was more effectively understood in the format of combined graphics and text when compared to risk information presented as relative risk. Although, participants with high numeracy scores were found to have a greater likelihood of understanding risk information, the authors found that risk information was more effectively understood by all participants in the format of combined graphics and text.

Waters, Weinstein, Colditz, and Emmons (2006) investigated patients' understanding of chances of a cancer drug's side effects in a sample of 2,601 participants. In this study, participants had to select which drug plan had the least risk of dying. Waters and colleagues discovered that percentages were more easily understood than frequencies, and participants more accurately understood the information when pictures were used. Specifically, Waters et al. (2006) found that using bar graphs to display proportions increased the likelihood that participants would respond correctly, suggesting an understanding of the material. These researchers also found that, when information was presented in a way that required one simple calculation rather than several mental calculations, participants had a greater likelihood of responding correctly.

### *Format of Health Information*

Research on nutrition labels generally refers to the information presented on these labels as “nutrition information” (Aboulnasr & Sivaraman, 2010; Kral, Roe, & Rolls, 2002; Suter &

Burton, 1996). However, this information can also be seen as health information. Health information communicates the influence of a behavior on a disease or illness (Mårtensson & Hensing, 2012). It is often presented in different formats, such as prevalence and risk information. Nutrition labels are more similar to health risk information, as nutrition labels provide estimates of the nutrients in each serving. The estimation of the nutrients can be thought of similarly as risk information. When risk information is presented, it details the likelihood of receiving a disease. When nutrition information is presented, it details the 100% likelihood of consuming the nutrients when the food is eaten.

As discussed previously, a key limitation of the current nutrition label format is its numerical format, which may be difficult for people to understand. While people may desire a large amount of information (Lepkowska-White & Parsons, 2005), they may not use it or pay attention to it (Wansink, Sonka, & Hasler, 2004). For example, Wansink (2010) concluded that people make over 300 food decisions a day. People may choose not to use detailed labels because this increased information makes it more difficult to interpret nutrition label information as part of these decisions (Wansink, 2010). People may also overestimate their ability to interpret numerical information (Bowen et al., 2013), suggesting that consumers are not even aware of their own limitations in interpreting and using nutrition label information.

Traffic-light labeling is an alternative to the standard numerical format for nutrition labels (TLL; see Figure 2 for an example). Traffic-light labeling, which is widely used in Europe and Australia, uses a combination of numbers, words, and colors to indicate the healthiness of various nutrients on nutrition labels. One of three colors is presented on each nutrient to denote how healthy it is: green means the food is healthy, yellow means the food is unhealthy, and red means the food is very unhealthy. Each color has a corresponding word indicating “high,”

“medium,” or “low” to denote the amount of the nutrient in the food item. For example, food with a green color in calories will have the word “low” next to the number. Traffic-light labels are generally used for the “Big Four”: caloric content, fat (saturated and regular fat), salt, and sugar (Wills, Grunert, Celemin, & Storcksdieck, 2009).

Traffic-light labeling has been recommended as an alternative format of nutrition labeling due to the simplicity of interpretation (Chandon & Wansink, 2012). Further, researchers have found that European markets prefer TLL specifically because of its ease of use compared to the standard numerical format for presenting nutrition information (Gorton, Mhurchu, Chen, & Dixon, 2008). Most traffic-light label studies compared sales data on various food items prior to the use of traffic-light labels and after the introduction of traffic-light labels (e.g., Gorton et al., 2008; Sacks, Rayner, & Swinburn, 2009; Sacks, Veerman, Moodie, & Swinburn, 2011). Gorton et al. (2008) found that consumers bought more food with traffic-light labels compared to standard labels. In contrast, Sacks et al. (2009) found that sales did not change for healthy or unhealthy food after traffic-light labels were brought into the stores. While there has been limited research measuring the effects on accuracy when using traffic-light labels, there are mixed results on other aspects of traffic-light labels.

There has been limited research on the use of traffic light labels in the United States. Andrews, Burton, and Kees (2011) compared the standard American labels to traffic-light labels and the Smart Choice™ labels, a registered trademark. Smart Choice™ labels are green labels with a checkmark indicating they received a Smart Choice mark. Although the researchers hypothesized that the simplest label, the Smart Choice™ labels, would be the most effective for indicating food healthiness, they found that food items with traffic-light labels were more likely to be correctly identified as being healthy food items. Although the Smart Choice™ labels were



simpler, participants were more likely to judge a healthy food as healthy when using traffic-light labels. This study suggests that traffic-light labeling may be an effective alternative to provide consumers with easy-to-understand nutrition labeling. Still, to date, no research has compared people's accuracy in determining the healthfulness of food when using traffic-light labels or standard numerical labels used in the U.S.

#### *Theory of Planned Behavior and Individual Difference Characteristics*

Theoretical models such as Diffusion of Innovations (Vyth, van der Meer, Seidell, & Steenhuis, 2012), Self-Efficacy (Carson & Hedl, 1998), and Theory of Planned Behavior (Carson & Hedl, 1998; Nejad, Wertheim, & Greenwood, 2004) have all been applied to study nutrition label use. One popular model of health behavior change is the Theory of Planned Behavior (Schifter & Ajzen, 1985). Three components comprise the theory: (1) personal attitude, (2) subjective personal pressure, and (3) personal control. As applied to weight loss, personal attitudes are people's feelings toward weight loss. The subjective personal pressure component is people's feeling pressure to maintain an appropriate weight. The personal control over losing weight component is the efficacy people have to lose weight. Nejad et al. (2004) have incorporated the perceived personal control component of the Theory of Planned Behavior into the study of weight loss research and found that people are more successful at losing weight when their perceived control was higher. The proposed research will build upon this prior research to apply the personal control construct from the Theory of Planned Behavior to investigate nutrition label use.

In addition to adding the Theory of Planned Behavior as the theoretical basis, this study examined the role various individual difference variables including the personal control construct and numeracy in the study of effective communication of nutrient information. Cacioppo, Petty,

and Kao (1984) define Need for Cognition as “the tendency to engage in and enjoy effortful cognitive endeavors” (p. 306). Nutrition labels require cognitive effort to be effectively calculated, yet no study has examined the relationship between nutrition label usage and Need for Cognition. The purposed study will use Need for Cognition as a moderating variable. As previously described, alternative formats may more effectively accommodate people with difficulty understanding numerical information compared to standard nutrition labels. Still, some people may be better able to use nutrition labels in standard format. Need for Cognition and numerical ability may be potential moderating variables to consider.

## **Present Studies**

In summary, previous research has demonstrated alternative nutrition labels, such as traffic-light labels, may be easier for people to use. This format may be especially beneficial for individuals with lower levels of Need for Cognition or lower levels of numeric ability. We expect the proposed study to provide evidence that traffic-light labeling assists people in making healthy choices and add to the literature. There are six hypotheses intended to examine the association between traffic-light labeling and healthy choices and the moderating variables of Need for Cognition and numeric ability:

*Hypothesis 1:* Participants higher in Need for Cognition will be more likely to self-report using nutrition labels.

*Hypothesis 2:* Participants higher in personal control construct from the Theory of Planned Behavior will be more likely to self-report using nutrition labels.

*Hypothesis 3:* When controlling for Need for Cognition and the personal control construct from the Theory of Planned Behavior, participants in the TLL conditions will have higher Nutrition Label Survey/Label Usage Survey scores than individuals using standard American labels.

*Hypothesis 4:* When controlling for Need for Cognition and the Personal Control construct from the Theory of Planned Behavior, participants in the single-serving conditions will have higher Nutrition Label Survey/Label Usage Survey scores than individuals in the multiple-serving conditions.

*Hypothesis 5:* A two-way interaction between the serving size factor and the labeling factor is also expected, such that individuals in the TLL single serving condition will have the highest scores on the Nutrition Label Survey/Label Usage Survey scores.

*Hypothesis 6:* With respect to both nutrition label scores, the experimental conditions will be more beneficial for individuals who have lower levels of numeric ability and lower levels of need for cognition. In other words, we expect to find an interaction between the conditional effects (“the main effects”) of labeling type and the two covariates mentioned above.

## **Study 1 Methods and Design**

### *Participants*

Study 1 served as the pilot study to test the two main dependent variables. Participants only completed the Nutrition Label and Label Usage Survey. Seventy-six participants were recruited from the University of Texas at El Paso for course credit. No descriptive data were collected from the participants.

### *Materials*

**Nutritional Label Survey.** This instrument is a 12-item measure (see Appendix B) of participants' ability to read and use nutritional labels (Rothman et al., 2006). It was originally created with help from the Food and Drug Administration. Participants were not allowed to use a calculator or cell phone while completing the measure and items are scored as either correct or incorrect. The composite score represents the total number of correct answers. The study used a modified version from Rothman et al. (2006) that uses non-descriptive foods, which were called Food A and Food B in the study.

**Label Usage Survey.** This instrument was a binary 10-item measure (see Appendix C) created for this study. The Label Usage Survey measured participants' ability to accurately use nutrition labels. Each question requested participants to hypothetically consider that if they had eaten a food item, would they have eaten a low, medium, or high amount of the following six nutrients: fat, saturated fat, cholesterol, calories, sodium, and sugar. The format of each item is the same for all nutrients. Each item on the measure has binary outcome (correct or incorrect) in which participants chose if eating 1.5 sizes of the food, twice a day would have consumed low, medium, or high amounts of the various

nutrients. Although each item had three responses, two were incorrect and one was correct.

### *Design*

Study 1 used a between-subjects design with participants randomly assigned to one of four groups. Participants were first asked to complete a consent form approved by the UTEP IRB (Appendix A). The first group was exposed to two standard nutrition labels with 1 serving size on a food item. The second group was exposed to two traffic-light nutrition labels with 1 serving size on a food item. The third group was exposed to two standard nutrition labels with 3 serving sizes on a food item. The fourth group was exposed to two traffic-light nutrition labels with the 3 serving sizes on a food item. Participants used two labels (Appendix 3; labeled Food 'A' and Food 'B' for each condition) to complete the Nutrition Label Survey and Label Usage Survey. The scores for these two food types were summed to create two dependent variables for the Nutrition Label Survey score and Label Usage Survey score. This scoring system is consistent with earlier work involving the Nutrition Label Survey (Rothman et al., 2006) and also used for the Label Usage Survey.

