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Effects of calorie information disclosure on consumers' food choices at restaurants

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ABSTRACT

Menu labeling is a provision in the Patient Protection and Affordable Care Act, but mandatory calorie information disclosure by restaurants is currently under consideration as a potential regulatory initiative to help curb excess calorie intake and encourage healthier food choices. There is much debate about the effectiveness of such legislation. The aim of this study was to examine the effect of calorie information disclosure on consumers' food choices at restaurants. Results of an online experimental study using real menu boards suggest that the effect of calorie information disclosure interplays with perceived healthfulness of restaurants to jointly affect consumers' food choices and underlying psychological processes. Upon exposure to calorie information, divergent food choice patterns at restaurants of varying levels of perceived healthfulness were observed. Theoretical and practical implications of the findings are discussed.

1. Introduction

Past decades have witnessed rising obesity rates and increased away-from-home food consumption at restaurants (Chandon and Wansink, 2007; Tangari et al., 2010). To increase consumers' awareness of potential health-related risks related to away-from-home food consumption, many initiatives have been proposed at federal, state, and local levels, one of which is mandatory calorie information disclosure by restaurants (Harnack and French, 2008). In the United States, the federal Patient Protection and Affordable Care Act was signed into law in March of 2010. This act includes a provision that creates a national uniform calorie-disclosure standard for restaurants: any restaurant chains with twenty or more outlets nationally are required to provide calorie information on menus, menu boards, and drive-throughs (Peregrin, 2010). Policy makers believe that such a provision would allow consumers easy access to calorie information and, thus, influence consumers' food choices at the point-of-purchase (Tangari et al., 2010). However, the U.S. Food and Drug Administration (FDA) announced in March of 2011 that the complexity of issues is delaying the promulgation of the regulations and that the restaurant industry needs additional guidance as well as extra time to comply with these provisions. The challenges center on whether and how the mandated disclosure of calorie information at restaurants can be helpful to consumers and the restaurant industry.

To examine the effectiveness of mandated disclosure of calorie information by food labeling legislation, previous studies employed various methodologies and outcome variables to examine how consumers make food choices based on calorie assessments (Hassan et al., 2010). Findings of these studies have been mixed. While there is empirical evidence of favorable effects of calorie information on consumers' food choices in some studies (e.g., Bollinger et al., 2010; Burton et al., 2006; Chu et al., 2009; Pulos and Leng, 2010; Roberto et al., 2010; Tandon et al., 2010), other studies found no significant difference in consumers' calorie intakes between situations with and without calorie information (e.g., Dumanovsky et al., 2011; Elbel et al., 2009; Finkelstein et al., 2011; Harnack et al., 2008; Tandon et al., 2011). The mixed results imply that knowledge of disclosed calorie information alone may not necessarily lead to healthful choices. Maher et al. (2010) suggested that researchers should consider potential factors that may interplay with disclosed calorie information on affecting consumers' food choices when attempting to clarify the relationship between calorie information disclosure and consumers' food choices.

The present study examined whether perceived healthfulness of a restaurant would influence the effect of disclosed calorie information on food choices. The quick service restaurant sector was chosen as the context for this research. The fast food industry is frequently targeted as one of the key causes of the national obesity problem for selling higher-calorie and less-nutritive meals (Bates et al., 2009). Quick service restaurants, specifically, share the blame

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for the rise of bodyweight and insulin resistance (Pereira et al., 2005). In the United States, more than twenty states and localities have considered legislation requiring quick service chain restaurants to provide nutrition information on menus (Hassan et al., 2010). The present study, therefore, focused on the quick service restaurant sector. As the benefits and setbacks of menu nutrition labeling are under debate, the findings of this study will help public policy makers, consumers, and restaurant managers to more accurately assess the impact of menu labeling on consumer behavior. The findings will also shed lights on the past discrepant findings in the menu labeling literature and suggest potentially important variables to be considered, such as the restaurant healthfulness, when evaluating the policy's effectiveness.

Recent studies examined the "halo" effect of the perceived healthfulness of fast-food restaurants on consumers' calorie estimates (Chandon and Wansink, 2007) and how consumers react to nutrition information disclosure at less healthful restaurants (Burton et al., 2006). The healthfulness of restaurants is an accessible and external cue when consumers patronize restaurants. Drawing on the consumer learning notions of concept-driven processing and data-driven processing (Bobrow and Norman, 1975), the present research examined how disclosed calorie information influence consumers' food choices and the underlying psychological processes at quick service restaurants of varying levels of perceived healthfulness.

The remainder of the article is structured as follows. A review of previous research leads to three hypotheses that predict the effects of calorie information on consumers' food choices and underlying psychological processes at restaurants of varying levels of perceived healthfulness. Then, the article presents an experimental study that tested the hypotheses. In conclusion, the article culminates with theoretical and practical implications of the findings in addition to a call for further research about menu labeling.

