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An Evaluation of Three Nutrition Labeling Formats for Restaurant Menus

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Introduction

Overweight and obesity are major public health concerns, contributing to chronic diseases and the death of more than 2.8 million adults each year (World Health Organization, 2012). The combination of physical inactivity and the overconsumption of energy-dense foods is considered a major factor contributing to excessive weight gain (World Health Organization, 2012). The increase in foods consumed away from home is also thought to be an important factor contributing to overconsumption, and in turn, the prevalence of overweight and obesity (Lachat, Nago, Verstraeten, Roberfroid, Camp, & Kolsteren, 2012; McCrory, Fuss, Hays, Vinken, Greenberg, & Roberts, 1999). This may be attributed to the fact that restaurant foods tend to be rich in calories, fat, saturated fat, cholesterol, and sodium, and contain fewer micronutrients compared to food prepared at home (Guthrie, Lin, & Frazao, 2002; Lachat et al., 2012). In addition, restaurant foods are usually served in larger portion sizes, which significantly increases consumers' energy intake (Diliberti, Bordi, Conklin, Roe, & Rolls, 2004; Kral & Rolls, 2004; Young & Nestle, 2002).

To help restaurant customers make healthier food selections, the U.S. Food and Drug Administration (2011) proposed a rule to implement menu nutrition labeling provisions in restaurant chains, which requires "restaurants and similar retail food establishments that are part of a chain with 20 or more locations doing business under the same name and offering for sale substantially the same menu items to provide calorie and other nutrition information for standard menu items, including food on display and self-service food" (U.S. Food and Drug Administration, 2011, p.19192). Many chain restaurants, such as McDonald's, Subway, Burger King, Wendy's, Panera, Taco Bell, and others, have taken the initiative in providing calorie information on their menus or menu boards. In some cities and regions, such as San Francisco, New York City, and King County in the State of Washington, similar menu nutrition labeling regulations were adopted before the federal proposed rules were published (Rutkow, Vernick, Hodge Jr., & Teret, 2008).

After the regional regulations were passed, several studies were conducted to examine the effects of the menu labeling implementation. It was found that although many restaurants in King County (especially sit-down restaurants) improved the overall nutritional content of their food, the energy, saturated fat, and sodium content still greatly exceeded the 2005 Dietary Guidelines for Americans recommendations (Bruemmer, Krieger, Saelens, & Chan, 2012). In New York City, surveys conducted at 45 fast food restaurants showed that 72% of the customers reported seeing the calorie information on the menus or menu boards after it was posted, but among these customers only 27% reported using the information when selecting food (Dumanovsky, Huang, Bassett, & Silver, 2010). Other studies examined the influence of menu calorie information on customers' choices in fast food restaurants, but little effect was found (Finkelstein, Strombotne, Chan, & Krieger, 2011; Harnack, French, Oakes, Story, Jeffery, & Rydell, 2008).

In addition to calorie labels, previous research examined the effect of different types of menu nutrition labels. Some studies found that nutrition information provided at the point of purchase was associated with increased healthy food selections (Almanza, Mason, Widdows, & Girard, 1993; Chu, Frongillo, Jones, & Kaye, 2009; Cranage, Conklin, & Lambert, 2004; Pulos & Leng, 2010); in these studies, other nutrient information in addition to calorie content was also provided, which might be more helpful for customers, especially for those with special dietary needs. However, restaurant menus often have limited space to provide nutrition information. In addition, having too much information on the menu may make the nutrition labels difficult to use, thus discouraging customers from reading the nutrition labels (Kim & Almanza, 2001). Therefore, an effective menu labeling format that allows a clear presentation of an appropriate amount of nutrition information needs to be devised in order to help restaurant customers make more informed food selections.

Literature Review

The Theory of Planned Behavior

Many factors can affect people's eating behaviors in complicated ways, and the effects vary for different individuals, at different times, and under different conditions (Mela, 1999; Nestle, Wing, Birch, DiSogra, Drewnowski, Middleton, Sigman-Grant, Sobal, Winston, & Economos, 1998; Rozin & Vollmecke, 1986). When investigating the effects of providing menu nutrition labels on restaurant customers' food selection in an actual restaurant setting, other factors that noticeably influence customers' food selections should be taken into consideration. For this study, a model was developed based on the theory of planned behavior (Ajzen, 1991) to account for the influences of customers' cognitive beliefs on their food selections.