The traffic-light labels for the experiment were created using guidelines from the Food and Drug Administration (FDA, 2011). Nutrients with a Daily Value range from 0%-5% were labeled as low and denoted in green. Nutrients with a Daily Value range from 6%-19% were labeled as medium and denoted in yellow. Nutrients with a Daily Value range from 20%-100% were labeled high and denoted in red. These categories were consistent with low, medium, and high categories provided by the Food and Drug Administration.

Specific colors for each nutrient were created using a Daily Value percentage. While calories do not have a Daily Value percentage, the Food and Drug Administration gives

recommendations and those were used to indicate healthiness. Foods with calories that range from 0 calories to 99 calories were labeled 'low' and denoted in green. Foods with calories that range from 100 calories to 399 calories were labeled 'medium' and denoted in yellow. Foods with calories that have more than of 400 calories were labeled 'high' and denoted in red.

The Label Usage Survey was developed for this study to assess participants' accuracy reading nutrition labels. The Label Usage Survey was developed with the assistance of two experts, Drs. Louis Brown and Theodore Cooper. It was created to take advantage of the possible ease of traffic-light nutrition label format. An initial draft was created by the lead author and revisions were suggested by both experts.

## Results for Study 1

Both the Label Usage Survey and Nutritional Label Survey demonstrated adequate internal consistency. The Label Usage Survey Composite scores ranged from 0-10 ( $M = 6.76$ ,  $SD = 2.30$ ) and had an internal consistency of 0.71. For this scale, skewness was -.28 and kurtosis was -.28 with the Shapiro-Wilk's test significant ( $p < .001$ ). The Shapiro-Wilk's test assesses that variables are normally distributed (Shapiro & Wilk, 1964). The Nutritional Label Survey scores ranged from 3-12 ( $M = 7.72$ ,  $SD = 2.69$ ) and had an internal consistency of .77. For this scale, skewness was .17 and -1.33 with the Shapiro-Wilk's test significant ( $p < .001$ ). The Label Usage Survey was significantly related with the modified Nutritional Label Survey ( $r = 0.59$ ).

While the purpose of this pilot study was to develop and assess two potential pilot measures of accuracy, not to be used for tests of significance, the means and standard deviations for the scores on these measures is also provided in Table 1. While no statistical analyses were performed on these measures, it is seen that the single-serving conditions appear to have higher scores on these measures than the multiple serving conditions.



## Discussion for Study 1

Both measures showed adequate internal consistency. The sample contained the full range of scores (0-12) for the Label Usage Survey, while the lowest score for the Nutritional Label Survey was three. Very few participants scored 100% on either test. For the Label Usage Survey and Nutritional Label Survey, 9% and 17%, respectively, got all the items correct. For both tests, most participants got 5 items correct. Both the Label Usage Survey and Nutritional Label Survey displayed slight skewness and according to the results from the Shapiro-Wilk's test, we assumed both measures were not normally distributed.

Both scales showed variability in scores. The means of both scales were greater than the midpoint. While no statistical analyzes were done, the means in the single-serving conditions were higher ( $\bar{x}_{\text{Nutritional Label Survey}} = 10.08$  &  $\bar{x}_{\text{Label Usage Survey}} = 8.00$ ) than the multiple-serving conditions ( $\bar{x}_{\text{Label Usage Survey}} = 5.49$  &  $\bar{x}_{\text{Label Usage Survey}} = 5.59$ ). In a larger sample, with higher power, we expect to detect differences between conditions.

## Study 2 Methods and Design

Three hundred twenty-six participants were recruited from the University of Texas at El Paso for course credit. Eighteen participants were excluded from the analyses because of experimenter error and one participant was excluded because s/he identified as being color-blind, thus resulting in a total sample size of 307. Participants were 61.7% female with an average age of 20.39 ( $SD = 4.58$ ). The majority of participants reported Hispanic ethnicity (81.1%). The average BMI was 25.87 ( $SD = 5.94$ ). The average BMI for females was 25.47 ( $SD = 5.61$ ) and for males was 26.53 ( $SD = 6.43$ ). There was no significance difference for BMI between the sexes ( $t = 1.53$ ;  $p = .13$ ).

Based on Roberto et al. (2012), we expected to detect a small-medium size effect ( $f = 0.20$  or  $f^2 = 0.04$ ) at 80% power with  $\alpha = 0.05$  for a hierarchical regression. An a priori power analysis indicated we needed a minimum of 260 participants. We assumed that the control variables would account for an additional 3% of the variance in NLS and LUS scores after the control variables sex, BMI, the need for cognition construct, and the personal control construct.

### *Measures*

**Nutritional Label Survey.** This instrument is a 12-item measure (see Appendix 1) of a participants' ability to read and use nutritional labels (Rothman et al., 2006). The original measure was created with help from the Food and Drug Administration. When completing this survey, participants are not allowed to use a calculator and items are scored as either correct or incorrect. The composite score represents the total number of correct answers. The study used a modified version from Rothman et al. (2006). Similar to Study 1, participants used two, fake foods (Appendix 3; labeled 'Food A' and 'Food B' for each condition) to complete the Nutrition Label Survey and Label Usage Survey. Composite scores ranged from 3-12 ( $M = 8.74$ ,  $SD =$

2.67) with an adequate internal consistency ( $KR-20 = 0.76$ ). The modified version contained questions that applied to both standard and traffic-light nutritional labels.

**Label Usage Survey.** This instrument is a binary 10-item measure (see Appendix 2) created for this study. The Label Usage Survey measured participants' ability to accurately use nutrition labels. Each question requested participants to hypothetically consider that if they had eaten a food item, would they have eaten a low, medium, or high amount of the following six nutrients: fat, saturated fat, cholesterol, calories, sodium, and sugar. The format of each item is the same for all nutrients. Each item on the measure was a binary item (two choices were incorrect and one choice was correct) in which participants chose the healthiness after eating 1.5 sizes of the food, twice a day for the various nutrients. Although participants did not have to make calculations, they are not allowed to use a calculator. Composite scores ranged from 3-10 ( $M = 7.24$ ,  $SD = 2.30$ ) with an adequate internal consistency ( $KR-20 = 0.76$ ). Also, similar to Study 1, the Label Usage Survey demonstrated a large correlation with the modified Nutritional Label Survey ( $r = .63$ ,  $p < .001$ ).

**Demographic survey.** Demographic information (see Appendix 4) was collected for all participants including age, gender, ethnicity, language proficiency, and Body Mass Index. The Body Mass Index was calculated using the participants' weight and height from the weight scale listed at the end of the Materials section.

**Individual Characteristics Survey.** This instrument (see Appendix 5) asked participants to indicate food allergies, dieting, and how often they use nutrition labels. If participants indicated they are dieting, participants wrote their dieting strategy. The nutrition label question was a 5-point Likert type item ranging from 1 (Never use labels) to 5 (Always use labels). The mean score was 2.79 ( $SE = 1.31$ ).

**Objective Numeracy Scale.** This instrument is an 11-item measure (see Appendix 6) originally developed by Lipkus, Samsa, and Rimer (2001) with university students. The Objective Numeracy Scale asked participants to calculate percentages and portions. When completing this survey, participants were not allowed to use a calculator. Items were scored as either correct or incorrect. The correct items were summed to create a composite score. Higher scores indicate increased numerical ability. Furthermore, we used similar methods from previous research (Lipkus et al., 2001; Fagerlin et al., 2006) to address unanswered items; specifically items that do not receive an answer are scored incorrect. Participants had enough room to compute calculations and were given an extra sheet of paper. Composite scores ranged 1-11 ( $M = 7.32$ ,  $SD = 2.30$ ) with low internal consistency ( $KR-20 = 0.69$ ).

**Need for Cognition Short Form (NFCSF).** This instrument is an 18-item measure (see Appendix 7) created by Cacioppo et al. (1984) similar to the original Need for Cognition Scale made by Cacioppo and Petty (1982). Cacioppo and colleagues developed the shorten scale for quicker use in future research. The NFCSF is scored on a 5-point Likert-type scale. All items were added together to make a composite score. Higher scores indicate increased need for cognition. Composite scores ranged from 33-90 ( $M = 60.09$ ,  $SD = 9.88$ ) with adequate internal consistency ( $\alpha = 0.85$ ).

**Planned Behavior Scale.** This measure is a 6-item measure (see Appendix 8) created by Connor, Russell, and Bell (2002). The Planned Behavior Scale is scored on a 7-point Likert scale. All scores on each item were added together to make a composite score. Higher scores indicated greater behavioral control for dieting. Composite scores ranged from 15-42 ( $M = 32.34$ ,  $SD = 6.24$ ) with adequate internal consistency ( $\alpha = 0.76$ ).

**Subjective Numeracy Scale.** This instrument is an 8-item scale (see Appendix 9) that was originally developed by Fagerlin et al. (2006). The Subjective Numeracy Scale is a continuous scale that assessed participants' self-reported abilities to use and manipulate numbers. Item seven was reverse scored. All of the scores on each item were added together to make a composite score. Higher scores indicate higher perceived numeric ability for participants. Composite scores ranged from 8-48. The mean score was 32.25 ( $SD = 7.93$ ) with adequate internal consistency ( $\alpha = 0.81$ ).

### *Procedure*

Participants were recruited for the study from UTEP's Sona-Systems. Color blind participants were asked not sign up for the study. When participants came to the study, they were first asked to complete a consent form approved by the UTEP IRB. Once participants signed the consent form, the experiment began.