2. Literature review

2.1. Effects of calorie information on attitudes and food choices

Using both qualitative and quantitative approaches, recent studies on menu labeling have assessed consumers' attitudes toward menu labeling and subsequent food choices. Qualitative data showed that consumers embrace the menu labels, even though they may not necessarily use the information concerning their food choices (Lando and Labiner-Wolfe, 2007). Previous studies, using a quantitative approach, including studies using historical sales data from restaurants, intercept surveys (Pulos and Leng, 2010), and experimental approaches (Roberto et al., 2010), found a decrease in participants' actual or reported calories in their food orders when exposed to calorie information.

While seemingly positive effects of calorie information on consumers' food choices were observed in the above studies, the robustness of the evidence was questioned by some researchers. In a review of empirical studies related to the effects of calorie and nutrition information on food choices, Harnack and French (2008) found that although five out of six studies provided some evidence that calorie information influences food choices, the effect was weak and inconsistent. For example, in the study by Burton et al. (2006), the provision of calorie labeling only affected purchase intention for two out of four food items analyzed. In another study (Yamamoto et al., 2005), the provision of calorie information only caused modification of 20% of food orders. Moreover, some other studies detected no difference in consumers' purchased calories between menu conditions (e.g., Harnack et al., 2008; Mayer et al., 1987).

2.2. Effects of perceived restaurant healthfulness on calorie estimates and food choices

While the disparate findings in the menu labeling literature are not fully understood, the inconsistent results of the effect of calorie information on food choices might partially be due to the different methods, diverse populations and restaurants being studied. Maher et al. (2010) suggested that factors other than menu labels may have influenced consumers' food choices. Among the limited studies that have taken into account other factors when examining the effect of calorie information, the healthfulness of menu items or/and restaurants has been discussed as an accessible cue to predict consumers' calorie estimates and food choices (e.g., Burton et al., 2006). One research stream showed that people are more likely to underestimate the caloric content of main dishes when fast food restaurants claim to be healthful than when they do not (e.g., Chandon and Wansink, 2007). The other research stream focuses on effects of perceived healthfulness of less healthful restaurants and/or food items on consumers' reactions to nutrition information disclosure. For example, using the expectancy disconfirmation theory as a theoretical framework, Burton et al. (2006) found that for less-healthful menu items whose calorie counts exceeded consumers' expectations, the provision of nutrition information had a significant influence on consumers' purchase intention and decision making.

2.3. Interaction effects of calorie information and perceived restaurant healthfulness on food choices

The present study focused on the effect of calorie information on consumers' food choices at restaurants of varying levels of perceived healthfulness. Inclusion of behavioral outcomes is important in menu labeling research (Harnack and French, 2008). The present study used calorie counts of consumers' food choices as one of the outcome variables: with its weight-related implications, calorie count is one of the most salient food attributes during consumers' decision-making process (Burton et al., 2009). To gain a better understanding of how consumers react to the disclosed calorie information at restaurants of varying levels of perceived healthfulness, the present study drew upon the consumer learning concepts of concept-driven processing and data-driven processing (Bobrow and Norman, 1975).

Concept-driven processing, or top-down processing, suggests that consumers' perception is guided by expectations and prior knowledge when the decision environment provides ambiguous evidence and the accessible information is not conclusive to provide a clear violation of expectations. Data-driven processing, or bottom-up processing, is the notion that consumers' perception is guided by the objective characteristics of the stimulus in an unambiguous environment where the objective data may contradict expectations (Hoch and Ha, 1986). In the context of the current research, the condition in which calorie information is absent resembles an ambiguous decision environment, in which concept-driven processing is likely to prevail. Previous studies suggested that consumers tend to categorize food-related objects by the perceived healthfulness of restaurants when such "healthfulness" category exists (Oakes and Slotterback, 2005). As some fast food restaurants position themselves as healthful choices (e.g., Subway) while others do not (e.g., Burger King) (Chandon and Wansink, 2007), the overall perception of the healthfulness of a restaurant can help shape consumers' expectations of the healthfulness of specific food items (Tangari et al., 2010). Thus, it is expected that consumers without prior exposure to calorie information are likely to rely on perceived healthfulness of restaurants to make calorie inferences. Conversely, when consumers are provided with calorie information at point of purchase, the ambiguity of the decision

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environment is decreased and data-driven processing is likely to dominate. As a result, consumers are predicted to be more likely to make food choices based on the disclosed calorie information.