According to the theory of planned behavior (TPB), people's expectation about the consequences of performing a given behavior and the evaluation of these consequences (attitude), people's perceived social pressure to perform or not perform a certain behavior (subjective norm), and people's perceived ease or difficulty of performing a given behavior (perceived behavioral control) can determine behavioral intentions (Ajzen, 1991). According to TPB, a more favorable attitude, agreement with the subjective norm, and greater perceived control with regard to performing a given behavior are positively associated with a stronger intention to perform the behavior. Furthermore, intentions and perceived behavioral control jointly can explain a large proportion of the variation in actual behavior (Ajzen, 1991). The theory of planned behavior was an extension of the original theory of reasoned action, with an additional predictor, perceived behavioral control, of behavior intentions and behavior (Madden, Ellen, Ajzen, 1992).

In previous research, the TPB variables (attitude, subjective norm, and perceived behavioral control) proved to be good predictors of the behavioral intentions of various health-related behaviors including healthy eating (Åström & Rise, 2001; Conner, Norman, & Bell, 2002), fruit and vegetable

intake (Bogers, Brug, Van Assema, & Dagnelie, 2004; Emanuel, McCully, Gallagher, & Updegraff, 2012; Povey, Conner, Sparks, James, & Shepherd, 2000), eating a low-fat diet (Povey et al., 2000), and dietary supplement use (Conner, Kirk, Cade, & Barrett, 2001). In these studies, the TPB variables were able to explain between 43 to 63% of the variance in behavioral intentions (Åström & Rise, 2001; Bogers et al., 2004; Conner, Norman, & Bell, 2002; Povey et al., 2000). But the ability of the TPB variables to predict actual behavior (self-reported and observed) was not as strong, explaining only 9 to 46% of the variance (Bogers et al., 2004; Conner et al., 2002; Povey et al., 2000). Among the TPB variables, perceived behavioral control (PBC) was generally found to be a strong predictor of intention and behavior, while subjective norm was thought to be a relatively weak predictor (Armitage & Conner, 2001; Åström & Rise, 2001; Bogers et al., 2004; Conner et al., 2002; Emanuel et al., 2012).

Evaluation of Menu Nutrition Labeling Formats

In order to develop an appropriate menu labeling format, a number of studies have evaluated the effects of menu labeling formats on entrée selections. It was found that the application of different nutrition labeling formats affected people's entrée selections (Kim & Almanza, 2001; Almanza et al., 1993). However, the findings appeared to be inconsistent as to which format was most effective in helping people make healthy entrée selections and no single menu labeling format was found to be the best on all performance measures (Almanza et al., 1993; Almanza & Hsieh, 1995; Kim & Almanza, 2001). In these studies, the effectiveness of different formats was measured either through the percentage of entrees chosen by the respondents that met the designated guidelines (Almanza et al., 1993) or through the number of correct answers that the respondents gave on the menu-related test (Kim & Almanza, 2001). When calculating the percentage of entrees sold that met the designated guidelines, the entrees were grouped into only two categories – “entrees that meet the designated guidelines” and “entrees that do not meet the designated guidelines,” which might be too rigid for determining the effectiveness of nutrition labeling on people's food selections. In addition, even though the respondents could answer the

questions better when the nutrition information was provided, it did not necessarily mean that they would actually make healthier food choices.

Based on the literature review, the following hypotheses were proposed. Figure 1 illustrates the conceptual model of this study.

H1: People who have a more favorable attitude towards healthy eating will be more likely to select healthier entrees when dining in a restaurant.

H2: People who perceive a greater subjective norm with regard to healthy eating will be more likely to select healthy food when dining in a restaurant.

H3: People who perceive greater behavioral control over selecting healthy food items from a restaurant menu will be more likely to choose healthy food.

H4: The number of calories contained in the food purchased by each customer on average will be different when different types of nutrition labels are provided.

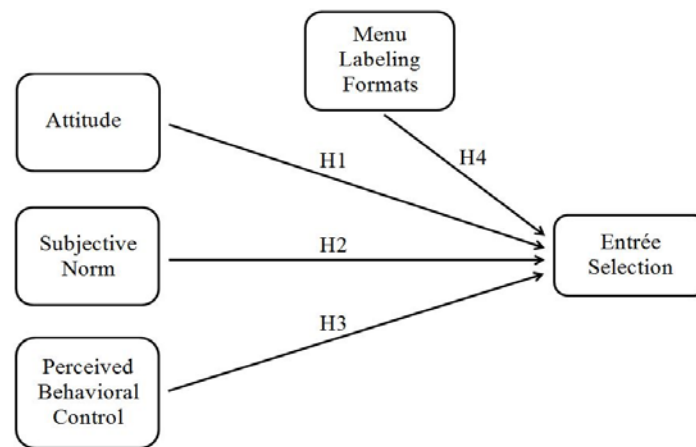


Figure 1. Conceptual Model Adapted from Ajzen's (1991) Framework for the Theory of Planned Behavior

