

Parents' meal choices for their children at fast food and family restaurants with different menu labeling presentations

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BACKGROUND/OBJECTIVES: This study examined the effect of nutrition labeling formats on parents' food choices for their children at different restaurant types.

SUBJECTS/METHODS: An online survey was conducted with 1,980 parents of children aged 3-12 years. Participants were randomly assigned to fast food or family restaurant scenarios, and one of four menu stimuli conditions: no labeling, low-calorie symbol (symbol), numeric value (numeric), and both low-calorie symbol and numeric value (symbol + numeric). Participants selected menu items for their children. Menu choices and total calories were compared by nutrition labeling formats in each type of the restaurant.

RESULTS: Low-calorie item selections were scored and a two-way analysis of variance (ANOVA) was conducted for an interaction effect between restaurant and labeling type. In the fast food restaurant group, parents presented with low-calorie symbols selected the lowest calorie items more often than those not presented with the format. Parents in the symbol + numeric condition selected significantly fewer calories (653 kcal) than those in the no labeling (677 kcal) or numeric conditions (674 kcal) ($P = 0.006$). In the family restaurant group, no significant difference were observed among different labeling conditions. A significant interaction between restaurant and labeling type on low-calorie selection score ($F = 6.03$, $P < 0.01$) suggests that the effect of nutrition labeling format interplays with restaurant type to jointly affect parents' food choices for their children.

CONCLUSIONS: The provision of easily interpretable nutritional information format at fast food restaurants may encourage healthier food choices of parents for their children; however, the effects were negligible at family restaurants.

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INTRODUCTION

Childhood obesity has become a prominent public health concern worldwide and the increasing consumption of food away from home has been linked to rising childhood obesity rates [1-5]. To reduce excessive calorie intake and encourage healthier food choices of children at restaurants, many national level initiatives have been proposed including mandatory nutritional information disclosure at restaurants. In South Korea, the Special Act on Safety Management of Children's Dietary Life was passed in 2008. It includes the provision of calorie and nutrient information on children's menus at restaurants. This act stipulates that any restaurant chain with 100 or more units nationally has a duty to disclose nutritional information [6].

Several studies were conducted on the effects of nutrition labeling in restaurants in South Korea; however, the studies were limited to consumers' attitudes, awareness, and satisfaction [7-9]. Many studies abroad have examined the effectiveness of disclosing nutritional information at restaurants. While some studies presented empirical evidence demonstrating positive effects of nutritional information on consumers' healthier food

choices [10-13], there are other studies reporting no significant difference in calorie intakes [14-18]. Some systematic reviews have also reported mixed findings about the effect of nutritional labeling at restaurants [19-21]. These varied results imply there are potential factors that may interplay with nutritional information disclosure on affecting consumers food choices.

The type of restaurant is considered one of the factors affecting food choices with disclosed nutritional information. In general, consumers pursue more utilitarian values at limited service restaurants (e.g., fast food), which involves an economical and functional view of consumption. On the other hand, consumers pursue more hedonic values at table service restaurants (e.g., family restaurants), in which consumers value experiential benefits [22]. It is well known that utilitarian value-seeking consumers pay attention to detailed aspects of products and hedonic value-seeking consumers to abstract and experiential information [23]. Hence, we can assume that consumers visiting limited service restaurants are more likely to carefully consider information about menu items when selecting foods than consumers visiting table service restaurants are. However, it can also be argued that consumers visit fast food restaurants with

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low expectation on food quality, thus less attention will be paid to menu information.

Consumers perceive fast foods to be less healthful than foods served at upper-level restaurants. The perceived healthfulness of restaurants has been discussed as an accessible cue to predict consumers' food choices [24-26]. Chandon and Wansink [25] examined the effect of the perceived healthfulness of fast food restaurants on consumers' calorie estimation and food selection. Accordingly, the effects of menu labeling format may differ in full-service restaurants versus fast food restaurants. It is well recognized that the nutritional information format has a significant impact on customers' buying behavior [10, 27-29]. Liu *et al.* found that rank-ordered and colored-calorie menu format led to fewer caloric items ordered compared to the no calorie information or only calorie information group [27]. A traffic light information was also found to influence customers' fast food selections toward lower calorie items [29]. However, research on the interaction effect of restaurant type and nutritional information format on food selection is limited.