Based on the dominance of concept-driven versus data-driven processing in different types of decision environment at restaurants, the present study predicted that the perceived healthfulness of restaurants would serve as a cue to influence the effect of the calorie information disclosure on consumers' behavioral changes in overt food choices. When the objective calorie information is not available at restaurants perceived as *healthful*, the concept-driven mode of processing is likely to bias an individual's calorie estimate toward the perceived healthfulness of the restaurants, resulting in an under-estimation of calorie counts of menu items and food choices with calorie counts higher than desired. Conversely, when calorie counts are explicitly stated on the menu, consumers are inclined to engage in data-driven processing and make food choices based on the actual calorie counts, resulting in more optimal food choices. In the same vein, when the objective calorie information is not accessible at restaurants perceived as *unhealthful*, concept-driven consumers are likely to overestimate the calorie counts of food items and adjust food choices downward to compensate for the perceived excess calorie intake based on the biased calorie estimates. In contrast, when calorie counts of menu items are disclosed, consumers become data-driven and the objective calorie information is utilized in the decision-making process. As the actual calorie counts of particular food items can be lower than consumers' biased calorie estimates, consumers may adjust food choices upward, resulting in higher calorie intake than consumers without calorie information. The hypothesis is summarized below:

H1. For consumers with no prior exposure to calorie information, there will be differential effects of calorie information disclosure on food choices at restaurants of varying levels of perceived healthfulness. In a perceived *healthful* restaurant, consumers with calorie information will make food choices with *fewer* calorie counts than those without calorie information. In a perceived *unhealthful* restaurant, consumers with calorie information will make food choices with *more* calorie counts than those without calorie information.

2.4. Interaction effects of calorie information and perceived restaurant healthfulness on feeling of conflict

Conflict is an important factor in understanding consumption choices (Hassan et al., 2010). Overt consumption choices are characterized by one's underlying conflicting desires for different goals. In the context of food choices, selecting food is one of the most regular activities consumers pursue each day and often involves different goals (e.g., taste, nutritional value, price) (Finkelstein and Fishbach, 2010). Desire for indulgence in food and pleasure often competes with the desire to eat healthfully, such that people experience a feeling of conflict between desire to indulge (e.g., eating butter-baked cream cake) and the perceived cost of negative consequences (e.g., health) (Geyskens et al., 2008).

Previous studies suggested that upon exposure to calorie information, consumers' perceived health costs increase and compete with the desire for self-indulgence in food (Hassan et al., 2010), resulting in a greater feeling of conflict. Drawing on the distinction between concept-driven processing and data-driven processing, the present study posits that the perceived healthfulness of restaurants will moderate the effect of calorie information disclosure on the feeling of conflict. It is expected that when calorie information is not available, concept-driven consumers make calorie inferences based on perceived healthfulness of restaurants. As a result, the present study predicted that consumers tend to make lower calorie estimates with restaurants perceived as healthful, resulting in a lower level of feeling of conflict between desire for health and desire for indulgence compared with consumers with objective calorie information. Conversely, for restaurants perceived as unhealthful, consumers tend to overestimate the actual calorie counts of the menu items, resulting in a higher level of feeling of conflict compared with consumers with objective calorie information. The hypothesis is summarized below:

H2. For consumers with no prior exposure to calorie information, there will be differential effects of calorie information disclosure on consumers' feeling of conflict at restaurants of varying levels of perceived healthfulness. In a perceived *healthful* restaurant, consumers with calorie information will experience a *higher* level of feeling of conflict than those without calorie information. In a perceived *unhealthful* restaurant, consumers with calorie information will experience a *lower* level of feeling of conflict than those without calorie information.

2.5. Interaction effects of calorie information and perceived restaurant healthfulness on need for self-control

Self-control is another essential factor to understand consumption choices. Self-control refers to individuals' ability to resist initial tendencies to respond to tempting stimuli (Hassan et al., 2010). A high personal capacity for self-control enables individuals to live healthier lives (Tangney et al., 2004). In the context of food choices, while food temptations increase consumers' desire for indulgence (Fedoroff et al., 2003), self-control plays an important role in overriding or changing one's inner responses and controlling one's undesired behavioral tendencies (Tangney et al., 2004).

Previous studies suggested that actionable information, such as nutritional information, can activate consumers' need for self-control and influence consumers' tendency to consume (Baumeister, 2002). The present study predicts that the perceived healthfulness of restaurants influences the effect of calorie information disclosure on the need for self-control. Due to the different processing modes activated by a particular decision environment (Bobrow and Norman, 1975), the present study predicted that consumers without calorie information at a restaurant perceived as healthful tend to make biased calorie estimates consistent with the health claims made by restaurants. However, consumers with objective calorie information may find the actual calorie counts of food choices higher than originally estimated, resulting in a greater need for self-control to regulate the temptation for indulgence. Conversely, calorie information disclosure at a restaurant perceived as unhealthful is expected to lead consumers to adjust their overestimated calorie counts, resulting in a lower need for self-control. The hypothesis is presented below:

H3. For consumers with no prior exposure to calorie information, there will be differential effects of calorie information disclosure on consumers' need for self-control at restaurants of varying levels of perceived healthfulness. In a perceived *healthful* restaurant, consumers with calorie information will experience a *higher* level of need for self-control than those without calorie information. In a perceived *unhealthful* restaurant, consumers with calorie information will experience a *lower* level of need for self-control than those without calorie information.