Participants first completed a demographic form which assessed their age, student classification, color blind status, and English proficiency. When participants got to the end of the demographics, they were asked to get their weight and height taken. A Detecto Scale (Global, 2014) was used to measure both weight and height of participants. The scale can measure a weight up to 400 pounds and a height of 6 feet 6 inches. Before participants stepped on the scale, the experimenter requested they remove their shoes and items in their pockets. The experimenter took the height in both feet and centimeters and weight in pounds. These measurements were used to create their Body Mass Index. After being weighed, participants completed the need for cognition measure, the Objective Numeracy Survey, the Planned Behavior Scale measure, and an individual characteristics survey. Each measure after the demographics until the experimental manipulation was counterbalanced to avoid order effects.

After those measures were completed, the participants were exposed to the experimental manipulation. Similar to Study 1, participants in Study 2 were randomly assigned to one of four groups. Participants for the four groups were exposed to the same manipulations as in Study 1. Specifically, participants were given nutrition labels for Foods A and B along with both the Nutritional Label Survey and Label Usage Survey. Participants were given the nutrition labels to use when answering both surveys. They were allowed to do this to mimic a grocery store situation. The correct items for both surveys were also summed to create separate composite scores. The experimental materials are provided in Appendix 3 and the dependent measures are provided in Appendices 1 and 2.

The same nutrition label colors were used for Study 2's manipulation as Study 1's. Foods with calories that range from 0 calories to 99 calories were labeled 'low' and denoted in green. Foods with calories that range from 100 calories to 399 calories were labeled 'medium' and denoted in yellow. Foods with calories that are in excess of 400 calories or more were labeled 'high' and denoted in red.

Upon completing the label accuracy measures and giving back the nutrition labels, the participants were given the Subjective Numeracy Scale. Finally, after completing the Subjective Numeracy Scale participants were given a debriefing form. The debriefing form detailed the purpose of the study including examining the possible effects of using traffic-light labels to increase the user accuracy. The debriefing form also asked participants not to share details of the experiment because that could influence future respondents.

## Study 2 Results

Descriptive statistics for demographic and clinical variables for both Study 1 and 2 are reported in Table 1 and are comparable from the sample to the UTEP population.

### *Analyses when Nutrition Label Use was the Dependent Variable*

The first two hypotheses involved participants' self-reported nutrition label use. To test the first hypothesis (*Hypothesis 1: Participants higher in need for cognition will be more likely to self-report using nutrition labels*), we measured the linear association between scores on need for cognition with the nutrition label use outcome variable. Hypothesis 1 was supported. A positive, small correlation ( $r = .176, p = .002$ ; based on Cohen's, 2009 recommendations) was shown between composite scores of need for cognition and participants reporting using a nutrition label.

To test the second hypothesis (*Hypothesis 2: Participants higher in personal control construct from the Theory of Planned Behavior will be more likely to self-report using nutrition labels*), we also measured the linear association between scores on these two variables. Hypothesis 2 was supported. A positive, medium correlation ( $r = .361, p < .001$ ) was shown between composite scores of personal control and participants' reporting using a nutrition label.

### *Analyses when the Nutrition Label Survey is the Dependent Variable*

One hierarchical regression was conducted to test Hypotheses 3a through 6a. Contrasted coded variables were created, so that one contrast coded variable represented a contrast consisting of single serving versus multiple serving conditions. A second contrast compared the traffic-light label conditions to the standard nutrition labels. In each regression model, need for cognition, personal control, objective numeracy scores, BMI,

and female sex were entered in the first step of the model. In the first step of the regression model was significant and explained 10.8% of the variance ( $p < .001$ ). As shown on Table 2, need for cognition and personal control were not predictors of NLS scores; but numerical ability was a predictor ( $\beta = .334, p < .001$ ). In the second step of the model, contrast coded variables represented the conditional effects for serving-size, and type of label were entered into the model. The second step of the model was significant and explained an additional 47.5% change in the variance ( $p < .001$ ). In regards to hypothesis 3a, which examined the effect of traffic-light labels on accuracy, this hypothesis was not supported. In regards to hypothesis 4a, which examined the effect of single-serving size on accuracy, it was supported. Traffic-light label condition was not a significant predictor ( $\beta = -.045, p = .23$ ), but single-serving size nutrition labels were significant ( $\beta = .687, p < .001$ ). In the third step of the regression model, interactions involving contrast-coded variables, need for cognition, personal control, and objective numeracy were entered into the model. In regards to hypothesis 5a, it was partially supported; an interaction between numeracy and single-serving size was supported. In regards to hypothesis 6a, which examined an interaction between traffic-light labels and serving size, it was not supported. The third step of the model was not significant and explained an additional 1% change in the variance ( $p = .114$ ). In step 3, only the interaction between numeracy and single-serving size was significant ( $\beta = -.300, p = .040$ ).

#### *Analyses when the Label Usage Survey is the Dependent Variable*

One hierarchical regression was conducted to test Hypotheses 3b through 6b. Contrasted coded variables were created, so that one contrast coded variable represented a contrast consisting of single serving versus multiple serving conditions. A second contrast



compared the traffic-light label conditions to the standard nutrition labels. The first step of the model contained need for cognition, personal control, objective numeracy scores, BMI, and female sex. This step was significant and explained 10% of the variance ( $p < .001$ ). Need for cognition and personal control were not predictors of NLS scores; but numerical ability was a predictor ( $\beta = .337, p < .001$ ; see Table 3). In the second step of the model contained contrast coded variables representing the conditional effects for serving size and type of label. This model was significant and explained an additional 10% change in the variance ( $p < .001$ ). Traffic-light label condition was not a significant predictor ( $\beta = -.064, p = .23$ ), but single-serving size nutrition labels were significant ( $\beta = .468, p < .001$ ). Thus, in regards to hypothesis 3b, which examined the effect of traffic-light labels on accuracy, this hypothesis was not supported. In regards to hypothesis 4b, which examined the effect of single-serving size on accuracy, it was supported. In the third step of the regression model, interactions involving contrast-coded variables, need for cognition, personal control, and objective numeracy were entered into the model. The third step of the model was not significant and explained an additional 1.3% change in the variance ( $p = .11$ ). In step 3, no interactions were significant. Thus, in regards to hypothesis 5b, which examined multiple interactions between traffic-light labels, serving size, objective numeracy, and need for cognition, it was not supported. In regards to hypothesis 6b, which examined an interaction between traffic-light labels and serving size, it was not supported.

## Study 2 Discussion

The findings in this study partially supported the hypotheses. Although the first two hypotheses assessing relationships between participants reporting nutrition label use and need for cognition and personal control were supported, the theoretical constructs were not significant in the regression models assessing accuracy using nutrition labels. The strength of the relationship between need for cognition and nutrition label use was consistent with the a priori power analysis. Given the positive relationship between need for cognition and accuracy, future research may want to examine whether need for cognition serves as a mediator variable.

The average BMI indicated participants were overweight. The mean BMI for all Hispanics was 25.89 and when examining by sex, males had a BMI of 26.72 and females had a BMI of 25.51. The differences between the sexes was not significant ( $p = .078$ ). Overall, the means for Hispanic BMI indicated they would be classified in an overweight status. This finding is consistent with findings about the weight in Hispanics (Office of Minority Health, 2012) as well as the non-significant sex differences (Ogden, Carroll, Kit, & Flegal, 2014). This finding is concerning because even a slight increase in BMI or waist circumference is associated with an increase in Type II Diabetes (Surgeon General, 2007).

The relationship between nutrition label use and the personal control construct also supports prior research examining a positive relationship between the Theory of Planned Behavior and dieting (Armitage & Conner, 1999; Conner, Norman, & Bell, 2002; Nejad et al., 2004). Nutrition labels can be used for dietary concerns, and when effectively implemented allow consumers to have further control over their diet. This study's findings of the relationship between label use and personal control support this notion.

Regarding nutrition label format, only single-serving sizes predicted higher accuracy scores on reading nutrition labels ( $\beta = .687, p < .001$ ;  $\beta = .468, p < .001$ ). Traffic-light labels did not predict higher accuracy scores on reading nutrition labels ( $\beta = -.045, p = .23$ ;  $\beta = -.064, p = .23$ ). Numeracy was also positively related ( $\beta = .334, p < .001$ ;  $\beta = .337, p < .001$ ) to higher accuracy scores. Both single-serving size and greater numeric ability aid consumers' accuracy in reading nutrition labels as compared to multiple-serving size labels and lower numeric ability. Both these findings are supported in prior research. Rothman et al. (2006) found that numeracy scores were positively related to nutrition label scores. Lando and Lo (2012) found that single-serving size improved participants understanding of nutrition labels. The findings from the current studies further add to the literature by having examined an interaction between serving size and numeracy.

Traffic-light labels did not improve participant accuracy. This finding is inconsistent with the limited prior research examining traffic-light labels and accuracy in America. The traffic-light label finding in this study could be partially explained by Andrew and colleagues (2011) where they asked participants to calculate healthiness from nutrition labels. Their focus was on Smart Choice labels where green checkmarks denoted healthy food. They found that while Smart Choice labels were simpler to understand than standard nutrition labels, they did not increase participant accuracy. In their discussion, Andrew and colleagues (2011) explained that Smart Choice labels were too simple which allowed participants to not think as much when reading labels, leading participants to overgeneralize and perceive Smart Choice food as healthy (when in fact only one nutrient was shown to be healthy). Thus, in the current study, participants could have chosen not to make calculations because the traffic-light labels already showed the healthiness of the

item, as both traffic-light and Smart Choice labels use the color green to denote healthiness. Although participants were asked to make calculations, participants in the traffic-light labels could have overgeneralized about the healthiness of the food. Specifically, participants in the multiple-serving size traffic-light label conditions could have overgeneralized answering the Label Usage Survey based on a quick glance of the nutrition label (four out of five nutrients were green) and those participants may have chosen not to multiply each nutrient value by three. Participants completing the Label Usage Survey did not have to make calculations to answer each of those items. In contrast, the Nutrition Label Survey did have items requiring calculation for participants to answer. Participants answering the Label Usage Survey could have chosen not to make any calculations and chose one of three answers for each item.