It is important to understand the role of restaurant type and nutritional information format on food selection, especially on parents. Parents influence their children's eating behaviors from birth and still influence their food selection by helping them choose foods or selecting foods directly for children to eat [30,31]. Besides, menu labeling effects on parental decision-making differ depending on whether the parents are ordering for themselves or their children [11]. However, few studies have investigated the influence of different types of nutritional labeling on parents' meal choices for their children, including how parents response to different types of restaurants.

Based on the above arguments, we developed the following research questions; there will be differential effects of nutritional information formats on food choices of parents for their children at different types of restaurants. Therefore, the present study examined the effect of four different levels of nutritional information formats on parental food choices for their children in two types of restaurants; fast food and family restaurants.

SUBJECTS AND METHODS

Study design and subjects

Previous studies [27,29] used a scenario-based experimental design to investigate the effects of different menu labeling. Thus, we employed a 2 (restaurant type: fast food vs. family restaurants) × 4 (labeling type) scenario-based experimental design. Labeling conditions were: (1) no labeling (No labeling); (2) low-calorie symbol (symbol); (3) numeric value (numeric); and (4) both low-calorie symbol and numeric value (symbol + numeric).

Participants were recruited from consumer panels of a research company in South Korea. They consisted of parents to children aged between 3-12 years, who dined with their children at fast food or family restaurants at least once a month in the past 3 months. An email with an embedded survey link directed participants who met the criteria to the experimental condition. Participants were evenly and randomly assigned to either the fast food or the family restaurant scenario, and to one of the four labeling conditions of each type of restaurant.

Participants were asked to project themselves into a situation at a restaurant when they were ready to order a meal (one main dish, one side dish, and one beverage) for their children and to respond to a series of questions. A total of 2,237 were participated in the survey, of which the answers of 1,980 participants (993 for fast food restaurants and 987 for family restaurants) were analyzed after excluding incomplete and inconsistent questionnaires. The survey was conducted from March 31, 2014 to April 14, 2014. The study protocol was reviewed and approved by the Institutional Review Board of Myongji University (MJU-2014-03-001-01).

Stimuli (menu) development

We developed a menu comprising of five items for each menu category of main dish, side dish, and beverage, with 15 items in total. Participants could select one item in each menu category at a fixed price. To provide a more naturalistic setting for the experiment, the menu included items for children that are typically sold at fast food restaurants (e.g., Lotteria, McDonald, Burger King, Popeyes, and KFC) and family restaurants (e.g., Bannigan's, Outback Steakhouse, and TGI Fridays) in South Korea. Menus were designed by a professional menu designer and all menu items, except beverages, included brief descriptions.

Numeric values were presented for all items per portion: calories (kcal), sugar (g), protein (g), saturated fat (g), and sodium (mg), all of which are required by law to be presented on menus at restaurants with more than 100 units in South Korea [6]. The nutritional information was obtained from the websites of the fast-food and family restaurant chains. For the condition including low-calorie symbols, a symbol indicating "low calorie" was added besides the lowest calorie item within each menu category (main dishes, side dishes, and beverages).

Measures

The questionnaire included questions regarding the participants' general characteristics (gender, age, educational level, occupation type, and monthly household income). The total calorific load of selected items was calculated by adding together their calorie values. In addition, we devised a "low calorie selection score" to evaluate the effects of different calorie labeling in inducing consumers to choose the lowest calorie menus. The low calorie selection score was graded in a way that parents earned 1 point per one lowest calorie item, selected from each category. Because the menu stimulus had three categories, the possible score of low calorie selection ranged from 0 to 3. To test the assumption that parents will perceive fast foods to be less healthful than foods at family restaurants, this study measured perception of healthfulness of foods offered at the restaurant in stimuli (1 = strongly disagree to 7 = strongly agree).

Statistical analysis

All statistical analyses were conducted using SPSS 21.0 for Windows. Variables were compared between the groups using the χ^2 test, independent *t*-test or ANOVA (analysis of variance) and post hoc test. For a direct comparison of restaurant type and labeling type, a two-way ANOVA was conducted for the low calorie selection score. The results were presented as frequency and percentage or average and standard deviation.