3. Methodology

3.1. Research design

The present study employed a 2 (calorie information disclosure: present vs. absent) × 2 (restaurant type: healthful vs. unhealthful) full-factorial experimental design. Calorie information disclosure and restaurant type were between-subjects factors. To provide a

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more naturalistic setting for the experiment, the present study used actual menu boards obtained from select restaurant chains' websites as the experimental stimuli. The menu boards contained food items available at restaurants and calorie information for each menu item. The menu boards used in the study are presented in Appendix.

To manipulate the disclosure of calorie information, the calorie information was either present at (experimental group) or absent from (control group) the menu boards used in a particular experimental condition. To improve the generalizability of the results, the present study used two quick service restaurants to represent each type of restaurant, resulting in eight experimental conditions: Panera and Subway were examples of perceived healthful restaurants while McDonald's and Wendy's served as examples of perceived unhealthful restaurants. These restaurant retailers were selected as the stimuli because of their difference in healthfulness perceived by consumers and their high nationwide level of familiarity (Chandon and Wansink, 2007).

3.2. Participants and procedure

One hundred and eighty-nine consumers in a Mid-western town located in Indiana of the United States were recruited through a community-wide e-newsletter. Because mandatory calorie information disclosure by chain-affiliated restaurants has not be implemented in this region, the population of this study is unlikely to have acquired accurate knowledge of calorie information of menu items, although some participants may have some sporadic exposure to calorie information while traveling to regions where calorie information disclosure has been implemented. This population was ideal to test the hypotheses of this study in which direct and immediate effect of calorie information disclosure on food choices was examined. Potential respondents were invited to participate in an online study about food choices at restaurants for a drawing to win a $10 Starbucks gift card. Dining at quick service restaurants is a common consumption experience among this population and the majority of participants reported that they had dined at the target restaurant at least once in the past six months (83% for Panera, 88% for Subway, 87% for McDonald's, and 80% for Wendy's). Out of those participants, eleven responses were deemed unusable due to significant missing data or uniform answers. A total of one hundred and seventy-eight usable responses were included in the data analysis.

A web link of the survey randomly directed participants to one of the eight experimental conditions containing the menu boards seen at restaurants. Participants were asked to project themselves into a situation at a restaurant when they were ready to order for lunch from the menu board presented in the online questionnaire. Then participants were instructed to enter the selected food item(s) on a computer that they intended to order from the menu board as well as their feeling of conflict experienced and need for self-control when making food choices.

3.3. Measurement

3.3.1. Dependent variables

The primary dependent variable in the present study was the calorie counts contained in food items participants selected from the menu boards. The calorie counts were computed by adding up the calorie counts of all food items each participant selected, resulting in a single numeric score for each participant. For example, the calorie counts for a participant who selected a McChicken sandwich (360 cal), small fries (230 cal), and a diet Coke (0 cal) from McDonald's were 590 (590 = 360 + 230 + 0).

Feeling of conflict was measured with two items (Cronbach's alpha = .91): "When making food choices, how much conflict did you feel between favoring the healthy food items and taking pleasure in foods and eating?" and "When making food choices, how much tension did you feel between favoring the healthy food items and taking pleasure in foods and eating?" (Hassan et al., 2010). Seven-point scales were used with endpoints of "no conflict" to "a lot of conflict" and "no tension" to "a lot of tension" respectively.

Need for self-control was measured with two items (Cronbach's alpha = .75): "When making food choices, I tried to control myself and eat healthy" and "When making food choices, I tried to resist my urge to get the tasty but unhealthy food items" (Dholakia et al., 2006). Seven-point Likert scales were used with endpoints of "strongly disagree" and "strongly disagree".

3.3.2. Control variables

Other potentially influential variables that are difficult to control experimentally – *health concern*, *weight control*, and *the level of hunger* – were measured in the present study. The health concern measure with six statements (Cronbach's alpha = .89) was adapted from the study of Gebhardt et al. (2001), with items such as "I take care of my health as a matter of principle". Seven-point Likert scales were used with endpoints of "strongly disagree" and "strongly disagree". The weight control measure with one item – "When making food choices, how important is it for you to maintain your weight or lose weight?" – was adapted from the study of Mandal (2010). A seven-point scale was used with endpoints of "not at all important" and "very important". The level of hunger measure with one item – "How hungry are you at this moment?" – was adapted from the study of Nordgren et al. (2007) and a seven-point scale was used with endpoints of "not at all hungry" and "very hungry". Finally, demographic information was collected, including participants' gender, age, educational background, ethnic background, and frequency of restaurant patronage in the past six months.

