Influence of placement of a nutrition logo on cafeteria menu items on lunchtime food choices at Dutch worksites

Ellis L Vyth
Ingrid HM Steenhuis
Martijn W Heymans
Annet JC Roodenburg
Johannes Brug
Jacob C Seidell

Abstract
Introduction: This study investigates the effectiveness of labeling foods with the Choices nutrition logo on influencing cafeteria menu selection and the behavioral determinants of menu choices in worksite cafeterias in the Netherlands.
Methods: A cluster randomized controlled trial was conducted. Intervention cafeterias (n=13), where the Choices logo was used to promote healthier eating for a three-week period, were compared with control cafeterias (n=12), which offered the same menu without the logo. Sales data were collected daily for nine weeks, from March to May 2009. Additionally, employees from one intervention and one control company completed an online questionnaire at baseline and after the intervention (n=368) in which the behavioral determinants of food choice (attitude, self-efficacy and intention) and logo use were measured. Generalized estimating equation (GEE) analyses, chi-square tests, t-tests and linear regression analyses were performed.
Results: No nutritionally meaningful intervention effects were found in the sales of sandwiches, soups, snacks, fruit and salads. Also, no significant differences in behavioral determinants were found. An “intention to eat healthier” and “paying attention to product information” were positively associated with self-reported consumption of foods with the Choices logo at lunch.
Conclusions: The intervention did not have a significant impact on employees’ lunchtime food choices. Labeling healthy choices might be useful for health-conscious employees in the volitional phase of behavior change. Further research should focus on the possible health benefits of menu reformulation in the catering sector.
Introduction
The World Health Organization recommends that consumers reduce their intake of sodium, sugar, saturated fats and trans fats in order to reduce the prevalence of diet-related chronic diseases, which are increasing worldwide (1). Because food consumption during lunch appears to contribute significantly to the intake of these substances, the worksite cafeteria could be a strategically important venue in which to expose individuals to healthy food choices (2–4). Therefore, the Choices nutrition logo was introduced in several large catering organizations in the Netherlands in 2006.

The Choices nutrition logo is found on a variety of brands in many supermarket chains and food service locations in the Netherlands, including worksite cafeterias. The logo is assigned to products that meet the determined criteria for sodium, added sugar, saturated fats, trans fats, fiber and calories. These criteria were developed by an independent scientific committee of experts in nutrition, food science and consumer behavior from Europe, the United States, South America and Asia. Choices products must meet all of the nutritional criteria determined for their category. The Choices logo can be compared with nutrition scoring systems in the United States, such as NuVal, a science-based nutrition index score that is designed to help consumers purchase healthier products, or the Smart Choices program, a front-of-pack nutrition symbol that looks similar to Choices, although the systems are not related (5, 6). Detailed background information for the Choices logo has been given elsewhere (7).

The catering sector is different from supermarkets because cafeterias are allowed to assign the Choices logo to freshly prepared products, such as sandwiches with self-prepared sandwich filling (Figure 1). Catering managers are trained to prepare these products with reduced levels of sodium, sugar, saturated fats, trans fats and calories, and with increased fiber content. By both increasing the availability of healthy foods and labeling these products with the Choices logo, caterers try to facilitate employee selection of healthier foods in worksite cafeterias.

The labeling of healthier items in the food service sector may influence behavior, promoting a healthier dietary pattern (8, 9). Earlier studies exploring the effect of labeling in worksite cafeterias suggest some positive benefits, whereas other studies show only modest effects on sales data or consumer behavior (8, 10–13). There is a general need for high-quality studies investigating the potential benefits to nutrition education of implementing healthy menu logos in point-of-purchase settings, such as worksite cafeterias (6, 14, 15). Therefore, this study aimed to investigate the effectiveness of the Choices logo on influencing cafeteria menu selection and on the behavioral determinants (attitude, self-efficacy and intention) of menu choice by conducting a randomized controlled trial in worksite cafeterias in the Netherlands.

Methods
Participants
A cluster randomized controlled trial was conducted in the Netherlands from March to May 2009. The power calculation was based on the main outcome measure: the sales data. With the assumption of a standard deviation of 10%, a sample of twelve intervention and twelve control worksite cafeterias was estimated to provide 80% power at a 5% level of significance to detect a 12% increase in sales between the
intervention and the control group. Twenty-five worksite cafeterias (including one more worksite than in the power calculation in case another dropped out) in Dutch companies employing office workers with mainly sedentary jobs were recruited in collaboration with the leading catering organization in the Netherlands. At the onset of the study the companies (employing 120-2000 workers) had not yet implemented the Choices logo system. Randomization was stratified by company size (companies >500 employees and companies <500 employees). Seven worksites with more than 500 employees were blindly allocated to either the intervention group or the control group. The remaining 18 cafeterias were randomized similarly. Treatment assignment codes were available to the research staff during the study in order to check for compliance. The study protocol was approved by the Scientific Ethics Committee of VU University.