Methodology

Nutrition Analysis and Menu Labeling

This study was conducted in a table service restaurant located on the campus of Purdue University, West Lafayette, Indiana. The restaurant's lunch menu offered nine standard menu items including a soup and eight entrees, and three special items that changed daily or weekly. Prior to this study, nutrition information was not provided on the restaurant's lunch menu. To determine the

nutritional content of each standard menu item, nutrition analysis was conducted using Food Processor SQL (version 10.7.0, ESHA Research, Salem, Oregon), the USDA National Nutrient Database for Standard Reference (Release 25, U.S. Department of Agriculture, Agricultural Research Service), and the recipes for the menu items provided by the restaurant.

In order to provide nutrition information on the menus, three nutrition labeling formats were developed as shown below.

- (1) **Calorie Only Information:** The calorie content accompanied by the term “Cal” was presented on the menu in brackets adjacent to the name of each standard menu item.
- (2) **A Healthy Symbol:** The healthy symbol format was developed based on previous studies (Almanza et al., 1993; Almanza & Hsieh, 1995; Kim & Almanza, 2001). In addition to calorie information, an icon of a green leaf was posted adjacent to the name of the menu items that contained less than 600 calories and met at least one of the following guidelines representing one-third of the Daily Values (DVs) as established by the FDA: containing less than 21.7 grams of fat and no more than 30% of calories derived from fat, less than 6.7 grams of saturated fat and less than 10% of calories derived from saturated fat, less than 800 milligrams of sodium, less than 100 milligrams of cholesterol, or more than 8.3 grams of fiber. An explanation of the green leaf icon was provided at the bottom of the menu.
- (3) **A Nutrient List:** In addition to calorie information, the nutritional content of fat, calories derived from fat (%), saturated fat, cholesterol, sodium and fiber were listed below the menu description of each standard menu item. The daily values (DV) established by FDA for the appropriate intake of fat, saturated fat, cholesterol, sodium and fiber based on a daily caloric intake of 2,000 calories were provided at the bottom of the menu.

For all three nutrition labeling formats, the statement “A 2,000 calorie daily diet is used as the basis for general nutrition information; however, individual calorie needs may vary” was presented at the bottom of the menu (U.S. Food and Drug Administration, 2011). For the items that changed daily or weekly (and were therefore not included in the analyses), “Calories vary” was presented in brackets adjacent to the name of the item.

Study Design and Data Collection

The study was conducted during the lunch hours of a four-week period from January 28th to February 24th, 2013. During the first week, surveys were not conducted; customers were provided menus with no nutrition information in order to capture baseline data. From weeks two through four, menus with calorie only information, the healthy symbol, and the nutrient list, were provided respectively, and surveys were administered. Sales data for lunch items were recorded daily throughout the four weeks to obtain menu item sales information. Restaurant specials were not included in the analyses as comparisons could not be made to previous sales data and also because adequate time was not available for nutritional analysis and printing of the menus (daily specials were often determined the morning they were offered). During the three weeks when surveys were conducted, a poster announcement was placed on the front door of the restaurant informing the guests about the ongoing study. Procedures used in this study were approved by the Purdue University Institutional Review Board.

On the days when surveys were conducted, menus, questionnaires, and pens were placed on the restaurant tables at each seat prior to opening for service. As an incentive, all customers who completed the questionnaire were eligible for a drawing for a free lunch for two in the restaurant. The restaurant host invited the customers to complete the questionnaire after they ordered, and gave them a brief explanation about the survey. Customers were asked to return the completed questionnaires to a survey collection box located by the restaurant entrance when they left. To be entered in the drawing, customers needed to put their name and email address on a small card which was placed on the table together with the questionnaire, and place the card in a bowl next to the survey collection box. The cards were kept separately from the questionnaires so that the questionnaire responses were kept anonymous.

