Research Article

Effects of Environmental Intervention in Workplace Cafeterias on Vegetable Consumption by Male Workers

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ABSTRACT

Objective: To assess the effects of an environmental intervention based on the transtheoretical model to increase access to nutritional information about vegetable consumption in workplace cafeterias.

Design: Nonrandomized controlled trial.

Setting: Sixteen workplaces with cafeterias in Niigata, Japan, were assigned to intervention (n = 8) or comparison sites (n = 8).

Participants: A total of 349 Japanese male workers aged 20–59 years, who visited the cafeterias ≥ 3 times/wk.

Intervention: For the intervention group, 12 types of table tents containing information on increasing vegetable consumption, based on the transtheoretical model stages and processes of change, were distributed to cafeterias for 24 weeks in 2009. Information was presented according to the sequence suggested by the stages of change.

Main Outcome Measures: Vegetable consumption in the cafeteria and per day and stage of change were assessed using self-administered questionnaires.

Analysis: Differences between groups were tested using a generalized linear model adjusted for age, work environment, and position.

Results: The difference in the stage of change was not statistically significantly different ($P = .05$), but the intervention group (n = 181) had increased vegetable consumption in the cafeteria (+0.18 servings; $P = .01$) and per day (+0.32 servings; $P = .01$) vs the comparison group.

Conclusions and Implications: The findings suggest a beneficial effect of providing access to nutrition information about vegetable consumption as an environmental intervention in workplace cafeterias.

Key Words: environmental intervention, transtheoretical model, vegetables, workplace, cafeteria (*J Nutr Educ Behav*. 2014;46:350-358.)

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INTRODUCTION

Current epidemiological studies have correlated the risk of lifestyle-related diseases, such as cancer or cardiovascular disease, with particular eating habits. According to systematic reviews of prospective cohort studies, an increased consumption of fruits and vegetables is associated with a reduced risk of coronary heart disease.[1,2] However, recent Japanese data have shown that vegetable consumption was below the Japanese recommendations of 350 g/d in adults, especially in those aged 20–49 years.[3] In Japan, 1 serving of vegetables is approximately 70 g, and various 5-A-Day programs that encourage people to eat at least 5 servings (350 g) of vegetables have been implemented in various settings (eg, restaurants, food retailers, and workplace cafeterias).[4]

Because most adults spend approximately half their waking hours working, there are good opportunities to influence employee behavior in the workplace.[5] Consequently, the workplace has been targeted by many nutritional interventions aimed at increasing vegetable (and/or fruit) consumption, and there have been many studies examining these effects.[6-25] Most of these studies were based on individual nutritional education or counseling (eg, face-to-face, telephone, and e-mail) or employee advisory boards formed to guide project activities in the workplace. However, because such treatments are often expensive and labor-intensive to conduct, they can be difficult to disseminate. A few previous studies have adopted relatively modest strategies, using only environmental interventions to improve access to information about healthy food (eg, increasing the availability of posters, brochures, leaflets, and table tents concerning healthy food) and access to healthy food (eg, increasing the availability of healthy dishes).[20,22] Because it is difficult to tailor an environmental intervention to individual needs, these studies suggest that environmental in-terventions do not markedly affect actual healthy eating even though they have a modest but

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significant effect on the determinants of dietary behavior changes.

An understanding of the psychological determinants of vegetable intake is needed to design effective intervention programs.[26] According to a previous systematic review,[27] the transtheoretical model (TTM)[28] is a psychological theory that has been applied in many intervention studies of behavioral changes in vegetable consumption. A core construct of the TTM is that processes and stages of change are considered to be strongly related to behavior change. Stage of change is the temporal and motivational readiness to modify a health behavior. Five stages have been identified: precontemplation, contemplation, preparation, action, and maintenance. Processes of change consist of cognitive and behavioral strategies used to progress through the stages of change.[29] Although theory-based environmental interventions have been developed to promote vegetable consumption,[20,22] TTM-based environmental interventions are lacking. The Seattle 5-A-Day program[30] combined environmental and individual interventions guided by the TTM, assuming a linear progression through the stages. The TTM can be usefully applied to the environmental intervention because the Seattle 5-A-Day program increased fruit and vegetable consumption in the intervention group at follow-up.[15]

Environmental interventions to improve access to information about healthy food are easier and more cost-effective to implement than are programs designed to improve access to healthy food because only information media need to be produced and distributed. Therefore, improved access to information about healthy food could be an important and effective environmental intervention.