The two dependent variables showed adequate internal consistency in the second study. We expected, as ancillary hypotheses for this study, that both Rothman et al. (2006)'s adapted Nutrition Label Survey and Label Usage Surveys would show adequate internal consistency. Both of these hypotheses were supported. Not only did both measures show adequate internal consistency, but they were strongly related ( $r = .63, p < .001$ ). This study demonstrated that the scale created by Rothman et al. (2006) could be adapted and shortened without sacrificing internal consistency.

While two regressions were used to predict both dependent variables, a more efficient approach would be analyzing with a measured variable path model. When using a path model, residual variability of both dependent measures can be correlated. In addition, one can correct for the non-normality as indicated by the Shapiro-Wilks test.

While both dependent variables are highly correlated, they were created to assess different nutrition labels. The first dependent variable was created by Rothman et al. (2006) for standard nutrition label accuracy and adapted for this study. The second dependent variable was specifically created for this study to measure accuracy for traffic-light labels. Because both variables measure nutrition label accuracy, they needed to be positively related. While the Label Usage Survey was created to capture the uniqueness of the traffic-light labels and not standard nutrition labels, this can explain how the interaction between numeracy scores and single-serving size was not significant when examining the Label Usage Survey as the dependent variable (Table 3).

Most participants did not answer all items correctly on either nutrition label test. Less than 20% of participants answered all of the Nutrition Label Survey correct and less than 30% answered all of the Label Usage Survey correct. The first finding is in contrast with Rothman et al. (2006) where the original Nutrition Label Survey was created. They found that 69% of participants could correctly answer all of the Nutrition Label Survey. The difference between the 2006 and the current findings suggest that consumers are getting worse at reading nutrition labels.

Participants' Subjective Numeracy scores on Table 1 indicated that, on average, participants felt more confident about their perceived numerical ability. Although there were no regressions and hypotheses with subjective numeracy, there was a positive, medium-large correlation between subjective and objective numeracy scores ( $r = .476, p < .001$ ). This finding is similar with the findings from the original authors of the scale (Fagerlin et al., 2007). The Subjective Numeracy scale could be used as a quicker assessment of numeracy instead of the Objective Numeracy scale because of the time participants take to complete it.

### *Strengths and Limitations*

These studies had several limitations. One limitation was the use of a student population, which limits generalizability to older and less-educated populations. In addition, the use of a Hispanic majority sample limits comparison to non-Hispanics, although it is also a strength because Hispanics are an underserved population that are disproportionately impacted by obesity and cardiovascular disease (Office of Minority Health, 2012). Another limitation is using BMI to assess weight status which has been criticized for assessing fat compared to using other weight assessments (Janssen, Katzmarzyk, & Ross, 2004). Body Mass Index is calculated using the weight and height of the participant, so a short, muscular participant could have a BMI indicating an overweight or obese status even though that individual is not. A better indicator of being overweight or obese would be measuring waist circumference or waist-to-hip ratio (de Koning, Merchant, Pogue, & Anand, 2007). This study should have also asked participants their preference for the nutrition label presented to them. Although there were no significant differences between traffic-light and standard label, participants may have preferred to use traffic-light labels more than standard labels. If participants preferred using traffic-light labels more, they may be able to get participants to use labels more frequently. If traffic-light labels are preferred, consumers may use them more. This view is similar to the conclusion reached by Sacks et al. (2011) that traffic-light labels are preferred more than standard labels. Finally, Rothman et al. (2006) used both a numeracy and literary scale when examining nutrition label accuracy while this study only examined numeracy.

While the study has some limitations, it has numerous strengths. First, this study examines nutrition label use with theory. Although most studies should be designed with theory, most studies that examine numeracy do not integrate theory within the design. These study

designs have been noted in Lipkus (2007) and as such have criticized researchers for not including theoretical considerations when examining numeracy. Subsequently, Lipkus (2007) has requested future researchers use theory when examining numeracy. Similarly to numeracy research, most studies that examine nutrition labels do not integrate theory within the design. To this researcher's knowledge, this is the only study that has combined nutrition label use and theory. While this study found no interactions between the two theoretical constructs and nutrition label formats, there may be other theories that can predict nutrition label accuracy. Also, this study used objective tests to measure participants' understanding of nutrition labels. According to a literature review by Cowburn and Stockley (2004), most studies (18 out of 21) used subjective self-reports to measure participants' understanding of nutrition labels. Using subjective self-reports may be related to objective measures, but cannot accurately assess consumers' ability to accurately use labels.

Second, two theoretical constructs—Need for Cognition and Theory of Planned Behavior—were used and previous research has not used either theory when examining nutrition label use. Third, this study further adds to the literature of the relationship between reading nutrition labels accurately and numeracy. The results from this study find that participants with lower levels of numeracy are aided in using nutrition labels by having one single serving size. Finally, whereas Rothman et al. (2006) used the numeracy portion of the Wide Range Achievement Test to measure numeracy, this study used another, shorter scale to measure numeracy. The findings from the current study shows that a different, shorter test can also be used to accurately measure numeracy and nutrition label accuracy.

#### *Future Directions*

This study provided an examination of standard labels, traffic-light labels, numeracy, and theoretical constructs in a Hispanic student population. For accuracy, there was no difference between standard labels and traffic-light labels. One construct from the Theory of Planned Behavior and a construct from the Elaboration Likelihood Model are positively related to nutrition label use. Although both are related to nutrition label use, they are ineffective for predicting nutrition label accuracy. Future studies should further examine the relationship between numeracy and nutrition label accuracy by adding literacy as a predictor. Two studies suggest that literacy has a positive relationship with nutrition label accuracy (Rothman et al., 2006; Viswanathan, Hastak, & Gau, 2009).

Future studies should also examine adding other elements from the Theory of Planned Behavior and Elaboration Likelihood Model because constructs from each of those are related to nutrition label use. Researchers should study and use the other constructs from the Theory of Planned Behavior, attitudes and subjective beliefs towards a behavior. Although for attitudes, Aikman, Min, and Graham (2006) suggest that examining nutrition labels does not influence the consumer food choices and purchasing. Attitudes towards nutrition label use are still worth studying because, under the Theory of Planned Behavior, nutrition label use can be used to predict healthy food choices (Higginson, Kirk, Rayner, & Draper, 2002) and decreases in BMI (Loureiro, Yen, & Nayga, 2012). Thus, future studies should investigate whether positive attitudes towards nutrition labels influence whether they use nutrition labels. For attitudes, future research could use an experimental setting to ask if participants believe that using nutrition labels could lead to a lower weight and they desire to lose weight, thus they will have a positive attitude towards nutrition labels. For subjective beliefs, future research could use a naturalistic setting, such as a grocery store, to examine how often consumers use nutrition labels. Another



possibility in the study of subjective beliefs would involve asking participants if their significant others use nutrition labels or if they were raised to use nutrition labels. Given previous nutrition label use research has not included theory in their design, future research should examine other health theories when examining nutrition label behavior. Another question to measure in future studies that examine traffic-light labels is to assess preference. It may be that while accuracy is not improved when using traffic-light labels, preference to use them may increase. This view has been expressed in Chandon & Wansink (2012). Finally, future studies that investigate nutrition label use should include adding a health literacy measure similar to Rothman et al. (2006), as nutrition label use also involves reading the nutrition label. Rothman et al. (2006) found that participants with more than 9<sup>th</sup> grade literacy accounted for a 20% increase in correct responses.

### *Conclusion*

Overall, this study found that single-serving nutrition labels leads to increases in nutrition label accuracy. Traffic-light labels do not lead to increases in accuracy. Traffic-light labels are believed to be a possible new type of nutrition label for the FDA to use (Chandon & Wansink, 2012). While Chandon and Wansink (2012) believe that traffic-light labels are a new avenue for FDA to use in regards to more effective nutrition labels, the results from this study suggest that traffic-light labels do not lead to increases in accuracy for consumers.

Since this study was designed and conducted, a new nutrition label has been proposed to replace the current labels in the U.S. While these new labels have larger font size for consumers to view the contents of the label better, multiple-serving sizes are still present. The findings from this study would suggest that the presence of serving sizes three or greater, as used in this study, may impair user accuracy.

This study's findings about single-serving size are also consistent with previous research. Lando and Lo (2012) found that one serving size on nutrition labels was associated with greater accuracy for participants in selecting healthy meals. Even though new multiple-serving sizes on the new nutrition labels may reflect "actual serving sizes" (NY Times, 2014), they may hinder users reading these labels because of the added calculation.

Given the limitations of the current series of studies, future studies should use more parts of current health theory and examine other parts of the nutrition label. The findings from the current study and other studies strongly suggest that consumers cannot make computations while using nutrition labels, so a single-serving size would be the most effective option for consumers.