4. Results

4.1. Sample profile

Gender composition of the sample was 71% female and 29% male. Data analysis detected no significant interaction effects of gender with the disclosure of calorie information and the type of restaurants, indicating similar behavioral tendencies by participants across gender groups. The ages of respondents in the sample ranged from 19 to 72 years with a median age of 39 years. Seventy-two percent of the respondents were Caucasian. Forty percent of the respondents had received a college degree. Further analysis was conducted to test potential significant differences across demographic variables among the four groups. Results of Pearson's chi-square tests showed no statistically significant differences in gender ($\chi^2(3,176) = 3.17$, $p = .37$), ethnicity ($\chi^2(12,175) = 16.29$, $p = .18$), and education ($\chi^2(12,176) = 10.52$, $p = .57$) across the groups. In addition, ANOVA test detected no significant age difference across the groups ($F_{(3,168)} = .80$, $p = .49$). Participants' profiles did not differ significantly by groups.

4.2. Manipulation checks

Manipulation checks were conducted for the perceived healthfulness of restaurants and the disclosure of calorie information. For the manipulation check of restaurants' perceived healthfulness, participants were asked to indicate their level of agreement/disagreement with one statement: "In general, the food at this restaurant is healthy". The seven-point Likert scale was used with endpoints of "strongly disagree" and "strongly agree". Results of ANOVA tests indicated that, as intended, participants in the healthful restaurant condition perceived their target restaurant

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as more healthful than participants in the unhealthful restaurant condition ($F_{(1,176)} = 121.78$, $p < .001$; $M_{\text{Healthful group}} = 5.00$, SD = 1.13 vs. $M_{\text{Unhealthful group}} = 2.89$, SD = 1.38) Therefore, the manipulation of participants' perceived healthfulness of restaurants was proven effective. In addition, one-way MANCOVA analysis also was conducted to test the consistency of participants' food choices, feeling of conflict, and need for self-control in the two restaurants within each restaurant category. Results showed no significant difference between the two restaurants in the unhealthful restaurant category (Wilks' Lambda = .98, $F_{(3,85)} = .58$, $p = .63$). For the two restaurants in the healthful restaurant category, the difference was marginal (Wilks' Lambda = .92, $F_{(3,78)} = 2.21$, $p = .09$). As such, the two restaurants in each category were collapsed for further data analysis.

To ascertain whether participants in the experimental group (disclosure of calorie information) actually noticed the calorie information, participants were asked to indicate the helpfulness of the disclosed calorie information on a seven-point Likert scale with endpoints of "strongly disagree" and "strongly agree". Results showed that participants exposed to calorie information at all four restaurants perceived the disclosed information as helpful ($M_{\text{Panera}} = 4.42$, SD = 1.98; $M_{\text{Subway}} = 5.05$, SD = 1.32; $M_{\text{McDonald's}} = 4.15$, SD = 2.23; $M_{\text{Wendy's}} = 4.95$, SD = 1.69). Therefore, the manipulation of the presence of calorie information was proven effective. Furthermore, ANOVA analysis was conducted to examine the potential difference in perceived helpfulness between the two restaurants within each category. Results showed no significant difference between the two restaurants within the healthful restaurant category ($F_{(1,39)} = 1.44$, $p = .24$; $M_{\text{Panera}} = 4.42$, SD = 1.98 vs. $M_{\text{Subway}} = 5.05$, SD = 1.32) or the unhealthful restaurant category ($F_{(1,39)} = 1.70$, $p = .20$; $M_{\text{McDonald's}} = 4.15$, SD = 2.23; $M_{\text{Wendy's}} = 4.95$, SD = 1.69).

4.3. Hypotheses testing

The main argument of the present study is that, for consumers with less than accurate calorie count estimates, the perceived healthfulness of restaurants serves as a cue to influence the effect of the calorie information disclosure on consumers' behavioral changes in overt food choices and underlying psychological processes. Two-way Multivariate Analysis of Covariance (MANCOVA) was conducted to test the hypotheses. Perceived healthfulness of restaurants (1 = healthful vs. 2 = unhealthful) and the disclosure of calorie information (1 = present vs. 2 = absent) were included as independent variables while participants' calorie counts, feeling of conflict, and need for self-control were dependent variables. Health concern, weight control, and level of hunger were included as co-variates in the data analysis. Results of MANCOVA (Wilks' Lambda = .95, $F_{(3,168)} = 2.82$, $p < .05$) showed a statistically significant interaction effect of restaurants' healthfulness and calorie information disclosure.