Table 1. Demographic characteristics of subjects

| | Restaurant type (n = 1,980) | | | | Fast food restaurant (n = 993) | | | | Family restaurant (n = 987) | | | | |
|--|-----------------------------|---------------------|-----------------------|--------------------------|--------------------------------|----------------------|----------------------------------|-----------------------|-----------------------------|---------------------|----------------------|----------------------------------|-----------------------|
| | Fast food (n = 993) | Family (n = 987) | P-value ¹⁾ | No labeling (n = 255) | Symbol (n = 244) | Numeric (n = 242) | Symbol + numeric (n = 252) | P-value ¹⁾ | No labeling (n = 250) | Symbol (n = 247) | Numeric (n = 246) | Symbol + numeric (n = 244) | P-value ¹⁾ |
| Gender | | | | | | | | | | | | | |
| Male | 494 (49.7) | 492 (49.8) | 0.965 | 127 (49.8) | 120 (49.2) | 122 (50.4) | 125 (49.6) | 0.994 | 125 (50.0) | 122 (49.4) | 125 (50.8) | 120 (49.2) | 0.984 |
| Female | 499 (50.3) | 495 (50.2) | | 128 (50.2) | 124 (50.8) | 120 (49.6) | 127 (50.4) | | 125 (50.0) | 125 (50.6) | 121 (49.2) | 124 (50.8) | |
| Age | 38.9 ± 4.4 | 38.7 ± 4.4 | 0.342 | 38.7 ± 4.5 | 38.9 ± 4.3 | 39.1 ± 4.1 | 40.0 ± 4.5 | 0.725 | 38.8 ± 4.46 | 38.7 ± 4.44 | 38.7 ± 4.30 | 38.6 ± 4.58 | 0.961 |
| Education level | | | | | | | | | | | | | |
| ≤ High school | 166 (16.7) | 154 (15.6) | 0.785 | 43 (16.9) | 33 (13.5) | 47 (19.4) | 43 (17.1) | 0.598 | 38 (15.2) | 37 (15.0) | 43 (17.5) | 36 (14.8) | 0.881 |
| College graduate | 730 (73.5) | 733 (74.3) | | 191 (74.9) | 183 (75.0) | 170 (70.2) | 186 (73.8) | | 190 (76.2) | 187 (75.7) | 176 (71.5) | 180 (73.8) | |
| ≥ Graduate school | 97 (9.8) | 100 (10.1) | | 21 (8.2) | 28 (11.5) | 25 (10.3) | 23 (9.1) | | 22 (8.8) | 23 (9.3) | 27 (11.0) | 28 (11.5) | |
| Occupation type | | | | | | | | | | | | | |
| Office job | 559 (56.3) | 545 (55.2) | 0.610 | 149 (58.4) | 139 (57.0) | 137 (56.6) | 134 (53.2) | 0.554 | 130 (52.0) | 135 (54.7) | 147 (59.8) | 133 (54.5) | 0.225 |
| Owner-operator | 61 (6.1) | 67 (6.8) | | 18 (7.1) | 16 (6.6) | 14 (5.8) | 13 (5.2) | | 24 (9.6) | 15 (6.1) | 9 (3.7) | 19 (7.8) | |
| Service industry | 39 (3.9) | 53 (5.4) | | 7 (2.7) | 9 (3.7) | 10 (4.1) | 13 (5.2) | | 20 (8.0) | 14 (5.7) | 10 (4.1) | 9 (3.7) | |
| Specialized job | 65 (6.5) | 54 (5.5) | | 19 (7.5) | 12 (4.9) | 18 (7.4) | 16 (6.3) | | 10 (4.0) | 13 (5.3) | 15 (6.1) | 16 (6.6) | |
| Homemaker | 243 (24.5) | 242 (24.5) | | 51 (20.0) | 61 (25.0) | 60 (24.8) | 71 (28.2) | | 57 (22.8) | 63 (25.5) | 62 (25.2) | 60 (24.6) | |
| Others | 26 (2.6) | 26 (2.6) | | 11 (4.3) | 7 (2.9) | 3 (1.2) | 5 (2.0) | | 9 (3.6) | 7 (2.8) | 3 (1.2) | 7 (2.9) | |
| Monthly household income (10,000 won/month) | 479.3 ± 464.2 | 475.8 ± 365.1 | 0.851 | 525.4 ± 654.6 | 495.7 ± 494.2 | 450.2 ± 208.5 | 444.9 ± 367.8 | 0.161 | 445.2 ± 174.4 | 450.4 ± 169.3 | 507.3 ± 521.3 | 501.1 ± 450.9 | 0.113 |