## List of References

- Aboulnasr, K., & Sivaraman, A. (2010). Food for thought: the effect of counterfactual thinking on the use of nutrition information. *Journal of People Behaviour*, 9, 191–205.  
doi:10.1002/cb.311
- Aikman, S. N., Min, K. E., & Graham, D. (2006). Food attitudes, eating behavior, and the information underlying food attitudes. *Appetite*, 47(1), 111-114.
- Armitage, C. J., & Conner, M. (1999). Distinguishing Perceptions of Control From Self-Efficacy: Predicting Consumption of a Low-Fat Diet Using the Theory of Planned Behavior. *Journal of applied social psychology*, 29(1), 72-90.
- Block, L. G. & Peracchio, L. A. (2006). The calcium quandary: how people use nutrition labels. *Journal of Public Policy*, 25, 188-196.
- BMI, O. C. (1998). Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults.
- Bowen, M. E., Cavanaugh, K. L., Wolff, K., Davis, D., Gregory, B., & Rothman, R. L. (2013). Numeracy and dietary intake in patients with type 2 diabetes. *The Diabetes Educator*, 39(2), 240-247. doi:10.1177/0145721713475841
- Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal Of Personality And Social Psychology*, 42(1), 116-131. doi:10.1037/0022-3514.42.1.116
- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal Of Personality Assessment*, 48(3), 306-307. doi:10.1207/s15327752jpa4803\_13
- Cacioppo, J. T., Petty, R. E., Kao, C., & Rodriguez, R. (1986). Central and peripheral routes to persuasion: An individual difference perspective. *Journal Of Personality And Social Psychology*, 51(5), 1032-1043. doi:10.1037/0022-3514.51.5.1032

- Campos, S., Doxey, J., & Hammond, D. (2011). Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutrition*, 14(08), 1496–1506.  
doi:10.1017/S1368980010003290
- Carson, J. S., & Hedl, J. J. (1998). Smart Shoppers Tours: Outcome evaluation. *Journal Of Nutrition Education*, 30(5), 323-331. doi:10.1016/S0022-3182(98)70341-3
- Cavanaugh, K., Huizinga, M. M., Wallston, K. A., Gebretsadik, T., Shintani, A., Davis, D., ... & Rothman, R. L. (2008). Association of numeracy and diabetes control. *Annals of Internal Medicine*, 148(10), 737-746.
- CDC - Lifetime Risk for Diabetes Mellitus in United States - Diabetes Issues - News - Diabetes DDT. (2012). Retrieved December 4, 2012, from  
<http://www.cdc.gov/diabetes/news/docs/lifetime.htm>
- CDC – Healthy Weight: Caloric Balance | DNPAO | CDC. (2011). Retrieved October 30, 2013, from <http://www.cdc.gov/healthyweight/calories/index.html>
- Chandon, P., & Wansink, B. (2012). Does food marketing need to make us fat? A review and solutions. *Nutrition reviews*, 70(10), 571-593.
- Cohen, D. A. (2008). Obesity and the built environment: changes in environmental cues cause energy imbalances. *International Journal of Obesity*, 32, S137-S142.
- Conner, M., Norman, P., & Bell, R. (2002). The theory of planned behavior and healthy eating. *Health Psychology*, 21(2), 194.
- Culhane, S. E., Morera, O. F., & Hosch, H. M. (2004). The factor structure of the need for cognition short form in a Hispanic sample. *Journal Of Psychology: Interdisciplinary And Applied*, 138(1), 77-88. doi:10.3200/JRLP.138.1.77-90
- Dane’el, M. I. (2012). *Identifying Effective Health Communications for Reducing Hispanic*

- Health Disparities*. Unpublished manuscript, Department of Psychology, University of Texas at El Paso, El Paso, Texas.
- de Koning, L., Merchant, A. T., Pogue, J., & Anand, S. S. (2007). Waist circumference and waist-to-hip ratio as predictors of cardiovascular events: meta-regression analysis of prospective studies. *European heart journal*, 28(7), 850-856.
- Food Labeling Guide > 14. Appendix F: Calculate the Percent Daily Value for the Appropriate Nutrients. (n.d.). Retrieved November 29, 2012, from <http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/FoodLabelingGuide/ucm064928.htm>
- Food Standards Agency (FSA), UK. (2008) Retrieved November 30, 2012, from <http://www.eatwell.gov.uk/>
- Flegal, K. M., Kit, B. K., Orpana, H., & Graubard, B. I. (2013). Association of all-cause mortality with overweight and obesity using standard body mass index categories a systematic review and meta-analysis all-cause mortality using BMI categories. *JAMA*, 309(1), 71-82.
- Gao, Z., & Kosma, M. (2008). Intention as a mediator of weight training behavior among college students: An integrative framework. *Journal Of Applied Sport Psychology*, 20(3), 363-374. doi:10.1080/10413200701871200
- Gorton, D., Ni Mhurchu, C., Chen, M., & Dixon, R. (2008). Nutrition labels: a survey of use, understanding and preferences among ethnically diverse shoppers in New Zealand. *Public Health Nutrition*, 12, 1359. doi:10.1017/S1368980008004059
- Grunert, K. G., & Wills, J. M. (2007). A review of European research on people response to nutrition information on food labels. *Journal of Public Health*, 15(5), 385–399.

doi:10.1007/s10389-007-0101-9

Guthrie, J. F., Fox, J. J., Cleveland, L. E., & Welse, S. (1995). Who uses nutrition labeling, and what effects does label use have on diet quality? *Journal of Nutrition Education*, 27(4), 163-172

Healthy Weight: Assessing Your Weight: BMI: About Adult BMI | DNPAO | CDC. (2011).

Retrieved June 28, 2013, from

[http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html#Interpreted](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html#Interpreted)

Higginson, C. S., Kirk, T. R., Rayner, M. J., & Draper, S. (2002). How do consumers use nutrition label information?. *Nutrition & Food Science*, 32(4), 145-152.

Initiative, N. O. E. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults.

Janssen, I., Katzmarzyk, P. T., & Ross, R. (2004). Waist circumference and not body mass index explains obesity-related health risk. *The American journal of clinical nutrition*, 79(3), 379-384.

Kolodinsky, J., Green, J., Michahelles, M., Harvey-Berino, J. R. (2008). The use of nutritional labels by college students in a food-court setting. *Journal of American College Health*, 57(3), 297-301.

Kral, T. V. E., Roe, L. S., & Rolls, B. J. (2002). Does nutrition information about the energy density of meals affect food intake in normal-weight women?. *Appetite*, 39(2), 137-145.

Kreuter, M. W., Brennan, L. K., Scharff, D. P., & Lukwago, S. N. (1996). Do nutrition label readers eat healthier diets? Behavioral correlates of adults' use of food labels. *American Journal of Preventive Medicine*, 13(4), 277-283.

Lepkowska-White, E. & Parsons, A. L. (2001). Comprehension of warnings and resulting

- attitudes. *Journal of Consumer Affairs*, 35(2), 278-294.
- Levy, A. S., Fein, S. B., & Schucker, R. E. (1996). Performance Characteristics of Seven Nutrition Label Formats. *Journal of Public*, 15(1), 1–15.
- Lewis, J. E., Arheart, K. L., LeBlanc, W. G., Fleming, L. E., Lee, D. J., Davila, E. P., ... Clark, J. D. (2009). Food label use and awareness of nutritional information and recommendations among persons with chronic disease. *American Journal of Clinical Nutrition*, 90(5), 1351–1357. doi:10.3945/ajcn.2009.27684
- Lipkus, I. M., Samsa, G., & Rimer, B. K. (2001). General performance on a numeracy scale among highly educated samples. *Medical Decision Making*, 21, 37–44.
- Loureiro, M. L., Yen, S. T., & Nayga Jr, R. M. (2012). The effects of nutritional labels on obesity. *Agricultural Economics*, 43(3), 333–342. doi:10.1111/j.1574-0862.2012.00586.x
- Mårtensson, L., & Hensing, G. (2012). Health literacy—A heterogeneous phenomenon: A literature review. *Scandinavian Journal Of Caring Sciences*, 26(1), 151-160. doi:10.1111/j.1471-6712.2011.00900.x
- McConnon, A., Raats, M., Astrup, A., Bajzová, M., Handjieva-Darlenska, T., Lindroos, A., & ... Shepherd, R. (2012). Application of the Theory of Planned Behaviour to weight control in an overweight cohort. Results from a pan-European dietary intervention trial (DiOGenes). *Appetite*, 58(1), 313-318. doi:10.1016/j.appet.2011.10.017
- Moorman, C. (1996). A Quasi Experiment to Assess the People and Informational Determinants of Nutrition Information Processing Activities: The Case of the Nutrition Labeling and Education Act. *Journal of Public Policy & Marketing*, 15(1), 28–44.
- Murnaghan, D. A., Blanchard, C. M., Rodgers, W. M., LaRosa, J. N., MacQuarrie, C. R., MacLellan, D. L., & Gray, B. J. (2010). Predictors of physical activity, healthy eating and

- being smoke-free in teens: A theory of planned behaviour approach. *Psychology & Health*, 25(8), 925-941. doi:10.1080/08870440902866894
- Nejad, L. M., Wetheim, E. H., & Greenwood, K. M. (2004). Predicting dieting behavior by using, modifying, and extending the Theory of Planned Behavior. *Journal of Applied Social Psychology*, 34(10), 2099-2131.
- Obesity and Cancer Risk - National Cancer Institute. (2012). Retrieved March 27, 2014, from <http://www.cancer.gov/cancertopics/factsheet/Risk/obesity>
- Obesity and Hispanic Americans - The Office of Minority Health - OMH. (n.d.). Retrieved November 8, 2012, from <http://minorityhealth.hhs.gov/templates/content.aspx?lvl=3&lvlID=537&ID=6459>
- Obesity Information. (2012). Retrieved December 2, 2012, from [http://www.heart.org/HEARTORG/GettingHealthy/WeightManagement/Obesity/Obesity-Information\\_UCM\\_307908\\_Article.jsp](http://www.heart.org/HEARTORG/GettingHealthy/WeightManagement/Obesity/Obesity-Information_UCM_307908_Article.jsp)
- Obesity and Overweight for Professionals: Adult: Defining - DNPAO - CDC. (2012, April 27). Retrieved September 25, 2012, from <http://www.cdc.gov/obesity/adult/defining.html>
- Obesity overtaking smoking as America's number one killer. (2004). Retrieved July 1, 2013, from <http://www.medicalnewstoday.com/releases/6438.php>
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity in the United States, 2009-2010.
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*, 311(8), 806-814.
- Osberg, T. M., Poland, D., Aguayo, G., & MacDougall, S. (2008). The Irrational Food Beliefs Scale: Development and validation. *Eating Behaviors*, 9(1), 25-40.



doi:10.1016/j.eatbeh.2007.02.001

People More Likely To Identify Healthy Food Using Traffic Light Nutrition Labels. (n.d.).

Retrieved November 26, 2012, from

<http://www.sciencedaily.com/releases/2009/05/090507055506.htm>

Reyna, V. F., Nelson, W. L., Han, P. K., & Dieckmann, N. F. (2009). How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*, 135, 943–973.

doi:10.1037/a0017327

Roberto, C. A., Bragg, M. A., Schwartz, M. B., Seamans, M. J., Musicus, A., Novak, N., & Brownell, K. D. (2012). Facts up front versus traffic light food labels: a randomized controlled trial. *American Journal of Preventive Medicine*, 43(2), 134-141.