4.3.1. Interaction effects on food choices

Hypothesis 1 proposed that there would be differential effects of calorie information disclosure on food choices at quick service restaurants of varying levels of perceived healthfulness. No main effects were detected for the perceived healthfulness of the restaurant ($F_{(1,170)} = 1.10$, $p = .30$) or the disclosure of calorie information ($F_{(1,170)} = .35$, $p = .55$). However, a significant interaction effect was found between the perceived restaurant healthfulness and the disclosure of calorie information on consumers' food choices ($F_{(1,170)} = 4.68$, $p < .05$). As expected (see Table 1), in a restaurant perceived as healthful, people with access to calorie information chose food items with significantly lower calorie counts than those without such information ($M_{\text{Healthful\_calorie}} = 618.54$, SD = 253.75 vs. $M_{\text{Healthful\_no calorie}} = 714.89$, SD = 313.00). In contrast, in a restaurant perceived as unhealthful, while difference in calorie counts between the two disclosure groups was in the predicted direction, the difference failed to reach the conventional levels of significance ($M_{\text{Unhealthful\_calorie}} = 668.33$, SD = 275.65 vs. $M_{\text{Unhealthful\_no calorie}} = 612.40$, SD = 233.94). Overall, Hypothesis 1 was partially supported, indicating that the disclosure of calorie information has differential effects on food choices at quick service restaurants of varying levels of perceived healthfulness. The interaction effect is shown in Fig. 1.

Table 1
Means and standard deviations for calorie counts across groups.

Healthfulness	Calorie info	Mean	SD
Healthful	With calorie info	618.54	253.75
	Without calorie info	714.89	313.00
Unhealthful	With calorie info	668.33	275.65
	Without calorie info	612.40	233.94

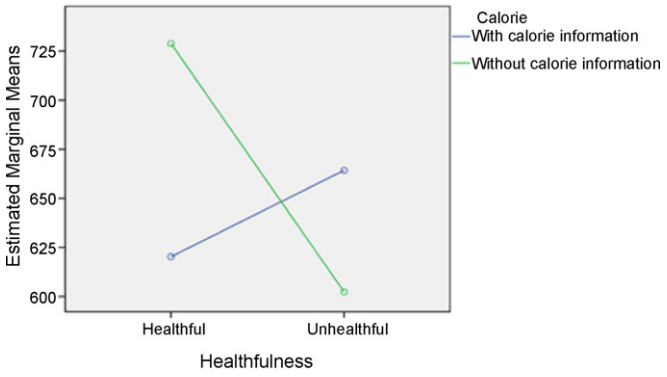

Fig. 1. Interaction effect on calorie counts.

4.3.2. Interaction effects on psychological variables

Hypotheses 2 and 3 suggested that there would be differential effects of calorie information disclosure on consumers' feeling of conflict and need for self-control at quick service restaurants of varying levels of perceived healthfulness. While no significant main effects were observed for the perceived healthfulness of the restaurant ($F_{(1,170)} = .04$, $p = .85$) or the disclosure of calorie information ($F_{(1,170)} = .03$, $p = .86$) on consumers' feeling of conflict, results revealed a marginally significant interaction effect of restaurants' healthfulness and calorie information disclosure ($F_{(1,170)} = 2.87$, $p = .09$). At a perceived healthful restaurant, the disclosure of calorie information increased consumers' feeling of conflict ($M_{\text{Healthful\_calorie}} = 3.43$, SD = 1.84 vs. $M_{\text{Healthful\_no calorie}} = 2.99$, SD = 1.63). Conversely, at a restaurant perceived as unhealthful, the disclosure of calorie information reduced consumers' feeling of conflict ($M_{\text{Unhealthful\_calorie}} = 2.84$, SD = 1.50 vs. $M_{\text{Unhealthful\_no calorie}} = 3.21$, SD = 1.68) (see Table 2). Overall, results supported Hypothesis 2 predicting that calorie information disclosure has differential effects on feeling of conflict at quick service restaurants of varying levels of perceived healthfulness. The interaction effect is shown in Fig. 2.

Table 2
Means and standard deviations for feeling of conflict across groups.

Healthfulness	Calorie info	Mean	SD
Healthful	With calorie info	3.43	1.84
	Without calorie info	2.99	1.63
Unhealthful	With calorie info	2.84	1.50
	Without calorie info	3.21	1.68

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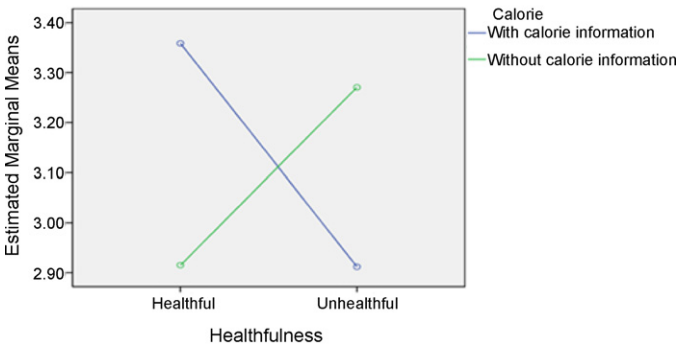

Fig. 2. Interaction effect on feeling of conflict.