The current study aimed to assess the effects of an environmental intervention based on the TTM stages and processes of change to increase access to nutritional information about vegetable consumption on workers' vegetable consumption behavior in workplace cafeterias.

METHODS

Study Design

This study was a nonrandomized controlled trial consisting of an intervention and a minimal intervention comparison group. The study was performed for 24 weeks between October, 2009 and March, 2010. This study was part of a project conducted by the Niigata city government in Japan.

Participants and Recruitment

Based on results from previous studies,[12,14,17] the authors estimated the minimum required sample size of each group to be 176 participants, for the following reasons: (1) the primary end point was vegetable consumption (servings per day), (2) the estimated standard deviation was 0.67 servings/d, (3) the estimated effect of the intervention was +0.2 servings/d, and (4) a power analysis was performed using a power of 80% and an α of .05.

The researchers initially selected performance sites that were workplaces with cafeterias in Niigata city and ultimately focused on workplaces with relatively large cafeterias. Because this study was conducted in cafeterias, the researchers approached the staff involved in managing each cafeteria (eg, the department of general affairs). At that time, because it is probable that recruitment would be more difficult for the intervention sites than that for the comparison sites, the researchers prioritized recruiting the intervention sites. Ultimately, this study included 16 workplaces, 8 of which were assigned as intervention sites and 8 as comparison sites. According to the Japan Standard Industrial Classification,[31] the industrial classifications of each group were distributed as follows: intervention sites (manufacturing: 3; information and communications: 1; accommodations, eating, and drinking services: 2; and compound services [eg, post office, agricultural cooperative]: 2) and comparison sites (construction: 1; manufacturing: 2; transport and postal activities: 1; wholesale and retail trade: 2; finance and insurance: 1, and government, except elsewhere classified: 1).

Participants included Japanese male workers aged 20–59 years. The sample was limited to males to control for possible gender differences and because males were easier to recruit in workplaces to reach the desired sample size. The authors added the criterion of visiting the cafeteria at least 3 times/wk (as confirmed by responses to a questionnaire) to assess effects of the intervention on people who received a certain amount of exposure to the intervention.

Respondents were selected by the staff involved in managing each cafeteria that was approached to participate in the study. At that time, the researchers asked the management staff to choose a person using the cafeteria if possible. In total, 499 workers participated in the study. The number of participants at each workplace was as follows (sorted in order): intervention sites (11, 25, 31, 39, 40, 40, 40, and 45) and comparison sites (4, 20, 24, 25, 27, 38, 41, and 49). According to the project conducted by the Niigata city government, the workplaces employed a mean of 199.3 male workers (median, 128.5) who used the cafeteria. Workers who provided informed consent com-pleted a questionnaire at baseline and again 1 week after the last intervention concluded.

The protocol was approved by the Ethical Committee of the Niigata University of Health and Welfare. Participants received a written explanation of the study and gave informed consent.

Procedure

At baseline, 40 copies of the questionnaires were distributed to each workplace and 10–20 further copies were sent to selected workplaces where many male workers used the cafeteria. The management staff arranged the distribution and recovery of the questionnaires. Respondents were given approximately 2 weeks to complete the questionnaire. The researchers checked questionnaires and missing or illogical answers were obtained or corrected by a re-survey. The questionnaires had a signature space; therefore, they could be matched at baseline and postintervention.

Stages of change and vegetable consumption. Stages of change in vegetable consumption behavior were calculated using an algorithm that was a Japanese version of the evaluation method[32] used in the 5-A-Day program in the US.[33] The algorithm consisted of 2 stages, with clear