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Impact of the promotion of fruit and vegetables on their consumption in the workplace

ABSTRACT

OBJECTIVE: To evaluate the impact of activities promoting the consumption of fruit and vegetables (FV) in the workplace.

METHODS: Intervention study with historical control group conducted in a public company in Rio de Janeiro, Southeastern Brazil, between 2007 and 2009. It consisted of three stages: (a) baseline, which included the characterization of both the company studied and the one responsible for providing meals to the employees, assessment of FV intake by the staff and forming a focus group to identify the determinants of FV consumption and to inform the planning of the intervention; (b) intervention, comprised of an environmental component (company's restaurant) and an educational component (directed at individuals); and (c) post-intervention assessment, which included impressions about changes in the company's restaurant in terms of FV supply, exposure of individuals to the intervention and FV consumption by the employees. The analysis of the association between exposure and outcome indicators was conducted using multiple regression models.

RESULTS: On average, the coverage of educational activities and materials was 63.5%. Most employees perceived positive changes in at least one of the five environmental aspects examined. There was an increase (38%) in FV consumption by employees, which corresponds to 0.66 servings in the meal evaluated (lunch). Significant association between indicators of exposure, (both environmental and educational components) and outcome indicators was observed.

CONCLUSIONS: FV consumption increased among employees exposed to an intervention focused on the promotion of these foods in the workplace. The multi-component design of the intervention seems to have contributed to these findings.

DESCRIPTORS: Food Promotion. Fruit. Vegetables. Food Habits. Feeding Behavior. Collective Feeding. Working Environment. Intervention Studies. Intervention Studies.

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INTRODUCTION

Fruit and vegetables (FV) are essential components of a healthy diet, being low in calories and high in fiber and anti-oxidants, as well as being a source of micro-nutrients. The World Health Organization (WHO) recommends consuming at least 400 g/day, the equivalent of five daily portions.^a

Studies show that FV consumption is lower than the recommended level in various parts of the world and this is one of the top ten factors in determining global levels of illness over the last decade.^b The most recent Family Budget Survey (*Pesquisa de Orçamentos Familiares – POF*) showed that in relative terms, FV accounted for 2.8% of the total food calories available for consumption in a Brazilian home, representing approximately a quarter of the recommended level (between 9 and 12%).^c

There are various reasons for the insufficient consumption of FV, among them: inefficient production processes, cost, difficulty in finding and preparing, taste and lack of knowledge about their benefits on the part of the individuals.^{a,d}

National health and agricultural organizations, international bodies, non-governmental organizations and academic institutions work to identify obstacles in consuming FV in each reality and to propose solutions to overcome them.^{e,f}

The workplace is considered to be strategically important since a large part of the adult population spend approximately a third of their day there. This means that at least one main meal is eaten in the workplace propitiating the development of continued campaigns to promote healthy eating. The interventions which take place in the workplace environment, even if they show modest results, may produce important benefits for public health.^{1,8}

International studies indicate that campaigns in the workplace can have a positive impact on FV consumption, especially when they articulate changes in the working environment and educational activities.^{2,7,9}

There are few studies which evaluate campaigns promoting FV in Brazilian workplaces.

This study aims to evaluate the impact of campaigns promoting fruit and vegetables in the workplace.

METHODS

This study is part of the “Creating intervention strategy at a local level to promote the consumption of fruit and vegetables” project.^g

This is a before and after interventional study, with an historical control group (condition reported by the individuals taking part before the intervention began), which took place in a workplace in Rio de Janeiro between 2007 and 2009. The study population was made up of workers who had lunch in the company cafeteria on the three days on which data were collected. The institution studied, a branch of scientific research in food technology, had 130 workers categorized into three groups: Researcher (33.1%), Analyst (19.2%) and Administrative Assistant (47.7%), as well as ten tertiary workers who undertook general and security work. Of the workers eligible to take part, 97 were interviewed in the first survey and 100 in the second: 61 workers were interviewed in both surveys.

The company was registered in the PAT (*Programa de Alimentação do Trabalhador – Employees’ Food Program*) and provided its workers with a meal voucher. There was a Food and Nutrition Unit (FNU) at the company headquarters, the management of which was outsourced. The cafeteria system was self-service, pay by weight. Fruit and desserts were sold at a fixed price. On average 30 and 110 meals were served at breakfast and lunch, respectively. The service contract made no mention of fruit and stipulated that, for vegetables, four varieties of salad should be available daily. The company had a nutritionist who was responsible for creating the menus and supervising the production process of the meals.

^a World Health Organization. Fruit and vegetable promotion initiative: a meeting report. Geneva; 2003.

^b World Health Organization. Diet, nutrition and the prevention of chronic diseases: report of a Joint WHO/FAO Expert Consultation. Geneva, 2003. (WHO Technical Report Series, 916).

^c Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008/2009: avaliação nutricional da disponibilidade de alimentos no Brasil. Rio de Janeiro; 2010.

^d Monteiro CA. Setting up a fruit and vegetable promotion initiative in a developing country. In: World Health Organization. Fruit and vegetable promotion initiative: a meeting report. Geneva; 2003. p.10.

^e Ministério da Saúde. Relatório final do 5º Congresso Panamericano de Incentivo ao Consumo de Frutas e Hortaliças para a Promoção da Saúde. Brasília (DF); 2009.