Questionnaire

The questionnaire was comprised of 17 items assessing the respondents' food selection for the current meal, their attitude, subjective norm, and perceived behavioral control regarding healthy eating,

their interests in having food nutrient information presented on restaurant menus, their demographic information, and their preferences for the three menu nutrition labeling formats. The nine items assessing the respondents' attitude, perception of subjective norm, and perceived behavioral control with regards to healthy eating in restaurants were developed based on a review of previous research (Ajzen, 1991; De Castro, 1994, 1995; Herman, Roth, & Polivy, 2003; Howlett, Burton, Bates, & Huggins, 2009; Nestle et al., 1998; Petrovici & Ritson, 2006), and are presented in Table 1. The respondents were asked to assess statements on a 7-point scale ranging from -3 to 3 (-3, -2, -1, 0, 1, 2, 3), with -3 representing "disagree" and 3 representing "agree". The attitude, subjective norm and perceived behavioral control rating scores were averaged respectively and the mean scores were used in the data analyses. Additionally, respondents were asked whether or not they noticed and used the nutrition information provided on the menu when they made their food selection for the current meal.

Table 1

Statements Measuring Attitude, Subjective Norm, and Perceived Behavioral Control

Measures	Statements
<i>Attitude</i>	When I have lunch in a restaurant, I would like to order whatever I want regardless of its nutrition content. (A)
	Healthy food generally does not taste as good as dishes that are higher in fat or calories. (B)
	When I have lunch in a restaurant, selecting food that is healthy is very important to me. (C)
<i>Subjective Norm</i>	My companion(s) for the current meal probably think I should select healthy food on the menu. (D)
	My friends probably think I should eat healthy food when dining in a restaurant. (E)
	My family probably thinks I should eat healthy food when dining in a restaurant. (F)
<i>Perceived Behavioral Control</i>	I consider myself very knowledgeable about nutrition. (G)
	When I made today's selection, having the nutrition information readily available on the menu made it easier for me to select food. (H)
	The nutrition information provided was enough for me to select the food I wanted to order. (I)

Note. The parenthetical letters are presented in Table 3 with the rating scores received by the corresponding statements.

Data Analysis

All data analyses were performed using SAS (version 9.3, SAS Institute Inc., Cary, NC). Descriptive statistics were used to summarize the response rates, sample demographics, respondents' preferences for different nutrition labeling formats, their use of nutrition labels, and their interest in having nutrient information presented on the restaurant menu. Customers' entree selection was measured by calculating the nutritional content of the entrees sold during each week of the study period. One way analyses of variance (ANOVAs) were conducted to compare the differences in the respondents' food

selections and their use of nutrition labels when different nutrition labeling formats were used. ANOVA tests also assessed the effects of demographic factors on the respondents' preferences for different nutrition labeling formats, their use of nutrition labels, and their food choices. Linear regression analyses were conducted to evaluate the influences of attitude, subjective norm, and perceived behavioral control on the subjects' food choices. The respondents' agreement to the two statements "When I have lunch in a restaurant, I would like to order whatever I want regardless of its nutrition content" and "Healthy food generally does not taste as good as dishes that are higher in fat or calories" indicated a negative attitude towards healthy eating, therefore these two measurements were reverse coded – the negative values of the rating scores received by these two statements were used in the data analysis. A significance level of 0.05 was applied for all significance tests.

Results & Conclusions

Descriptive Statistics

A total of 173 questionnaires were returned and analyzed. Unanswered questions were treated as missing values. Of the 173 questionnaires, 49 were returned during week two, 63 were returned during week three, and 61 were returned during week four. The estimated response rate was 53.8% for week two, 69.2% for week three, and 50.4% for week four, which were considered acceptable.

The sample was slightly skewed with more females (56.7%) than males (43.4%). Respondents' ages ranged from 18 to 72 years with the average age of 43.5 years (SD = 13.0362). The age distribution was positively skewed with over half the respondents between 26 and 45 years of age. In addition, the sample was severely skewed toward the highly educated sector of the population; 81.7% (n=107) of the respondents had a graduate degree, of which 71% (n=76) held doctorate degrees. In terms of dietary status, 14.71% (n=25) of the respondents reported that they were following a special diet. The demographic information of the sample is listed in Table 2.