The Choices intervention
All the cafeterias were trained to offer exactly the same sandwiches and soups every day (one freshly prepared Choices sandwich, one regular sandwich, one Choices soup and one regular soup) during the research period, essentially for comparison of the sales data among the cafeterias. The prices of the Choices products and the regular products were the same. Additionally, the cafeterias were allowed to offer their regular products, such as dairy products, desserts and hot meals, but were not permitted to offer sandwiches or soups not listed on the menu.

The three-week menu cycle was repeated three times during the nine-week research period: the baseline, intervention and post-intervention periods. During the intervention period, the intervention cafeterias were asked to place the Choices logo next to the freshly prepared Choices sandwiches and soups as well as the fresh fruit basket (it is permissible to assign the logo to fresh fruit, as described elsewhere (7). However, it is not permissible to assign the logo to the salad bar, because not all (processed) salads comply with the Choices criteria). Further, menus explaining the meaning of the Choices logo focused employees’ attention on the logo and aimed to

Figure 1. Choices sandwiches labeled with the Choices logo.
help them make healthy lunch choices. The control cafeterias did not use labels or any other communication about the logo. During the baseline and post-intervention periods, no Choices menu labeling was used in either the intervention or the control cafeterias. Each week four trained research assistants telephoned, e-mailed and visited all the cafeterias to check for compliance.

Data collection
Sales. The sales of sandwiches and soups and the number of employees lunching in the cafeteria were registered daily for the entire nine weeks (March to May 2009). Also, sales for fried snack foods, fruit and salads were collected to see whether the intervention had any effect on the sales of these other product categories.

Questionnaires. Additionally, to gain insights into the behavioral determinants of food choice, the employees at two worksites (the largest worksites for both the intervention group and the control group) were asked to complete an online questionnaire at baseline and after the intervention. The questionnaires assessed the presumed behavioral determinants of food choice, derived from the Theory of Planned Behavior (16, 17). Attitude (e.g. “How satisfied are you with the healthy products offered in the cafeteria?”); self-efficacy (e.g. “Do you consider yourself to be able to choose healthy foods in your worksite cafeteria?”) and intention (e.g. “Do you intend to eat healthier in the coming month?”) were measured by two items each, with all items measured on a five-point Likert scale. Further, self-reported demographic variables were collected, such as age, gender, body weight, height, level of education and frequency of lunching in the worksite cafeteria.

In the second questionnaire, completed in the same two worksites during the post-intervention period, the respondents were also asked about their familiarity with the Choices logo (in “yes” or “no” response categories) and whether they used the logo to make a healthy choice during lunch (in response categories ranging from one=“never” to five=“always”). Further, the questionnaire included three food choice motives measured by three statements, each measured on a seven-point Likert scale: “weight control,” “importance of product information” and “importance of pleasure in eating” (18–20). In earlier research these food choice motives were found to be significant predictors of the selection of foods with the Choices logo (14).

Statistics
Sales. Missing data (3.9% of the data was missing) were accounted for with the multiple imputation method for missing data, a statistical method to estimate missing data by multiple sampling (21, 22). Zeros were added to the data set where no sale took place. Generalized estimating equation (GEE) analyses were carried out, with the worksite as the unit of analysis (subject variable) (n=25) (23). The week was used as the within-subject variable and sales data per product category per week were used as the dependent variables. Intervention (one=intervention, zero=control) was used as the between-subject factor and the baseline sales score was added to the model as a covariate. To study whether the effect of the intervention on sales data was time dependent, the interaction between the intervention and the week was explored.

Questionnaires. The body mass index (BMI) was calculated (kg/m2) from self-reported body weight and height. A mean score was calculated for each of the food choice
motives (range, one to seven) and for each of the behavioral determinants (range, one to five). Chi-square tests and t-tests were used to test for differences in demographic variables between the intervention and control employees at baseline. After the intervention, T-tests were used to explore significant differences in the difference scores of the behavioral determinants of food choice between the intervention and the control participants. Finally, for the intervention group a backward selection procedure was used to obtain the best linear regression model for reported consumption of products with the Choices logo during lunch (dependent variable). The model started with all the independent variables (baseline intention, gender, BMI, age, educational level, frequency of lunching at the cafeteria and the three food choice motives) and tested them one by one for statistical significance, deleting any that were not significant.

All the statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS version 17.0, 2009, Chicago, IL), and a significance level of 0.05 was adopted. For the backward selection procedure an exclusion P-value of 0.10 was used.

Table 1. Change in cafeteria sales (b, 95% CI) at worksites with the Choices program compared to control worksites.