¹⁾ P-value by χ^2 -test or analysis of variance

RESULTS

Participants' characteristics and perception of healthfulness

Participants' general characteristics are presented in Table 1. The gender composition of the participants was 49.8% male and 50.2% female. The average age of participants was 38.8 years. No significant differences were found in gender, age, educational level, occupation type, and monthly household income by the restaurant type and the labeling type.

Participants' perception of healthfulness of foods at fast food restaurants was lower ($M = 3.77$) than foods at family restaurants ($M = 4.52$) ($P < 0.001$).

Menu choices according to labeling type

Table 2 and Table 3 show participants' menu choices for their children. In fast food restaurants, the menu choice of main dishes was significantly different among different labeling types ($P = 0.018$). The choice of the lowest calorie menu (chicken

Table 2. Menu choices in fast food restaurant according to labeling types

(n = 993)

| Menu | No labeling (n = 255) | Symbol (n = 244) | Numeric (n = 242) | Symbol + numeric (n = 252) | Total (n = 993) | P-value ¹⁾ |
|---|--------------------------|---------------------|----------------------|-------------------------------|--------------------|-----------------------|
| Main dish | | | | | | |
| Fried chicken (520.4 kcal) | 11 (4.3) | 11 (4.5) | 14 (5.8) | 15 (6.0) | 51 (5.1) | 0.018 |
| Shrimp burger (436.5 kcal) | 35 (13.7) | 44 (18.0) | 34 (14.0) | 30 (11.9) | 143 (14.4) | |
| <i>Bulgoji</i> burger (387 kcal) | 150 (58.8) | 117 (48.0) | 140 (57.9) | 139 (55.2) | 546 (55.0) | |
| Chicken burger (382 kcal) | 46 (18.0) | 40 (16.4) | 43 (17.8) | 40 (15.9) | 169 (17.0) | |
| Chicken tortilla wrap (345.2 kcal) | 13 (5.1) | 32 (13.1) | 11 (4.5) | 28 (11.1) | 84 (8.5) | |
| Side dish | | | | | | |
| French fries (236 kcal) | 127 (49.8) | 113 (46.3) | 111 (45.9) | 111 (44.0) | 462 (46.5) | 0.137 |
| Biscuit (196.2 kcal) | 8 (3.1) | 7 (2.9) | 10 (4.1) | 6 (2.4) | 31 (3.1) | |
| Cheese sticks (146 kcal) | 77 (30.2) | 75 (30.7) | 82 (33.9) | 76 (30.2) | 310 (31.2) | |
| Coleslaw (132 kcal) | 23 (9.0) | 19 (7.8) | 15 (6.2) | 14 (5.6) | 71 (7.2) | |
| Fruit cup (48 kcal) | 20 (7.8) | 30 (12.3) | 24 (9.9) | 45 (17.9) | 119 (12.0) | |
| Beverage | | | | | | |
| Milk (134.4 kcal) | 28 (11.0) | 26 (10.7) | 37 (15.3) | 27 (10.7) | 118 (11.9) | 0.084 |
| Ade (113.8 kcal) | 34 (13.3) | 31 (12.7) | 27 (11.2) | 26 (10.3) | 118 (11.9) | |
| Soda (95.9 kcal) | 91 (35.7) | 79 (32.4) | 73 (30.2) | 75 (29.8) | 318 (32.0) | |
| Fruit juice (88.5 kcal) | 95 (37.3) | 87 (35.7) | 92 (38.0) | 98 (38.9) | 372 (37.5) | |
| Zero calorie soda (0 kcal) | 7 (2.7) | 21 (8.6) | 13 (5.4) | 26 (10.3) | 67 (6.7) | |

¹⁾ P-value by χ^2 -test

Menu items with the lowest calories in each category are in bold. These items have the low-calorie symbol in the stimuli of 'symbol' and 'symbol + numeric.'