Rosenheck, R. (2008). Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews*, 9(6), 535-547.

Rothman, R. L. (2008). Association of numeracy and diabetes control. *Annals of Internal Medicine*, 148(10), 737–746.

Rothman, R. L., Housam, R., Weiss, H., Davis, D., Gregory, R., Gebretsadik, T., ... Elasy, T. A. (2006). Patient understanding of food labels. *American Journal of Preventive Medicine*, 31, 391–398. doi:10.1016/j.amepre.2006.07.025

Sacks, G., Rayner, M., & Swinburn, B. (2009). Impact of front-of-pack “traffic-light” nutrition labelling on people food purchases in the UK. *Health Promotion International*, 24(4), 344–352. doi:10.1093/heapro/dap032

Sacks, G., Veerman, J. L., Moodie, M., & Swinburn, B. (2010). “Traffic-light” nutrition labelling and “junk-food” tax: a modelled comparison of cost-effectiveness for obesity prevention. *International Journal of Obesity*, 35(7), 1001–1009. doi:10.1038/ijo.2010.228

Scales | Scales-Medical & Physician | Eye Level Physician Scale 400 Lb X 4 Oz With Height Rod 10 1/2" X 14 1/2" Platform | B586836 - GlobalIndustrial.com. (n.d.). Retrieved May 9, 2014, from <http://www.globalindustrial.com/p/packaging/scales/Medical-Physician/eye-level-physician-scale-400-lb-x-4-oz-with-height-rod-10-1-2-inch-x-14-1-2-inch-platform?infoParam.campaignId=T9F&gclid=CKaZ8qi-n74CFbTm7AodMlAAbw&gclsrc=aw.ds>

Schifter, D. E., & Ajzen, I. (1985). Intention, perceived control, and weight loss: An application of the theory of planned behavior. *Journal Of Personality And Social Psychology*, 49(3), 843-851. doi:10.1037/0022-3514.49.3.843

Sharf, M., Sela, R., Zentner, G., Shoob, H., Shai, I., & Stein-Zamir, C. (2012). Figuring out food labels. Young adults' understanding of nutritional information presented on food labels is inadequate. *Appetite*, 58(2), 531–534. doi:10.1016/j.appet.2011.12.010

Shapiro, S. S., & Wilk, M. B. (1964). *An analysis of variance test for normality(complete samples)* (Doctoral dissertation, Rutgers, The State University.).

State-Specific Incidence of Diabetes Among Adults --- Participating States, 1995--1997 and 2005-- 2007. ( 2012). Retrieved December 2, 2012, from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5743a2.htm>

Stein R. Obesity passing smoking as top avoidable cause of death. Washington Post. March 10, 2004:A1.

Stone, A. A., & Broderick, J. E. (2012). Obesity and Pain Are Associated in the United States. *Obesity*; doi: [10.1038/oby.2011.397](https://doi.org/10.1038/oby.2011.397)

Surgeon General (2007). Overweight and obesity: Health consequences. Retrieved on April 30<sup>th</sup>, 2014, from

[http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact\\_consequences.html](http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.html)

- Suter, T. A. & Burton, S. (1996). An examination of correlates and effects associated with a concise measure of people' nutrition knowledge. *Family and People Sciences Research Journal*. 25(2),117-136
- Temple, J. L., Johnson, K. M., Archer, K., LaCarte, A., Yi, C., & Epstein, L. H. (2011). Influence of simplified nutrition labeling and taxation on laboratory energy intake in adults. *Appetite*, 57(1), 184–192. doi:10.1016/j.appet.2011.04.018
- Thorndike, A. N., Sonnenberg, L., Riis, J., Barraclough, S., & Levy, D. E. (2012). A 2-Phase Labeling and Choice Architecture Intervention to Improve Healthy Food and Beverage Choices. *American Journal of Public Health*, e1–e7. doi:10.2105/AJPH.2011.300391
- Van Herpen, E., & Trijp, H. C. M. van. (2011). Front-of-pack nutrition labels. Their effect on attention and choices when people have varying goals and time constraints. *Appetite*, 57, 148–160. doi:10.1016/j.appet.2011.04.011
- Viswanathan, M., Hastak, M., & Gau, R. 2009. Understanding and Facilitating the Usage of Nutritional Labels by Low-Literate Consumers. *Journal of Public Policy & Marketing*, 28 (2): 135–145.
- Vyth, E. L., van der Meer, E. C., Seidell, J. C., & Steenhuis, I. M. (2012). A nutrition labeling intervention in worksite cafeterias: An implementation evaluation across two large catering companies in the Netherlands. *Health Promotion International*, 27(2), 230-237. doi:10.1093/heapro/dar034
- Wansink, B. (2010). From mindless eating to mindlessly eating better. *Physiology & Behavior*, 100(5), 454-463. doi:10.1016/j.physbeh.2010.05.003
- Wilkinson, GS. (1993). *WRAT-33: Wide Range Achievement Test administration manual*.

Wilmington DC: Wide Range Inc.

Williams-Piehota, P., Pizarro, J., Navarro Silvera, S. A., Mowad, L., & Salovey, P. (2006). Need for cognition and message complexity in motivating fruit and vegetable intake among callers to the cancer information service. *Health Communication, 19*(1), 75-84.  
doi:10.1207/s15327027hc1901\_8

Wright, J. D., Borrud, L. G., McDowell, M. A., Wang, C.-Y., Radimer, K., & Johnson, C. L. (2007). Nutrition Assessment in the National Health and Nutrition Examination Survey 1999-2002. *Journal of the American Dietetic Association, 107*(5), 822–829.  
doi:10.1016/j.jada.2007.02.017

Nutrition Facts	
Serving Size 172 g	
Amount Per Serving	
<b>Calories</b> 200	Calories from Fat 8
% Daily Value <sup>a</sup>	
<b>Total Fat</b> 1g	1%
Saturated Fat 0g	1%
Trans Fat	
<b>Cholesterol</b> 0mg	0%
<b>Sodium</b> 7mg	0%
<b>Total Carbohydrate</b> 36g	12%
Dietary Fiber 11g	45%
Sugars 6g	
<b>Protein</b> 13g	
Vitamin A 1%	Vitamin C 1%
Calcium 4%	Iron 24%
<sup>a</sup> Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.	
NutritionData.com	

Figure 1. Standard nutrition label

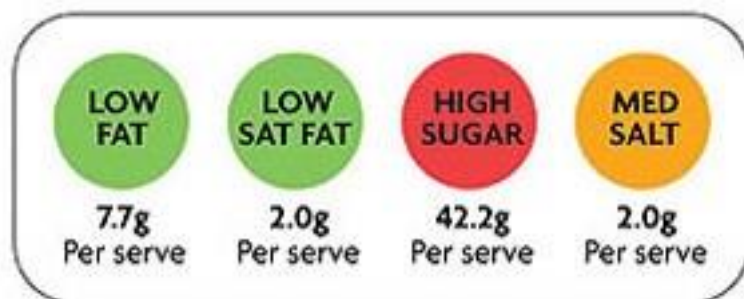


Figure 2. Traffic-light label

Table 1: Participant Characteristics (*N* = 307)

Characteristic	Mean	<i>SD</i>	Frequency (%)
Age	20.41	4.61	
<u>Sex</u>			
% Female			61.9
% Male			38.1
<u>Education</u>			
College Credits	20.02	29.98	
College Level	1.84	1.02	
<u>Weight (lbs)</u>			
Males	176.37	46.28	
Females	144.60	38.16	
<u>BMI</u>			
Males	26.72	6.13	
Females	25.51	5.65	
<u>Ethnicity</u>			
African-American			2.3
Asian			2.6
White			6.5
Hispanic			80.8
Native-American			0.7
Other			7.1
<u>Major</u>			
Accounting			3.6
Business			13.4
Engineering			3.3
Psychology/Sociology			12.4
Undeclared			6.2
Other			61.2
<u>Native Language</u>			
English			42.3
Spanish			39.4
Mixed			16.7
Other			1.7
<u>Stronger Language</u>			
English			62
Spanish			20.3
Mixed			16.7
Other			1.7
<u>Scale Sums (Study 1)</u>			
Nutrition Label Survey (0-12)	10.05	1.73	
Label Usage Survey (0-10)	7.90	2.53	
<u>Scale Sums (Study 2)</u>			
Personal Control (range 6-42)	32.30	6.26	
Need for Cognition (18-90)	60.04	9.86	
Objective Numeracy (0-11)	7.31	2.29	
Nutrition Label Survey (0-12)	8.76	2.66	
Label Usage Survey (0-10)	7.26	2.30	
Subjective Numeracy (8-48)	32.25	7.88	

Table 2: *Summary of the Hierarchical Regression Predicting NLS*

Variable	B	SE B	$\beta$
Step 1			
Constant	5.102	1.401	
Need for Cognition	-.008	.016	-.029
Personal Control	.016	.024	.038
Objective Numeracy	.426	.067	.367**
BMI	.019	.025	.041

Sex	.552	.311	.101	
R <sup>2</sup>				.122**
Step 2				
Constant	4.018	.971		
Need for Cognition	-.004	.011	-.015	
Personal Control	.013	.017	.031	
Objective Numeracy	.376	.047	.324**	
BMI	.009	.017	.021	
Sex	.245	.217	.045	
Single-Serving Size	3.663	.200	.687**	
Traffic-Light Label	.242	.201	-.045	
ΔR <sup>2</sup>				.458**
Step 3				
Constant	4.308	1.303		
Need for Cognition	-.006	.011	-.021	
Personal Control	.014	.017	.032	
Objective Numeracy	.483	.075	.416**	
BMI	.017	.018	.039	
Sex	.255	.216	.047	
Single-Serving Size	4.780	.693	.893**	
Traffic-Light Label	.359	.700	-.067	
Single-Serving Size x Traffic-Light Label	.609	.402	.100	
Objective Numeracy x Single-Serving Size	-.200	.089	-.300*	
Objective Numeracy x Traffic-Light Label	-.024	.088	-.037	
Need for Cognition x Single-Serving Size	.022	.021	.254	
Need for Cognition x Traffic-Light Label	.008	.021	.096	
ΔR <sup>2</sup>				.010
Note: Step 1 R <sup>2</sup> = .122; Step 2 R <sup>2</sup> = .580; Step 3 R <sup>2</sup> = .590				
* all values significant at the .05 level				
**all values significant at the .001 level				