<table>
<thead>
<tr>
<th>Product category</th>
<th>Intervention period</th>
<th>Intervention plus post-intervention period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b (95% CI)</td>
<td>P-Value</td>
</tr>
<tr>
<td>Proportion Choices bread</td>
<td>-0.006 (-0.060; 0.047)</td>
<td>0.815</td>
</tr>
<tr>
<td>Proportion Choices soups</td>
<td>0.011 (-0.028; 0.050)</td>
<td>0.583</td>
</tr>
<tr>
<td>Snacksa</td>
<td>0.368 (-2.105; 2.840)</td>
<td>0.769</td>
</tr>
<tr>
<td>Saladsa</td>
<td>1.163 (-0.378; 2.705)</td>
<td>0.139</td>
</tr>
<tr>
<td>Fruitsa</td>
<td>1.159 (0.454; 1.864)</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

1 The betas represent the differences between the mean sales at the intervention worksites and the mean sales at the control worksites. The betas were calculated separately for the intervention period (second column; weeks four to six of the complete study period of nine weeks) and the intervention plus post-intervention period (fourth column; weeks four to nine of the complete study period of nine weeks).

a Units sold per 50 lunching employees

** P< 0.01

Results

Sales

In table 1, the data show a significant effect on fruit sales to the intervention group compared with the control group during the intervention period (b=1.159, 95% CI: 0.454; 1.864, p=0.001). This effect represents one cup of fruit per 50 employees per week. This change continued during the post-intervention period (b=1.045, 95% CI: 0.406; 1.685, p=0.001). No significant differences in sales were found in the other
product categories. No interaction was detected between the intervention and the week.

Questionnaires
A total of 1014 questionnaires were completed in the two worksites at baseline (response rate, 48.0%) and 368 in the post-intervention period (response rate, 36.3%), resulting in a sample population of 368 consumers, of which 232 were in the intervention group and 136 in the control group. A total of 54.3% were women; the mean age (±SD) was 39.2 years (±9.9 years) and the mean BMI was 24.0 kg/m2 (±3.5). The majority had a relatively high level of education and frequently ate lunch in the worksite cafeteria (four to five times per week). No significant differences in the baseline characteristics (age, BMI, educational level and frequency of lunching in the cafeteria) were detected between the intervention group and the control group. Table 2 shows the mean scores for the determinants of behavior. No significant differences were found in the difference scores (post-intervention minus baseline) between the intervention and control groups. Further analyses within the intervention group showed that, at baseline, 66% had a low intention to eat healthier. A total of 56% of the intervention group had noticed information about healthier eating and 82% indicated that they were familiar with the Choices logo. The regression analyses showed that the best predictors of reported consumption of foods with the logo during lunch were "intention at baseline" and "importance of product information" (b=0.201, 95% CI: 0.085; 0.343, p=0.006 and b=0.170, 95% CI: 0.094; 0.245, p=0.000, respectively).

Table 2. Mean changes to the determinants of behavior change at worksites with the Choices program versus traditional food service sites (control sites).

<table>
<thead>
<tr>
<th></th>
<th>Baseline Mean (SD)</th>
<th>Post-intervention Mean (SD)</th>
<th>Difference Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-Efficacy (1-5) a</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>3.63 (0.76)</td>
<td>3.59 (0.76)</td>
<td>-0.04 (0.62)</td>
</tr>
<tr>
<td>Control</td>
<td>3.89 (0.67)</td>
<td>3.89 (0.56)</td>
<td>0.01 (0.57)</td>
</tr>
<tr>
<td><strong>Intention (1-5) a</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>3.25 (0.89)</td>
<td>3.22 (0.86)</td>
<td>-0.04 (0.77)</td>
</tr>
<tr>
<td>Control</td>
<td>2.98 (0.83)</td>
<td>2.92 (0.83)</td>
<td>-0.06 (0.69)</td>
</tr>
<tr>
<td><strong>Attitude (1-5) a</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>3.11 (1.03)</td>
<td>3.17 (0.94)</td>
<td>0.06 (0.79)</td>
</tr>
<tr>
<td>Control</td>
<td>3.48 (0.83)</td>
<td>3.51 (0.82)</td>
<td>0.04 (0.69)</td>
</tr>
</tbody>
</table>

a Self-Efficacy, Intention and Attitude were measured by two items each on a five-point Likert scale. Example of Self-Efficacy measurement: “Do you consider yourself to be able to choose healthy foods in your worksite cafeteria?” Example of Intention measurement: “Do you intend to eat more healthily in the coming month?” Example of Attitude measurement: “How satisfied are you with the healthy products offered in the cafeteria?”
Discussion
This study investigated the effectiveness of labeling with a nutrition logo on cafeteria menu selection and behavioral determinants (attitude, self-efficacy and intention) of this choice by conducting a randomized controlled trial in worksite cafeterias in the Netherlands. No nutritionally meaningful intervention effects were observed for the sales of sandwiches, soups, snacks, fruit and salads. Further, no significant differences in behavior determinants between the intervention and control groups were found. The best predictors of reported lunchtime consumption of products with the Choices logo after the intervention were “intention at baseline” and “product information.”