Table 2

Sample Demographics

	Week 2		Week 3		Week 4		Total	
	<i>Calories Only</i>		<i>Healthy Symbol</i>		<i>Nutrient List</i>		N	%
	N	%	N	%	N	%		
Gender								
Male	19	50.0	27	50.0	12	28.6	58	43.3
Female	19	50.0	27	50.0	30	71.4	76	56.7
Age								
18-25	1	2.7	0	0.0	4	9.8	5	3.8
26-35	9	24.3	16	30.8	17	41.5	42	32.3
36-45	11	29.7	11	21.2	9	22.0	31	23.8
46-55	9	24.3	10	19.2	3	7.3	22	16.9
56-65	6	16.2	10	19.2	7	17.1	23	17.7
≥ 66	1	2.7	5	9.6	1	2.4	7	5.4
Education								
High school diploma	1	2.6	1	1.9	2	4.9	4	3.0
Bachelor degree	9	23.7	7	13.5	4	9.7	20	15.3
Master degree	10	26.3	11	21.1	10	24.4	31	23.7
Doctorate	18	47.4	33	63.5	25	61.0	76	58.0
Diet Status								
No special diet	39	79.6	55	91.7	51	83.6	145	85.3
On a special diet	10	20.4	5	8.3	10	16.4	25	14.7
<i>Low fat</i>	1	10.0	3	60.0	4	40.0	8	32.0
<i>Low sodium</i>	2	20.0	2	40.0	3	30.0	7	28.0
<i>Low calorie</i>	5	50.0	0	0.0	1	10.0	6	24.0
<i>Vegetarian</i>	0	0.0	0	0.0	4	40.0	4	16.0
<i>Others</i>	3	30.0	1	20.0	2	20.0	7	28.0

Note. Frequencies may not total 173 due to non-response or multiple responses to the questions.

In their responses to the questionnaire, fifty-five (32.9%) of the respondents expressed interest in having nutritional information about all the listed nutrients on restaurant menus, including calories, fat, saturated fat, cholesterol, sodium, and fiber. Among the six nutrients, calories were a concern for most of the respondents (81.4%), followed by fat (56.9%) and sodium (50.3%). By contrast, 15.6% (n=26) of the respondents indicated that they had no interest in having nutrition information about any of the six nutrients displayed on restaurant menus.

The results of the survey also showed that the healthy symbol was the most preferred among the three types of nutrition labeling formats, favored by 43.44% (n=53) of the respondents, while only 17.21% (n=21) of the respondents preferred the calories only format. However, the calorie only label was used by a higher percentage of the respondents compared with the other two types of labels. During the second week when calorie information was provided on the menus, 87.8% (n=43) of the respondents reported that they noticed the information; among these respondents 76.7% (n=33) reported using the information when they selected food. During the third week when the healthy symbol was presented on the menus, 65.6% (n=40) of the respondents reported noticing the healthy symbols, but among these respondents only 27.5% (n=11) reported using the healthy symbol. During the fourth week, 76.7% (n=46) of the respondents reported that they noticed the nutrient information, and 67.4% (n=31) of these respondents reported using the information.

Analysis of Variance: Demographic Factors

One-way analysis of variance and post-hoc analysis were performed to evaluate the effects of demographic factors on the respondents' use of nutrition labels and their preferences for different menu labeling formats. The results showed that the respondents who were following special diets were more likely to use the menu nutrition labels ($F(1,165)=4.66, p=.0322$). Age was also found to significantly influence the respondents' use of nutrition labels ($F(5,124)=5.00, p=.0003$). Respondents aged 66 years or older were the least likely to use the nutrition labels, followed by the respondents in the 36 to 45 age group. In comparison, the respondents aged between 26 to 35 years and 56 to 65 years were significantly more likely to use the nutrition labels when they selected food. Gender and education were found to have no significant effect on nutrition label use. No significant association was found between demographic factors and the respondents' preferences for different menu labeling formats.

Theory of Planned Behavior Variables

Simple Linear regression analyses were conducted to determine the effects of the respondents' attitude, subjective norm, and perceived behavioral control on their food choices, use of nutrition labels, and preferences for different menu nutrition labeling formats. Each of the three dependent variables (the respondents' food choices, their use of nutrition labels, and their preferences for different nutrition labeling formats) was regressed on each of the three independent variables (attitude, subjective norm, and perceived behavioral control) respectively. The results are presented in Table 3.

Attitude. Simple linear regression analysis demonstrated that the respondents who held a more favorable attitude towards healthy eating were more likely to select entrees that were lower in calories ($b = -44.04$, $p = .0441$), and were more likely to use nutrition labels ($b = 0.20$, $p < .0001$). In addition, respondents with a more positive attitude also tended to prefer the nutrition labels that provided more nutrition information ($b = 0.14$, $p = .0033$). Therefore, the hypothesis (H1) that people who have a more favorable attitude towards healthy eating will be more likely to select healthier entrees when dining in a restaurant was supported.

Subjective Norm. Subjective norm was not significantly associated with the respondents' use of the nutrition label, or their preferences for different menu labeling formats. The results of regression analysis showed that there was some association between greater subjective norm and the purchase of food lower in calories; the association, while not significant at the level of 0.05, approached significance ($b = -35.42$, $p = .0754$). Thus, the hypothesis (H2) that people who perceive a greater subjective norm with regard to healthy eating will be more likely to select healthy food when dining in a restaurant was partially supported.