Table 3. Menu choices in family restaurant according to labeling types

(n = 987)

| Menu | No labeling (n = 250) | Symbol (n = 247) | Numeric (n = 246) | Symbol + numeric (n = 244) | Total (n = 987) | P-value ¹⁾ |
|-----------------------------------|--------------------------|---------------------|----------------------|-------------------------------|--------------------|-----------------------|
| Main dish | | | | | | |
| Chicken wings (782 kcal) | 5 (2.0) | 7 (2.8) | 6 (2.4) | 4 (1.6) | 22 (2.2) | 0.160 |
| Barbecue pork ribs (560 kcal) | 53 (21.2) | 53 (21.5) | 72 (29.3) | 59 (24.2) | 237 (24.0) | |
| Tomato spaghetti (418 kcal) | 31 (12.4) | 45 (18.2) | 33 (13.4) | 39 (16.0) | 148 (15.0) | |
| Fried rice (400 kcal) | 28 (11.2) | 27 (10.9) | 28 (11.4) | 40 (16.4) | 123 (12.5) | |
| Chop steak (309 kcal) | 133 (53.2) | 115 (46.6) | 107 (43.5) | 102 (41.8) | 457 (46.3) | |
| Side dish | | | | | | |
| French fries (463 kcal) | 124 (49.6) | 106 (42.9) | 101 (41.1) | 115 (47.1) | 446 (45.2) | 0.018 |
| Grilled vegetable (193 kcal) | 19 (7.6) | 17 (6.9) | 24 (9.8) | 36 (14.8) | 96 (9.7) | |
| Onion ring (183 kcal) | 11 (4.4) | 18 (7.3) | 21 (8.5) | 7 (2.9) | 57 (5.8) | |
| Roasted potato (176 kcal) | 40 (16.0) | 37 (15.0) | 42 (17.1) | 36 (14.8) | 155 (15.7) | |
| Yogurt salad (144 kcal) | 56 (22.4) | 69 (27.9) | 58 (23.6) | 50 (20.5) | 233 (23.6) | |
| Beverage | | | | | | |
| Milk (134.4 kcal) | 21 (8.4) | 23 (9.3) | 15 (6.1) | 17 (7.0) | 76 (7.7) | 0.326 |
| Ade (113.8 kcal) | 46 (18.4) | 48 (19.4) | 61 (24.8) | 52 (21.3) | 207 (21.0) | |
| Soda (95.9 kcal) | 29 (11.6) | 38 (15.4) | 35 (14.2) | 38 (15.6) | 140 (14.2) | |
| Fruit juice (88.5 kcal) | 149 (59.6) | 128 (51.8) | 126 (51.2) | 123 (50.4) | 526 (53.3) | |
| Zero calorie soda (0 kcal) | 5 (2.0) | 10 (4.0) | 9 (3.7) | 14 (5.7) | 38 (3.9) | |

¹⁾ P-value by χ^2 -test

Menu items with the lowest calories in each category are in bold. These items have the low-calorie symbol in the stimuli of 'symbol' and 'symbol + numeric.'

tortilla wrap in the current study) showed irregularities. In conditions with low-calorie symbols, the percentage of choice was higher (13.1% with low-calorie symbol and 11.1% with low-calorie symbol and numeric value). In conditions without low-calorie symbol, the percentage of choice remained approximately 5%. Similar tendencies were observed in side dishes and beverages, yet there were no significant differences. For example, the fruit cup (the lowest calorie menu in the side dishes category) was chosen more than twice in the condition with low-calorie symbol and numeric values (17.9%) than in the condition without any information (7.8%).

In the family restaurant, the menu choice of side dishes was significantly different among different labeling types ($P = 0.018$). The choice of the lowest calorie menu (yogurt salad in the current study) in the low-calorie symbol condition (27.9%) was relatively higher than in other conditions. However, no significant differences were observed in main dishes and beverages.

When we compared the difference in choices of the lowest calorie item in each menu category according to labeling type and restaurant type, the differences became apparent. In the fast food restaurant, the frequencies of the lowest calorie menu selection varied significantly in all menu categories ($P = 0.001$ in main dishes, $P = 0.004$ in side dishes, and $P = 0.003$ in beverages) whereas no significant differences were observed among different labeling conditions in family restaurant (Table 4).