MANCOVA results showed a marginally significant main effect of perceived restaurant healthfulness ($F_{(1,170)} = 3.29, p < .10$) on consumers' need for self-control. However, no significant main effect of calorie information disclosure ($F_{(1,170)} = .03$, $p = .86$) or interaction effect between the perceived healthfulness of the restaurant and calorie information disclosure ($F_{(1,170)} = 1.21$, $p = .27$) was observed on consumers' need for self-control. Therefore, Hypothesis 3 was not supported.

5. Conclusions and discussion

Obesity-related issues have resulted in a variety of direct and indirect costs (Finkelstein et al., 2010). Given the need to implement effective policies to reduce the obesity rate and food-related health risks, the current research provided important insights into how consumers without accurate prior knowledge of calorie information react to calorie information disclosure at quick service restaurants. In an experimental study using real menu boards as stimuli, the current research explored the joint effects of perceived healthfulness of a restaurant and the disclosure of calorie information on consumers' behavioral changes in overt food choices and underlying psychological processes. Results showed that for consumers with less than accurate prior knowledge of calorie information about menu items at restaurants perceived as healthful, the calorie counts of food choices made by consumers with calorie information were significantly lower than those without such information. At restaurants perceived as unhealthful, while consumers with calorie information tended to choose menu items with higher calorie counts than those without such information, the difference between the two groups was negligible. Furthermore, upon exposure to calorie information, consumers reported a greater sense of conflict experienced at healthful restaurants while the sense of conflict was subdued at unhealthful restaurants. The current research found no statistically significant interaction effect of perceived healthfulness of a restaurant and calorie information disclosure on consumers' need for self-control. However, the perceived restaurant healthfulness was found to exert a marginally significant effect on the need for self-control.

5.1. Theoretical implications

The present research contributes to menu labeling literature in several important ways. First, from a methodological perspective, the research extends previous studies by employing real full menu boards as the experimental stimuli to directly evaluate consumers' food choices. The use of full menu boards simulates a naturalistic setting to examine the effect of calorie information disclosure on food choices in an experimental environment. The study was made as unobtrusive as possible and participants were not sensitized by the research design to link the calorie information with their subsequent food choices. The use of full menu boards also addresses the drawbacks of previous studies that used calorie estimates as a proxy of food choice measurements or evaluated food choices from a limited number of food items (Burton et al., 2006; Tangari et al., 2010).

Second, the present research answers the call by Pan and Zinkhan (2006) to examine how store patronage and food choices are influenced by the provision of calorie information for an entire menu of a restaurant chain. The study also addresses Maher et al.'s (2010) call to better understand potential factors that affect the relationship between calorie information disclosure and consumers' food choices. The present research adds new knowledge to menu labeling literature by examining the effect of perceived healthfulness of restaurants on the relationship between the calorie information disclosure and food choices, as well as underlying psychological processes. The differential effects observed in restaurants of varying levels of perceived healthfulness suggest that perceived healthfulness is a significant factor that interplays with calorie information disclosure to influence consumers' food choices. While debate over the effectiveness of menu labeling is ongoing, the study provides empirical evidence that effects of menu labeling on food choices should be examined with a host of intervening factors.

Third, the present research makes an important link between calorie information disclosure and consumer learning. The developmental concepts of concept-driven processing and data-driven processing (Bobrow and Norman, 1975) was used to explore the effect of calorie information disclosure on food choices among a population not yet fully exposed to calorie information at restaurants. Results show that the perception of restaurants healthfulness has a strong influence on food choices, likely due to inaccurate calorie estimates made by not well-informed consumers. Previous research made a distinction between one-time use and extended use of menu labeling information (Grunert and Wils, 2007). While the findings from the present study can be best described as one-time use of calorie information by a population unfamiliar with such information, extended use of calorie information will likely facilitate consumer learning and mitigate the effect of perceived healthfulness of restaurants on food choices over time. Therefore, examining the impact of calorie information disclosure from a consumer learning perspective offers some unique and important insights into the long-term impact of calorie information disclosure on eating patterns.