Perceived Behavioral Control. The hypothesis (H3) that people who perceive greater behavioral control over selecting healthy food items from a restaurant menu will be more likely to choose healthy food was not supported since the study results suggested that perceived behavioral control was not

significantly associated with the respondents' food choices or their preferences towards different nutrition labeling formats. However, perceived behavioral control proved to be positively associated with the respondents' use of nutrition labels ($b=0.18$, $p<.0001$).

Table 3

Linear Regressions for the Behavior Measures and Preferences for Different Labeling Formats on Attitude, Subjective Norm, and Perceived Behavioral Control

Predictor	Food Choice		Use of Nutrition Label		Preference	
	<i>B</i>	<i>p-Value</i>	<i>B</i>	<i>p-Value</i>	<i>B</i>	<i>p-Value</i>
Attitude^a	-44.04	0.0441*	0.20	<0.0001***	0.14	.0033**
A ^b	-28.88	0.0364*	0.11	0.0004***	0.07	.0240*
B ^b	-12.10	0.4265	0.10	0.0018**	0.03	.3948
C ^b	-27.13	0.1536	0.13	0.0012**	0.14	.0003***
Norm^a	-35.42	0.0754	0.04	0.3855	0.05	.3092
D ^b	-6.17	0.7154	0.03	0.4094	0.06	.1423
E ^b	-40.71	0.0206*	0.03	0.4796	0.01	.7151
F ^b	-30.89	0.0590	0.03	0.4712	0.04	.2684
PBC^a	-12.64	0.5247	0.18	<0.0001***	0.06	.1651
G ^b	-3.97	0.8341	0.12	0.0030**	0.05	.2170
H ^b	-40.91	0.1732	— ^c	— ^c	0.09	.3285
I ^b	14.38	0.6768	— ^c	— ^c	-0.11	.3221

Note. *Significant at the $p<0.05$ level. **Significant at the $p<0.01$ level. ***Significant at the $p<0.001$ level.

Norm = Subjective Norm; PBC= Perceived Behavioral Control.

a. The average value of the rating scores received by the three statements measuring attitude (statement A~C), subjective norm (statement D~F), and perceived behavioral control (statement G~I), was used as a measure of attitude, subjective norm, and perceived behavioral control, respectively.

b. A~I represents each of the corresponding statements measuring attitude, subjective norm, and perceived behavioral control presented in Table 1. The rating score received by each of the nine statements was used in data analyses.

c. The respondents who reported not using the nutrition information were asked not to rate the statements H and I, therefore, only the respondents who used the nutrition labels rated these two statements, which makes the association between the respondents' rating of these two statements and their use of nutrition label biased.

Effect of Menu Nutrition Labeling Formats on Customers' Entree Selections

The analysis of the restaurant's sales data for the four-week study period showed that overall, the entrees purchased by customers after nutrition information was included on the menus contained fewer

calories, fat, saturated fat, cholesterol, and more fiber; the decreases in calories ($F(3,563)=4.50$, $p=.0039$), fat ($F(3,563)=4.57$, $p=.0036$), and saturated fat ($F(3,563)=4.73$, $p=.0029$) purchased were significantly associated with the provision of nutrition information (Table 4).

Table 4

ANOVA of Menu Nutrition Information Delivery on the Nutritional Content of the Entrees Purchased

Nutrient	<i>Means</i>				<i>F</i>	<i>P</i>
	<i>No Nutrition Label</i> (n=178)	<i>Calories Only Information</i> (n=123)	<i>Healthy Symbol</i> (n=126)	<i>Nutrient List</i> (n=140)		
Calories(Cal)	856	730	825	771	4.50	.0039**
Fat (g)	41.9	38.1	38.2	36.6	4.57	.0036**
Saturated Fat (g)	9.6	7.2	7.8	6.9	4.73	.0029**
Cholesterol (mg)	86.0	79.1	73.6	78.8	1.76	.1529
Sodium (mg)	1443	1317	1506	1406	1.26	.2858
Fiber (g)	7.3	7.4	7.8	7.7	2.04	.1069

Note. SD=Standard Deviation. ** Significant at the $p < 0.01$ level.

The results of post-hoc analysis indicated that, more specifically, the provision of Calories Only Information was associated with a significant decrease in calories ($p=.0041$) and saturated fat ($p=.0224$) contained in the entrees sold as compared to the entrees sold during week one (No Nutrition Information), while the format incorporating a Nutrient List was associated with a significant decrease in fat ($p=.0029$) and saturated fat ($p=.0040$) contained in the entrees sold.