The means of low calorie selection scores are plotted in Fig. 1. Although the means of low calorie selection scores (indicated as M) of all the groups were less than 1.0 point, the result of two-way ANOVA showed a significant interaction effect ($F = 6.03$, $P < 0.001$) between restaurant type and labeling type on low calorie selection scores. Parents who saw low calorie symbols on fast food restaurant menus were more likely to choose the lowest calorie items ($M_{\text{no labeling}} = 0.16$, $M_{\text{symbol}} = 0.34$,

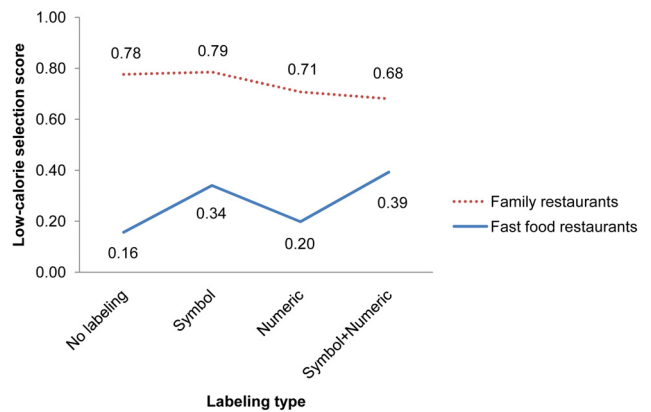


Fig. 1. Low calorie selection scores

$M_{\text{numeric}} = 0.20$, $M_{\text{symbol+numeric}} = 0.39$). The highest low calorie selection score was found with parents in the condition showing both symbol and numeric information. However, parents who saw family restaurant menus did not have different food selections by labeling type ($M_{\text{no labeling}} = 0.78$, $M_{\text{symbol}} = 0.79$, $M_{\text{numeric}} = 0.71$, $M_{\text{symbol+numeric}} = 0.68$). The lowest low calorie selection score was found in the condition that showed both symbolic and numerical information, which was contrary to the results shown in fast food restaurants.

Calorie selected

Calories selected according to labeling type are shown in Table 5. The total calories in the fast food restaurant significantly varied according to labeling type ($P = 0.006$). When numeric values as well as low-calorie symbols were offered, participants selected a meal with a lower caloric content (653.1 kcal) than

Table 4. Choices of the lowest calorie menu in each menu category according to labeling types

| Menu category | Menu choice | Fast food restaurant (n = 993) | | | | P-value ¹⁾ | Family restaurant (n = 987) | | | | P-value ¹⁾ |
|---------------|---------------------|--------------------------------|------------------|-------------------|----------------------------|-----------------------|-----------------------------|------------------|-------------------|----------------------------|-----------------------|
| | | No labeling (n = 255) | Symbol (n = 244) | Numeric (n = 242) | Symbol + numeric (n = 252) | | No labelling (n = 250) | Symbol (n = 247) | Numeric (n = 246) | Symbol + numeric (n = 244) | |
| Main dish | Lowest calorie menu | 13 (5.1) | 32 (13.1) | 11 (4.5) | 28 (11.1) | 0.001 | 133 (53.2) | 115 (46.6) | 107 (43.5) | 102 (41.8) | 0.056 |
| | Other menus | 242 (94.9) | 212 (86.9) | 231 (95.5) | 224 (88.9) | | 117 (46.8) | 132 (53.4) | 139 (56.5) | 142 (58.2) | |
| Side dish | Lowest calorie menu | 20 (7.8) | 30 (12.3) | 24 (9.9) | 45 (17.9) | 0.004 | 56 (22.4) | 69 (27.9) | 58 (23.6) | 50 (20.5) | 0.253 |
| | Other menus | 235 (92.2) | 214 (87.7) | 218 (90.1) | 207 (82.1) | | 194 (77.6) | 178 (72.1) | 188 (76.4) | 194 (79.5) | |
| Beverage | Lowest calorie menu | 7 (2.7) | 21 (8.6) | 13 (5.4) | 26 (10.3) | 0.003 | 5 (2.0) | 10 (4.0) | 9 (3.7) | 14 (5.7) | 0.194 |
| | Other menus | 248 (97.3) | 223 (91.4) | 229 (94.6) | 226 (89.7) | | 245 (98.0) | 237 (96.0) | 237 (96.3) | 230 (94.3) | |