A possible explanation for the intervention’s lack of impact is that the majority of the intervention population had a low intention to eat healthier at baseline. Common behavior theories argue that consumers first have to be motivated to change their behavior before they actually undertake action to change it (16, 17). Individuals then shift from the “motivational phase” to the “volitional phase,” as defined by Renner and Schwarzer (24). In the Transtheoretical Model of Behavior Change (25), this is described as a changing from the “contemplation phase” to the “preparation and action” phase. However, if consumers have no interest in healthier eating, they might not be motivated to pay attention to or use health information such as nutrition labeling (15). Labeling might be an intervention that suits the volitional phase of behavior change rather than the motivational phase. The findings of this study reveal that the intervention group participants who had an intention to eat healthier at baseline (volitional phase) and the participants who reported paying attention to nutrition information on food packages stated that they used the Choices logo to make a healthy choice during lunch. Unfortunately, no consumption data were available to support these findings, because the sales data were collected per cafeteria, and not per person. Nevertheless, these results suggest that health-conscious consumers may use the Choices logo to make a healthy choice, in agreement with previous supermarket research showing that health-conscious consumers bought more products with the Choices logo (14). The challenge, however, is to investigate how to improve the dietary pattern of all consumers. Consumer research in the United States on the NuVal system, a nutrition label on packaged foods that ranks foods on a scale of one to 100, shows that consumers prefer a nutrition logo combined with an education program (6). It would be interesting to investigate the effectiveness of combining nutrition logos with tailored health education to motivate vulnerable consumer groups to improve their diet (8, 15, 26).

Study limitations
This study focused primarily on office workers with sedentary jobs in the Netherlands. This homogeneous population is different from populations in other countries, such as the United States, which has a multiethnic workforce that eats a wide variety of foods. Further research is needed to be able to extrapolate these results to other populations. Secondly, although the questionnaire was based on validated concepts, this specific survey was not validated. Validation in future studies is recommended. Finally, although randomization was stratified by company size, it cannot be concluded that the randomization process was effective and ensured equal distribution of other possible confounding variables across the intervention and the control worksites, such as the percentage of male/female employees, mean age and
mean weight. Due to practical limitations, these data were not collected, but it is recommended that these data be collected in future studies in order to interpret the study findings more appropriately.

**Practical applications**

This study shows that labeling foods with a nutrition logo alone did not have a significant impact on employees’ food choice during lunch. It is assumed that more extensive health education is needed to influence food choice at lunch. Worksites should ask for the help of health professionals to motivate their employees to eat healthier, for example by performing health checks or by using the “Motivational Interviewing” counseling style, a client-centered, directive approach to enhance intrinsic motivation by working with and resolving ambivalence (27). Also, more detailed explanation of the meaning of a nutrition logo is needed. Catering managers should explain the meaning of the logo to their employees, the nutrient criteria, and how the labeling makes healthy products more recognizable. Previous research shows that the correct use of the Choices logo appears to be dependent on an accurate explanation that the Choices logo is found on healthy choices within a specific product category (7).

Furthermore, this study focused on labeling, and did not explore the health benefits of menu reformulation in the catering sector in order to meet the Choices guidelines, which could be an efficient way to improve the diet of both health-conscious and non-health-conscious employees (14, 28). Research shows that the Choices logo has influenced food manufacturers and caterers to reformulate existing products and develop new products with a healthier product composition, especially where sodium and dietary fiber are concerned (29). A worksite cafeteria with a menu limited to products with reduced levels of sodium, sugar, trans fats and saturated fats could have a great impact on healthy eating (30).

**Conclusions**

Labeling healthy choices in worksite cafeterias could be useful to health-conscious employees in the volitional phase of behavior change. Further research should investigate how to improve the dietary pattern of non-health-conscious employees, for example by combining nutrition logos with tailored health education via innovative technologies such as cell phones. Secondly, further research should focus on the possible health benefits of menu reformulation in the catering sector so that more healthy products are offered. It would be interesting to investigate how different partners, including chefs, marketing directors and food companies, could cooperate most effectively to create a significant impact on the health of corporate employees.

**Conflicts of interest and authors’ affiliations**

Annet Roodenburg is seconded at the VU University Amsterdam and employed by Unilever R&D, the Netherlands. The other authors have no conflicts of interest. Johannes Brug is employed by the Department of Epidemiology and Biostatistics, EMGO Institute for Health and Care Research, VU University Medical Center, Amsterdam, the Netherlands. The other authors are employed by the Department of Health Sciences and the EMGO Institute for Health and Care Research, VU University Amsterdam, the Netherlands.
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