Table 3: Summary of the Hierarchical Regression Predicting LUS

Variable	B	SE B	β	
Step 1				
Constant	4.172	1.198		
Need for Cognition	.016	.013	.067	
Personal Control	.004	.021	.010	
Objective Numeracy	.337	.058	.338**	
BMI	-.010	.021	-.026	
Sex	.265	.267	.056	
R <sup>2</sup>				.122**
Step 2				
Constant	3.592	1.039		
Need for Cognition	.018	.012	.079	
Personal Control	.002	.018	.005	
Objective Numeracy	.309	.050	.310**	
BMI	-.016	.018	-.042	
Sex	.071	.233	.015	
Single-Serving Size	2.154	.217	.468**	
Traffic-Light Label	-.295	.217	-.064	
ΔR <sup>2</sup>				.222**
Step 3				

Constant	2.525	1.403	
Need for Cognition	.017	.012	.072
Personal Control	.002	.018	.006
Objective Numeracy	.411	.081	.412**
BMI	-.011	.019	-.030
Sex	.081	.233	.017
Single-Serving Size	2.904	.748	.631**
Traffic-Light Label	-.034	.756	-.007
Single-Serving Size x Traffic-Light Label	.505	.435	.096
Objective Numeracy x Single-Serving Size	-.138	.096	-.241
Objective Numeracy x Traffic-Light Label	-.071	.095	-.126
Need for Cognition x Single-Serving Size	-.013	.023	-.170
Need for Cognition x Traffic-Light Label	-.010	.023	-.130
$\Delta R^2$			.012

Note: Step 1  $R^2 = .122$ ; Step 2  $R^2 = .344$ ; Step 3  $R^2 = .353$

\* all values significant at the .05 level

\*\*all values significant at the .001 level

Table 4: *Correlation Table*

	Gender	BMI	Planned Behavior	Need for Cognition	Objective Numeracy	Nutrition Label Survey	Label Usage Survey
Gender	1						
BMI	-.101	1					
Planned Behavior	-.075	-.138*	1				
Need for Cognition	-.127*	.107	.169**	1			
Objective Numeracy	-.257**	.004	-.037	.245**	1		
Nutrition Label Survey	-.011	.006	.012	.289	.329**	1	
Label Usage Survey	-.068	-.048	.016	.152**	.341**	.615**	1

\* all values significant at the .05 level

\*\*all values significant at the .001 level



**Appendix A: Informed Consent Form**  
**University of Texas at El Paso (UTEP) Institutional Review Board**  
**Informed Consent Form for Research Involving Human Subjects**

---

**Protocol Title:** Health Communication Survey  
**Principal Investigator:** Mosi Dane'el  
**UTEP:** Psychology Department

---

**Introduction**

You are being asked to take part voluntarily in the research project described below. Please take your time making a decision. Before agreeing to take part in this research study, it is important that you read this consent form. Please ask research investigators or research staff to explain any words or information that you do not clearly understand.

**Why is this study being done?**

You are being asked to take part in a research study that is investigating how students interpret health information and communications. Our findings may help public health officials develop more effective strategies for communicating health information to the public. Approximately, 300 participants will be enrolling in this study at UTEP. You are being asked to participate in this study because you are a student at UTEP. If you decide to enroll in this study, then the project will require approximately 60 minutes to complete the tasks.

**What is involved in the study?**

We will ask you to complete background surveys, a cognition scale, and a series of computations. We will also ask you to look at a series of nutrition labels and answer questions about them. We will also measure your weight and height.

**What are the risks and discomforts of the study?**

There are minimal direct or indirect risks associated with participation in this study. Some students may feel uncomfortable when reading about an illness that is described in the statements.

**What will happen if I am injured in this study?**

There is minimal risk of injury during participation in this study. The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. In the unlikely event that participation elicits psychological distress that

necessitates professional counseling services, you will be directed to the UTEP University Counseling Center at 202 Union West (915-747-5302; open Monday and Tuesday 8am to 7pm and Wednesday to Friday 8am to 5pm). No funds have been set aside to pay or reimburse you in the event of such injury or illness. You should report any such injury to Mosi Dane'el at 915-747-6430 and the Institutional Review Board (IRB) at UTEP at 915-747-8841 or [irb.orsp@utep.edu](mailto:irb.orsp@utep.edu).

**Are there benefits to taking part in this study?**

There are minimal direct benefits to you for participating in this study. You may gain a clearer understanding of how psychological research is conducted. You will also earn research credit for your class for your participation. This research may have broader implications in helping researchers understand health opinions.

**What other options are there?**

You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study. You can choose to participate in other studies that are being conducted in the Psychology Department to help meet your research requirement for Introduction to Psychology. You can also ask your Psychology instructor to assign you a research article to read and summarize in a brief paper.

**Who is paying for this study?**

Internal Funding:

N/A

External Funding:

N/A

**What are my costs?**

There are no costs to you for participating in the study.

**Will I be paid to participate in this study?**

You will not be paid for taking part in this research study.

**What if I want to withdraw, or am asked to withdraw from this study?**

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty. If you choose to take part, you have the right to stop at any time. However, we encourage you to talk to a member of the research

group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.

**Who do I call if I have questions or problems?**

If you have a question, you should contact the principal investigator, Mosi Dane’el by phone at 915-747-6430.

If you have questions or concerns about your participation as a research subject, please contact the UTEP Institutional Review Board (IRB) at 915-747-8841 or [irb.orsp@utep.edu](mailto:irb.orsp@utep.edu).

**What about confidentiality?**

Your part in this study is confidential. You will not be asked to write your name on any form except this consent form. None of the information will identify you by name. All records will be stored in a file cabinet in the psychology building. Only researchers directly associated with this project will have access to these surveys. Your participation is also completely anonymous. Your name will not be connected to any of the answers you provide on this survey.

**Authorization Statement**

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop being in this study without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: \_\_\_\_\_ Date: \_\_\_\_\_

Participant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **Appendix B**

### Nutrition Label Survey

- 1) How many calories are in 1 Food A's package?
- 2) What is the percent daily value of total fat in 1 Food A's package?
- 3) You decide to eat 1 Food B. How many grams of total fat are you eating?
- 4) How many grams of saturated fat are in 2 whole amounts of Food B?
- 5) You decide to make a eat Food B twice and use half of Food A. How many calories are you eating?
- 6) What is the percent daily value of total fat in Food B?
- 7) Choose the product which contains fewer grams of saturated fat: eating all of Food A or eating half of all of  $\frac{1}{2}$  the Food B?
- 8) Choose the product that contains more Calories: eating  $\frac{1}{2}$  of Food A or  $\frac{1}{2}$  of Food B.
- 9) Choose the combination of product which contains fewer grams of total fat: all of Food A with  $\frac{1}{2}$  of Food B or  $\frac{1}{2}$  of Food A with all of Food B?
- 10) Choose the product with more Calories: all of Food A or all of Food B.
- 11) Choose the product that contains fewer grams of saturated fat:  $\frac{1}{2}$  of Food A or all of Food B.
- 12) Choose the combination of products with less total fat: all of Food A with  $\frac{1}{2}$  of Food B or  $\frac{1}{2}$  of Food A and all of Food B.

## Appendix C

### Label Usage Survey

The Food and Drug Administration uses the Daily Value percentage to classify ranges for the amount of nutrients that you consume. They classify the ranges for **calories** as **Low = 0-99**, **Med = 100-399**, and **Hi = 400-2000**. They classify the ranges for the **other nutrients** as **Low = 0%-5%**, **Med = 6%-19%**, and **Hi = 20%-100%**. The Food and Drug Administration recommends that you do not eat food (or eat very little food) that is Hi in any of the nutrients because that is unhealthy.

**Please answer the following questions using the nutrition labels given.**

If you ate 1.5 packages, 2 times a day from food 'a,' would the total amount be **Low, Med, or Hi** for...

Calories? \_\_\_\_\_

Fat? \_\_\_\_\_

Sat Fat? \_\_\_\_\_

Cholesterol? \_\_\_\_\_

Sodium? \_\_\_\_\_

If you ate 1.5 packages, 2 times a day from food 'b,' would the total amount be **Low, Med, or Hi** for...