¹⁾ P-value by χ^2 -test

Table 5. Calorie selected according to labeling types

| Menu category | Fast food restaurant (n = 993) | | | | P-value ¹⁾ | Family restaurant (n = 987) | | | | P-value ¹⁾ |
|---------------|--------------------------------|----------------------------|---------------------------|----------------------------|-----------------------|-----------------------------|------------------|-------------------|----------------------------|-----------------------|
| | No labeling (n = 255) | Symbol (n = 244) | Numeric (n = 242) | Symbol + numeric (n = 252) | | No labelling (n = 250) | Symbol (n = 247) | Numeric (n = 246) | Symbol + numeric (n = 244) | |
| Main dish | 396.5 ± 33.3 ²⁾ | 395.6 ± 37.5 | 398.9 ± 36.4 | 395.4 ± 38.5 | 0.707 | 395.4 ± 113.2 | 406.1 ± 116.5 | 419.0 ± 120.0 | 407.5 ± 109.8 | 0.147 |
| Side dish | 183.4 ± 59.1 | 176.0 ± 64.3 | 178.8 ± 61.0 | 168.6 ± 69.7 | 0.065 | 312.8 ± 150.0 | 291.9 ± 149.4 | 288.5 ± 146.7 | 207.4 ± 148.0 | 0.199 |
| Beverage | 97.1 ± 21.9 ^c | 91.4 ± 31.5 ^{ab} | 95.8 ± 27.9 ^{bc} | 89.1 ± 33.5 ^a | 0.006 | 96.1 ± 20.0 | 95.2 ± 24.6 | 95.4 ± 23.2 | 93.2 ± 26.9 | 0.556 |
| Total | 677.1 ± 70.6 ^b | 663.0 ± 92.1 ^{ab} | 673.5 ± 79.3 ^b | 653.1 ± 93.7 ^a | 0.006 | 804.3 ± 186.6 | 793.2 ± 186.9 | 802.9 ± 189.2 | 810.4 ± 178.9 | 0.782 |

¹⁾ P-value by analysis of variance

²⁾ Values in the same row with different superscripted letters are significantly different at $P < 0.05$ using analysis of variance and Duncan's multiple range test.

when they had not been given any information (677.1 kcal) or when just numeric values were provided (673.5 kcal). Among menu categories, calories selected in beverages varied according to labeling type ($P = 0.006$). Participants given both numeric values and low-calorie symbols choose significantly lower calorie (89.1 kcal) than those who had been given no information (97.1 kcal) or only provided with numeric value (95.8 kcal). In side dishes, the participants with both low-calorie symbol and numeric values tended to select lower calorie options (168.6 kcal) than those who without any labels (183.4 kcal) ($P = 0.065$). However, we did not find any differences in calorific content in main dish choices. Furthermore, there were no significant differences in calories selected in the family restaurant.

DISCUSSION

In an experimental study using menus with real food items as stimuli, the current research explored the effects of restaurant type and labeling types on parents' behavioral changes in food choices. Our results showed that in the family restaurant setting, parents did not show considerable differences in their menu choices, particularly in the lowest calorie menu selection. In contrast, at the fast food restaurant, parents who were provided with nutritional information, particularly a low-calorie symbol, tended to choose menu items with lower calorie than those who had not been provided with such information.

Many researchers have tried to explain variances in consumers' behavior towards different types of restaurant. Concept-driven and data-driven processing [32,33] is one of the theories suggested. Using this theory, Wei and Miao [26] demonstrated that the perceived healthfulness of restaurants influences the effect of disclosed calorie information on food choices in the quick service restaurant sector. In a perceived healthful restaurant, consumers who have been provided with calorie information will make food choices with smaller calorie count than those without calorie information. Conversely, in a perceived unhealthy restaurant, consumers showed the opposite behavior. There have been several studies detailing similar results [25,34], however, our results showed contrast tendencies with the results of these.