Post-hoc analysis was also conducted to make comparisons among the three menu labeling conditions. The results showed that the entrees sold during week two (Calorie Only Information) contained 95 fewer calories as compared to the entrees sold during week three (Healthy Symbol), and this difference was statistically significant ($p=.0407$). Therefore, the hypothesis (H4) that the number of calories contained in the food purchased by each customer on average will be different when different types of nutrition labels are provided was supported.

The ANOVA results indicated a significant association between respondents' use of nutrition information and the calorie content of entrées purchased. Post-hoc analysis was performed and demonstrated that respondents who used the nutrition information ordered 226.23 fewer calories ($p=.0008$) as compared to the respondents who noticed but did not use the nutrition information, suggesting that the effectiveness of menu nutrition information is somewhat dependent on people's use of the labels, which, in turn, was positively associated with attitude and perceived behavioral control with regard to healthy eating in restaurants, and was also influenced by age and diet status.

Discussion

Summary

This study evaluated three menu nutrition labeling formats (calories only information, a healthy symbol, and a nutrient list) in terms of customers' nutrition information usage, their preferences, and the effectiveness of different formats in increasing customers' selection of healthier entrees. In order to objectively measure customers' entree selections, daily sales data were recorded and the nutritional content of the entrees purchased by customers under different menu labeling conditions was calculated and analyzed. Effects of the respondents' attitude, subjective norm, and perceived behavioral control on their entree selections were also assessed. The study findings supported the hypothesis (H1) that people who have a more favorable attitude towards healthy eating will be more likely to select healthier entrees when dining in a restaurant, and the hypothesis (H4) that the number of calories contained in the food purchased by each customer on average will be different when different types of nutrition labels are provided. The hypothesis (H2) that people who perceive a greater subjective norm with regard to healthy eating will be more likely to select healthy food when dining in a restaurant was partially supported, while the hypothesis (H3) that people who perceive greater behavioral control over selecting healthy food items from a restaurant menu will be more likely to choose healthy food was not supported by the findings of this study.

The results showed that both the calorie only information and the nutrient list were helpful in increasing customers' selection of healthier entrees. The nutrient list was the most effective in reducing fat and saturated fat of entrees purchased, and the calorie only label was the most effective in reducing calories purchased. The calorie only label was also noticed and used by the highest percentage of customers compared with the other two menu labeling formats, but was also the least preferred. The healthy symbol, although found to be the least used and the least effective nutrition labeling format among the three, was the most preferred with 43.44% of the respondents indicating a preference for it. This was possibly because the healthy symbol was simplistic and attractive (Almanza & Heiseh, 1995), but did not convey much specific information that was helpful for customers' food selection. In addition, only 18.1% of the respondents actually used the healthy symbol, which might also help explain why the healthy symbol was not as effective.

Implications & Applications

As suggested by the findings, calories intake might be perceived by consumers as more important than other nutrients for a healthy diet. Maintaining a balanced caloric intake, however, is only one aspect of a healthy diet; imbalanced intake of other nutrients like sodium, fat, saturated fat, and cholesterol can also cause serious health problems. However, consumers may not have a very clear understanding about the relationship between diet and diseases. In a study (Kim, Lopetcharat, Gerard, & Drake, 2012) examining consumers' knowledge about the relationship between a diet and disease, only 10% of the 489 respondents were aware that excessive sodium intake could increase the risk of heart disease. In another study investigating consumer's perception of diet and disease related risks (Garretson, & Burton, 2013), only 23% of the respondents correctly associated fat consumption with the risk of cancer. In order for consumers to have a better understanding of the relationship between dietary intake and the risk of associated chronic diseases, it is important for government policy makers and public health professionals to educate consumers through nutrition education programs, public health policies, or the media.

Increased nutrition knowledge may help increase consumers' ability to interpret the nutrition information provided on menus and thus improve the efficacy of menu nutrition labeling.

The findings of this study also suggest that the effectiveness of menu nutrition labeling on customers' food selection largely depended on customers' attitudes towards healthy eating and their actual use of the nutrition labels. In this study, however, less than half of the respondents reported using the nutrition information when they made their menu selections. In order to increase the effectiveness of menu nutrition labeling and to help customers make more healthful food selections, it is important to increase consumers' menu label usage. Several factors that influenced customers' use of nutrition information were identified in this study, including consumers' cognitive beliefs such as their perceived importance of healthy eating, their perceptions of healthy foods as being tasty, their knowledge about nutrition, and demographic factors including age and diet status. In order to increase consumers' use of menu nutrition labels, behavioral interventions could be developed from these aspects. Future research investigating the effectiveness of nutrition labeling may also need to take into consideration the influences of these factors.