5.2. Practical implications

As the current research addresses a policy-relevant consumer behavior issue, the findings have important implications for public policy makers, restaurant managers, and consumers. For public policy makers, the results suggest that disclosure of calorie information can help consumers make more informed decisions, although such decisions may not be always optimal. As the study shows, consumers with less than accurate knowledge of calorie information often make biased estimates based on health claims made by restaurants. Prior research suggests that consumers do not require very convincing evidence to start believing what advertisers tell them (Hoch and Ha, 1986). Making objective calorie information accessible to the general public will elicit data-driven processing when consumers make food choices and reduce the reliance on concept-driven processing based mainly on advertising claims.

The mandated disclosure of calorie/nutrition information at restaurants is perceived as impractical and anti-commercial, robustly opposed by the restaurant industry (Chandon and Wansink, 2007). Restaurant operators' major concern of calorie information disclosure is the potential decrease in sales. The

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present research shows that the calorie counts of the food choices made by consumers upon exposure to calorie information in restaurants perceived as less healthful are actually higher than those without the calorie information. This result may imply that the disclosure of calorie information does not necessarily lead to decreased sales. Given the social trend toward a healthy lifestyle, a strategic focus on food and its impact on health will make restaurant operations more sustainable in the long term.

Selecting food is one of the most common and mundane decisions consumers make several times each day. The present research offers several important messages to consumers. First, consumers should not solely rely on perceived healthfulness of a restaurant to make calorie inferences. Consumers are advised to pay more attention to each individual menu item rather than rely on perceived healthfulness of a restaurant to make food choices. Second, the present research shows that calorie information disclosure helps consumers make more informed decisions about food. While calorie information disclosure does not necessarily lead to healthier food choices, objective calorie information helps consumers accurately assess menu items and make food choices to fulfill needs for both health and indulgence. Third, accurate assessment of calorie content will make food consumption a more enjoyable experience for consumers. To resolve the conflict between wanting to be healthy and wanting to satisfy one's appetite in favor of the long-term health goal is often difficult and cognitively taxing (Finkelstein and Fishbach, 2010). Less self-conflict experienced with the calorie information disclosure can facilitate the decision-making process directed at satisfying different goals such as taste and nutritional value and make the dining experience more enjoyable.

6. Limitations and directions for future research

Several limitations of the current research warrant consideration and provide suggestions for future studies. The first limitation concerns the sample used in this research. Although follow-up analysis showed that participants demonstrated similar behavioral tendencies across gender groups, results reported may have been potentially biased toward the demographic strata over-represented. In addition, Caucasians and people who are fairly well educated were over-represented in the sample. It can be an avenue for future studies to examine how the interpretation of menu labels may differ by consumers' socio-economic status and education levels and affect the relationship between the disclosure of menu labels and consumers' food choices. For instance, previous research suggested that people with low income and low education level demonstrated high price sensitiveness to prescription drugs (Lundberg et al., 1998). It is likely that consumers with a lower socio-economic status and education level tend to be more sensitive to food price than disclosed calorie counts and thus. It is possible that their concern of food price may diminish the effect of disclosed calorie information on food choices.

The second limitation is related to the context of the study. The study used quick service chain-affiliated restaurants as the context to empirically test the relationship between calorie information disclosure and food choices. Therefore, generalization of the results to other restaurant segments such as fine-dining restaurants and stand-alone restaurants should be made with caution. Replication of the study in other restaurant contexts can verify the robustness of the results and provide a better understanding of the phenomenon.

The third limitation of the study was that consumers' food choices were only assessed in a single consumption episode. While results showed the short-term effect of disclosed calorie information on food choices, the present research is unable to capture the long-term effects on consumers' food choices as consumers become more knowledgeable about calorie contents of menu items as a result of calorie information disclosure at restaurants. Longitudinal research will provide better understanding of the long-term effects of calorie information disclosure on public health.

Finally, another limitation centers on the scenario-based experimental design used in the present study. A scenario-based approach allows researchers to manipulate variables of interest, to plausibly make a causal inference (Bitner, 1990), and to maximize the internal validity (Chan and Wan, 2008). However, it should be recognized that real situations with the presence of various restaurant stimuli such as smell and visual cues are more involving, and the likelihood to respond in such situations is likely to be higher than in response to scenarios (Argo et al., 2006). As a result, consumers' ability for self-control, desire for indulgence and food choices may differ. Future research may want to use field studies to examine how the disclosure of menu labels may influence consumers' actual food choices at restaurants.

In conclusion, the current research contributes to the growing stream of literature focusing on food-related health risks. By providing a better understanding of consumers' reactions to disclosed calorie information, the current research offers important implications for policymakers, consumers, and restaurant managers. Future studies that replicate and extend the current research will offer better understanding of this important issue and provide guidelines for effective public health policies.

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Appendix. Menu boards

1. Healthful category

a. Panera

With calorie information

Without calorie information

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b. Subway

With calorie information

Without calorie information

2. Unhealthful category

a. McDonald's

With calorie information

Without calorie information

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b. Wendy's

With calorie information

Without calorie information

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