Calories? \_\_\_\_\_

Fat? \_\_\_\_\_

Sat Fat? \_\_\_\_\_

Cholesterol? \_\_\_\_\_

Sodium? \_\_\_\_\_

## Appendix D

Condition 1a

<b>Nutrition Facts</b>	
Serving Size 171g	Serving size about 1
Amount Per Serving	
<b>Calories</b> 210	Calories from Fat 9
% Daily Value*	
<b>Total Fat</b> 3g	<b>1%</b>
Saturated Fat 0g	<b>1%</b>
Trans Fat	
<b>Cholesterol</b> 0mg	<b>0%</b>
<b>Sodium</b> 9mg	<b>0%</b>
<b>Total Carbohydrate</b> 36g	<b>12%</b>
Dietary Fiber 12g	<b>45%</b>
Sugars 6g	
<b>Protein</b> 12g	
Vitamin A 3%	Vitamin C 3%
Calcium 6%	Iron 24%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
NutritionData.com	

Condition 1b

<b>Nutrition Facts</b>	
Serving Size 171g	Serving size about 1
Amount Per Serving	
<b>Calories</b> 690	Calories from Fat 63
% Daily Value*	
<b>Total Fat</b> 12g	<b>18%</b>
Saturated Fat 6g	<b>24%</b>
Trans Fat	
<b>Cholesterol</b> 42mg	<b>12%</b>
<b>Sodium</b> 642mg	<b>27%</b>
<b>Total Carbohydrate</b> 36g	<b>12%</b>
Dietary Fiber 12g	<b>45%</b>
Sugars 6g	
<b>Protein</b> 12g	
Vitamin A 3%	Vitamin C 3%
Calcium 6%	Iron 24%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
NutritionData.com	

Condition 2a

Each pack contains 1 serving

MED	LOW	LOW	LOW	LOW
Calories	Fat	Sat Fat	Cholesterol	Sodium
<b>210</b>	<b>3g</b>	<b>0g</b>	<b>0g</b>	<b>9g</b>
<b>10%</b>	<b>1%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>

Condition 2b

Each pack contains 1 serving

HIGH	MED	HIGH	MED	HIGH
Calories	Fat	Sat Fat	Cholesterol	Sodium
<b>690</b>	<b>12g</b>	<b>6g</b>	<b>42mg</b>	<b>642mg</b>
<b>34%</b>	<b>18%</b>	<b>24%</b>	<b>12%</b>	<b>27%</b>

Condition 3a

Nutrition Facts	
Serving size about 3    Each pack contains 3 servings	
Amount Per Serving	
Calories 70	Calories from Fat 1
% Daily Value*	
Total Fat 1g	1%
Saturated Fat 0g	1%
Trans Fat	
Cholesterol 0mg	0%
Sodium 3mg	0%
Total Carbohydrate 12g	4%
Dietary Fiber 4g	15%
Sugars 2g	
Protein 4g	
Vitamin A    1% • Vitamin C    1%	
Calcium        2% • Iron            8%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
NutritionData.com	

Condition 3b

Nutrition Facts	
Serving size about 3    Each pack contains 3 servings	
Amount Per Serving	
Calories 230	Calories from Fat 31
% Daily Value*	
Total Fat 4g	6%
Saturated Fat 2g	8%
Trans Fat	
Cholesterol 13mg	4%
Sodium 313mg	9%
Total Carbohydrate 12g	4%
Dietary Fiber 4g	15%
Sugars 2g	
Protein 4g	
Vitamin A    1% • Vitamin C    1%	
Calcium        2% • Iron            8%	
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
NutritionData.com	

Condition 4a

Each pack contains 3 servings

LOW	LOW	LOW	LOW	LOW
Calories	Fat	Sat Fat	Cholesterol	Sodium
70	1g	0g	0g	3g
0%	1%	1%	0%	0%

Condition 4b

Each pack contains 3 servings

MED	MED	MED	LOW	MED
Calories	Fat	Sat Fat	Cholesterol	Sodium
230	4g	2g	13mg	313mg
12%	6%	8%	4%	9%

**Appendix E**  
**Demographic Questionnaire**

1. Age: \_\_\_\_\_
2. Gender: \_\_\_\_\_ Female (1)      \_\_\_\_\_ Male (2)
3. Ethnic/ cultural background
  - \_\_\_\_\_ (1)      African-American
  - \_\_\_\_\_ (2)      Asian/ Asian-American/ Pacific Islander
  - \_\_\_\_\_ (3)      Caucasian/ White (not of Hispanic origin)
  - \_\_\_\_\_ (4)      Hispanic
  - \_\_\_\_\_ (5)      Native American
  - \_\_\_\_\_ (6)      Mixed (write in) \_\_\_\_\_
  - \_\_\_\_\_ (7)      Other (write in) \_\_\_\_\_
4. Approximate number of college credits completed before this semester (write 0 if this is your 1<sup>st</sup> semester in college; write "not sure" if you don't know): \_\_\_\_\_
5. Are you color blind? (check one)      \_\_\_ Yes      \_\_\_ No
6. What is your college level?
  - \_\_\_\_\_ (1)      Freshman                      \_\_\_\_\_ (3)      Junior
  - \_\_\_\_\_ (2)      Sophomore                      \_\_\_\_\_ (4)      Senior
  - \_\_\_\_\_ (5)      Not sure
7. What is your Major?
  - \_\_\_\_\_ (1)      Accounting
  - \_\_\_\_\_ (2)      Business
  - \_\_\_\_\_ (3)      Engineering
  - \_\_\_\_\_ (4)      Psychology/ Sociology
  - \_\_\_\_\_ (5)      Undeclared
  - \_\_\_\_\_ (6)      Other (please write Major) \_\_\_\_\_
8. Where did you live as you were growing up (**\*birth to 17 years of age\***)?  
\*the numbers you put down should add up to 17\*

<u>Location</u>	<u>Years</u>
_____ (1)      El Paso, Texas	number of years _____
_____ (2)      Juarez, Chihuahua	number of years _____
_____ (3)      Las Cruces, New Mexico	number of years _____
_____ (4)      Other (please write city and state) _____	number of years _____



9. What is your Native language (the first language you learned)?  
\_\_\_ (1) English                      \_\_\_ (2) Spanish                      \_\_\_ (3) Mixed English and Spanish  
\_\_\_ (4) Other (please fill in) \_\_\_\_\_

10. What language do you consider your stronger language overall?  
\_\_\_ (1) English                      \_\_\_ (2) Spanish                      \_\_\_ (3) Mixed English and Spanish  
\_\_\_ (4) Other (please fill in) \_\_\_\_\_

11. Weight \_\_\_\_\_

12. Height \_\_\_\_\_

13. BMI      \_\_\_\_\_

## Appendix F

### Individual Characteristics

1. Do you have any food allergies? (check one) \_\_\_ Yes (1) \_\_\_ No (0)

2. Are you dieting? (check one) \_\_\_ Yes (1) \_\_\_ No (0)

If yes, indicate what you are doing to diet

---

3. How often do you use nutrition labels?

1	2	3	4	5
(Never)				(Always)

## Appendix G

### Objective Numeracy Scale

#### Proportions & Percentages Exercise

1. Imagine that we have a fair, 6-sided die (for example, from a board game or casino craps table). Imagine that we now roll it 1000 times. Out of 1000 rolls, how many times do you think the die would come up even (numbers 2, 4, or 6)?
2. In the Big Bucks Lottery, the chances of winning a \$10.00 prize is 1%. What is your best guess about how many people would win a \$10.00 prize if 1000 people each buy a single ticket to Big Bucks?
3. In the Acme Publishing Sweepstakes, the chance of winning a car is 1 in 1000. What percentage of tickets to Acme Publishing Sweepstakes win a car?

4. Which of the following numbers represent the biggest risk of getting a disease?

\_\_\_ 1 in 100

\_\_\_ 1 in 1000

\_\_\_ 1 in 10

5. Which of the following numbers represents the biggest risk of getting a disease?

\_\_\_ 1%

\_\_\_ 10%

\_\_\_ 5%

6. If person A's risk of getting a disease is 1% in 10 years, and person B's risk is double that of A's, what is B's risk?
7. If person A's chance of getting a disease is 1 in 100 in 10 years, and person B's risk is double that of A's, what is B's risk?
8. If the chance of getting a disease is 10%, how many people of 100 would get the disease?
9. If a chance of getting a disease is 10%, how many people out of 1000 would be expected to get the disease?
10. If the chance of getting a disease is 20 out of 100, this would be the same as having a \_\_\_% chance of getting the disease?
11. The chance of getting a viral infection is 0.0005. Out of 10,000 people, about how many of them are expected to get infected?

## Appendix G

## Need for Cognition Short Form

For each of the following questions, **please circle the number that you agree with the most:**

1. I would prefer complex to simple problems.

1 2 3 4 5  
Extremely unlike me Extremely like me

2. I like to have the responsibility of handling a situation that requires a lot of thinking.

1 2 3 4 5  
Extremely unlike me Extremely like me

3. Thinking is not my idea of fun.

**1** **2** **3** **4** **5**  
Extremely unlike me Extremely like me

4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.

1 2 3 4 5  
Extremely unlike me Extremely like me

5. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.

1 2 3 4 5  
Extremely unlike me Extremely like me

6. I find satisfaction in deliberating hard and for long hours.

1 2 3 4 5  
Extremely unlike me Extremely like me

7. I only think as hard as I have to.

1 2 3 4 5  
Extremely unlike me Extremely like me

8. I prefer to think about small, daily projects to long-term ones.

**1** **2** **3** **4** **5**  
Extremely unlike me Extremely like me

9. I like tasks that require little thought once I've learned them.

1 2 3 4 5  
Extremely unlike me Extremely like me

10. The idea of relying on thought to make my way to the top appeals to me.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

11. I really enjoy a task that involves coming up with new solutions to problems.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

12. Learning new ways to think doesn't excite me very much.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

13. I prefer my life to be filled with puzzles that I must solve.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

14. The notion of thinking abstractly is appealing to me.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

17. It's enough for me that something gets the job done; I don't care how or why it works.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

18. I usually end up deliberation about issues even when they do not affect me personally.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Extremely unlike me				Extremely like me

**Appendix H**  
**Planned Behavior Scale**

For **each statement**, please select the rating you agree with the most.

**1.** For me to eat a healthy diet in the future is...

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
difficult						easy

**2.** I am confident that if I ate a healthy diet I could keep to it

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
strongly disagree						strongly agree

**3.** Whether I do or do not eat a healthy diet in the future is entirely up to me

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
strongly disagree						strongly agree

**4.** How much control do you feel you have over eating a healthy diet in the future

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
no control						complete
control						

**5.** I would like to eat a healthy diet but don't really know if I can

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
strongly agree						strongly
disagree						

**6.** I am confident that I could eat a healthy diet if I wanted to

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
strongly disagree						strongly agree

### Subjective Numeracy Scale

- [illegible]



## **Curricula Vita**

Mosi Dane'el received his Bachelor of Arts Degree at University of New Mexico at Albuquerque, NM 2006. After completion of that degree he was accepted into the graduate program at the University of Texas at El Paso. Conscious of his privacy he maintains a public profile that includes only department contacts and publications.