Burton *et al.* [24,35] reported consumers significantly underestimated levels of calories, fat and saturated fat in less-healthy restaurant items. Similarly, Elbel [36] and Block *et al.* [37] demonstrated that consumers often also underestimate calories in foods purchased from fast food restaurants. Burton *et al.* [24,35] found that for less-healthy menu items whose calorie counts exceeded consumers expectations, the provision of nutritional information had a significant influence on their purchase intention and decision making behaviors. Burton *et al.* [24,35] also revealed that the percentage of consumers choosing the less healthy menu items decreased in quick service restaurant when calorie information had been disclosed. They explained that the discrepancy between expected and objective nutritional levels should result in an interaction between the provision of nutritional information and the healthfulness of the menu item. Negative disconfirmation for less-healthy items is therefore expected to lead to increased choice preference for more-healthy items.

Consequently, the perceived healthfulness of restaurants would serve as a cue to influence the effect of the nutritional information disclosure on parents' behavioral changes in food choices. 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 [38]. There are similar situations in South Korea and consequently caregivers usually have negative perceptions of fast-food restaurants [39,40]. In the current study, the perceived healthfulness of family restaurants was measured as significantly higher than that of fast food restaurants. Accordingly, the clear effectiveness of menu labeling observed in the fast food restaurants was not identified as relevant in the family restaurants, which are perceived to be relatively healthful by consumers. A previous study also reported there to be no significant changes in the total calories and fat ordered in 4 different labeling conditions at a full service family restaurant [28]. Another explanation could be that parents at fast food restaurants seek more utilitarian value compared to parents at family restaurant enjoying hedonic value, as suggested in introduction [22]. We can assume that consumers visiting fast food restaurants are more likely to consider carefully information about menu items when selecting foods than consumers at family restaurants [23]. Future study can investigate the underlying mechanisms on such different results between fast food and family restaurant customers.

The results of the current study suggest that presenting numerical information with low-calorie symbol formats may increase labeling efficacy in fast-food restaurants. Research examining the effectiveness of labels on the front of packaged foods found that a "traffic light" labeling system, which uses red, green, and yellow traffic light symbols on packages to indicate fat, saturated fat, sugar, and salt levels, can help consumers identify healthier food choices [41]. There are several studies revealing that the addition of symbols to the calorie information could further reduce calories ordered [27,29,42,43]. Among limited studies concerning the effect of different nutrition label formats in South Korea, Sah and Yeo [44] revealed that consumers show more positive evaluation for alternative formats (nutrition certification mark, traffic lights) than existing formats (nutrition facts, nutrition claims) of nutrition labeling. In addition, consumers made more accurate decisions under alternative formats than existing formats. This therefore suggests that using symbols on menus may also direct parents to more positive choices for their children especially in fast food restaurants.

There are several limitations to the current research that warrant further consideration and provide suggestions for future studies. Firstly, a scenario-based experimental design using an online survey that measured hypothetical rather than actual choices was used in the present study. Future field research to examine how the disclosure of menu labels may influence consumers actual food choices at different types of restaurants should be undertaken. Secondly, the results may not be generalizable to the population at large as since the current study focused solely on Koreans. Future studies, perhaps employing a qualitative approach, should expand this research further afield. Finally, this study focused primarily on low calorie

selection, which could lead to misinterpretation of parents' food selections. In general, it is assumed that a lower calorie selection involves healthier food choices. However, in the beverage case of our scenario, fruit juice and milk are more nutritious in terms of their protein, vitamin, and mineral content, but higher calorie than zero calorie soda. Thus, the result of this study should not be interpreted in a way to evaluate parents' healthy food selections. Despite these limitations, our findings have some important implications for policymakers, consumers, and restaurant managers by providing a better understanding of caregivers' reactions to different nutritional information formats in different types of restaurants.

The results of this study suggest the effect of nutrition labeling type interplays with the type of restaurant to jointly affect caregivers' food choices for their children. These findings suggest that the provision of easily interpretable nutrition information in fast food restaurants may provide significant public health benefits by encouraging healthier parental food choices for their children. However, it is important to note the effects of different types of nutritional information disclosure were negligible in family restaurants. From these results, we concluded that disclosed nutritional information alone may not necessarily lead to healthful choices and the type of restaurant is a significant factor that interplays with nutritional information disclosure. This study suggests that the effects of menu labeling on food choices should be examined with a host of intervening factors. Future studies that extend the current research will offer a better understanding of this issue and provide guidelines for effective public health policies.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interests.

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