Furthermore, the effect of menu nutrition labeling on customers' food selection is underscored by the underlying complexity of people's food choices. People's food choices in daily life are often unconscious, emotional, or even impulsive, and can be affected unconsciously by some factors such as environmental influences, feelings, and emotions (Barker & Swift, 2009; Jacquier, Bonthoux, Baciou, & Ruffieux, 2012; Wansink & Sobal, 2007). Thus, the effects of different menu nutrition labeling formats on people's food selection might not only be attributed to the changes in people's cognitive beliefs due to the provided information; it is possible that presenting the same nutrition information in different forms could also affect people's food selections and their use of nutrition information in some unconscious ways. For example, the text font, the font size and color used for presenting menu nutrition information may affect people's food selections. Future research could further explore how different menu labeling

formats could influence people's use of nutrition labels and their food selections, and develop more effective menu nutrition labeling formats.

Limitations & Suggestions for Future Research

This study also has several limitations that must be acknowledged. First, a confirmed case of foodborne illness (Typhoid) in one of the restaurant's employees was revealed on the first day of the survey; consequently, the number of customers dining in the study restaurant decreased substantially. Because of this, survey collection was extended for an additional day each week in order to secure a reasonable sample size.

Second, the study sample was a convenience sample drawn from the customers dining in a restaurant located on a university campus, primarily comprised of university students, faculty and staff. Therefore, the educational level of the sample was severely skewed with 97% of the respondents holding at least a college degree (n=127), and the majority of the respondents had a graduate degree (n=107, 81.7%). Additionally, the age distribution of the sample was also skewed with only five (3.8%) respondents in the 18 – 25 years age group, and only seven (5.4%) respondents in the older-than-66-years age group. The demographic characteristics of the study sample make it difficult to generalize the findings of this study.

Third, the menu of the study restaurant also offered daily and weekly special items, side dishes and desserts, for which standard recipes were not provided, and the nutritional values were not calculated. In addition, customers who ordered any of the entrees could choose one of the soup items as a side dish for no extra charge, which would not be recorded by the cash register system. Therefore, even using the objectively recorded sales data, it was difficult to track actual customer orders. Although respondents were asked to report their food selections in the questionnaire, there was no guarantee that the self-reported food selections would be fully accurate. Consequently, customers' selection of any daily or

weekly special item, side item, dessert, or soup was excluded from data analysis, affecting the accuracy of the study results.

Additionally, customers' lunch meal selections alone may not be sufficient to reflect the effects and helpfulness of providing menu nutrition information. Customers could change their behavior by reducing their consumption of food instead of selecting different food. It was also possible that, even if the customers' food selection and consumption for the lunch meal was not significantly affected, their subsequent food intake after the lunch meal could have been influenced because of the nutrition information (Roberto, Larsen, Agnew, Baik, & Brownell, 2010). In future research investigating healthy eating interventions, more attention needs to be paid to customers' actual consumption of food and any subsequent or long-term influences that behavioral interventions may produce in order to accurately assess the efficacy of the interventions.

Furthermore, the theory of planned behavior has its own limitations. Social cognition theories such as the theory of planned behavior are better at predicting deliberate behaviors (Barker & Swift, 2009). Eating behavior, however, is not as cognitive and rational as other health behaviors. As previously discussed, people's daily food choices could be affected by many factors unconsciously (Barker & Swift, 2009; Jacquier et al., 2012; Wansink & Sobal, 2007). People are sometimes not even aware of the decisions they make about what they eat (Wansink & Sobal, 2007). Thus, people's daily food choices may not be explained thoroughly by cognitive beliefs alone. For future research examining the effectiveness of healthy eating interventions, it would be appropriate to incorporate factors from multiple theories and develop a better framework to get a clearer understanding of eating behaviors.

This study was conducted in a casual dining restaurant located on a university campus. Future research in this area could also be conducted in other types of restaurant settings. Comparisons of menu nutrition labeling in different restaurant settings could provide a better understanding about the effectiveness of menu nutrition labeling interventions on consumers' healthy eating behaviors, which can help public health policy makers to improve the effectiveness of health promotion interventions.

Additionally, studies can also be conducted to investigate the effects of menu nutrition labeling on restaurant sales of individual menu items. This could be helpful for restaurants or other foodservice operations to better understand how nutrition labeling would affect customers' purchases, and to be able to offer various food choices, develop attractive menu items, and formulate appropriate marketing and operation strategies to meet the market needs.

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