^f World Health Organization. Global strategy on diet, physical activity and health. 5. World Health Assembly; 2004; Geneva, Swiss. (Resolution WHA57.17). [cited 2013 Jan 28]. Available from: http://apps.who.int/gb/ebwha/pdf_files/WHA57/A57_R17-en.pdf

^g Coordinated by the Embrapa Agroindústria de Alimentos, the project took place between 2007 and 2011, through partnerships between various institutions, among them: Instituto de Nutrição Annes Dias and other bodies belonging to the Municipality of Rio de Janeiro, Instituto de Nutrição da Universidade do Estado do Rio de Janeiro (UERJ), Instituto Nacional de Câncer (INCA), Conselho Regional de Nutricionistas – 4ª Região (CRN4), Associação de Nutrição do Estado do Rio de Janeiro (ANERJ), Secretaria Estadual de Saúde e Defesa Civil, Rio de Janeiro (SESDEC), the Nutrition course in the Instituto Metodista BENNETT, Departamento de Economia Doméstica, Universidade Federal Rural do Rio de Janeiro (UFRRJ) and Faculdade de Nutrição, Universidade Federal Fluminense (UFF).

Data to characterize the company studied and the one that provided the meals (concessionaire), socio-demographic characteristics, FV consumption by the interviewees and their opinions on topics related to FV were collected in the pre-intervention assessment in November 2007. A focus group with key informants in the company was performed in order to guide the design of the intervention. The workers' FV consumption as well as their level of exposure to the intervention and their impressions on changes in fruit and vegetable supply at the company's cafeteria were recorded in the post-intervention in December 2009.

The food served by the concessionaire was observed in the pre- and post-intervention assessment as well as in the visits carried out while the intervention was ongoing, with the following being recorded in the field diary: variety, the appearance and sensory balance of the vegetable dishes, standardization in the total number of dishes and in the hot and cold options and forms of fruit supply.

The intervention began in May 2009 and lasted nine months. It had two axes: environmental (that which referred to the company's cafeteria) and educational (aimed at the individuals). In the former, there was an investment in making the concessionaire owner and the nutritionist more aware of the importance of promoting FV. Aspects which had been raised in the focus group about the running of the FNU were presented to them: lack of confidence in the way the food was cleaned and handled, little variety in the menus and in the FV available, unsatisfactory presentation of the dishes and difficulties in communicating with the nutritionist who, according to the focus group participants, did not accept criticisms nor defend healthy eating. This approach led the concessionaire owner to replace the nutritionist at the start of the intervention.

The new nutritionist was informed about the educational activities carried out during the intervention. She was given the educational material and the suggestions which could viably be carried out in the cafeteria were emphasized. At these times, the researchers also provided clarification (eight times during the intervention), offered suggestions and support for FV supply in the cafeteria and followed the nutritionist's reports on her perceptions regarding the workers' acceptance of the FV.

In the second axis, educational, face activities were held on dates when there were events in the company. Talks were given during SIPAT (*Semana de Prevenção de Acidentes de Trabalho* – Workplace Accident Prevention Week); a food tasting stand was set up showcasing FV dishes and plant seedlings were distributed during the company's July Festival; and the company invited

workers to take part in a live radio show, presenting a parody which aimed to stimulate FV consumption. The *Instituto Nacional do Câncer* (National Cancer Institute), one of the partners in the project, also organized a "Healthy Store" event on a normal work day. This consisted of workers selecting foodstuffs from a simulated store and discussing their choices with nutritionists, who emphasized the part FV played in this choice.

Educational material (three folders, a fridge magnet and six flyers) containing information about the benefits of consuming FV and practical tips for their cleaning, preparation and consumption were created and distributed at different opportunities, based on feedback from the focus group. During the last month of the campaign, displays were mounted on four tables in the cafeteria and during the last two months, ten electronic messages were sent to the workers. The entire staff of the company participated in the intervention, including trainees and those who were subcontracted.

The interval between the pre-intervention assessment and the start of the intervention was due to changes in the company's management, difficulties in finding available time slots to carry out the focus group and the time used to produce and copy the educational material.

The intervention impact analysis consisted of testing the relevance of difference between proportions or mean values taken before and after the intervention. These differences were examined by comparing the confidence intervals (95%CI) of the estimates obtained. The statistical significance of these differences was assessed using McNemar's Chi-squared test (for the proportions) or the Student's t-test (for the measurements).

The differences between the results obtained before and after the intervention were examined for the following indicators:

- Mean quantities of fruit (F) and, separately, vegetables (V) consumed at lunch served in the company cafeteria on the day of data collection. We used F and V to denote when fruit and vegetables were analyzed separately.
- Mean quantity of fruit and vegetables consumed on the day of data collection. When fruit and vegetables were analyzed together this is shown by FV.
- Proportion of workers who achieved the goal of minimum 160 g of FV at lunch. This goal is based on the reference values corresponding to two portions of this food group, minimum quantity to be offered in a main meal, as recommended by PAT.^h

^h Ministério do Trabalho e Emprego; Ministério da Fazenda; Ministério da Saúde; Ministério da Previdência Social; Ministério do Desenvolvimento Social e Combate à Fome. Portaria Interministerial nº 66, de 25 de agosto de 2006. Altera os parâmetros nutricionais do Programa de Alimentação do Trabalhador – PAT. Brasília (DF); 2006 [cited 2012]. Available from: http://189.28.128.100/nutricao/docs/legislacao/portaria66_25_08_06.pdf

- Daily mean consumption of fruit and vegetables in a typical week. We used FGV when these three food groups (fruits, leafy vegetables, other vegetables) were analyzed separately.
- Proportion of individuals who consumed FGV on at least five days of a typical week.
- Proportion of individuals who brought F and V to work.

The amounts reported in portion sizes were converted to grams in order to estimate the amount of FV consumed in the Food and Nutrition Unit by the individuals in the pre- and post-intervention assessments. The grammage of the serving instruments available at the counters was calculated. This was carried out three times using digital scales with a maximum of 30 kg, accurate to the nearest gram. The mean of the three observations was used.

Indicators to evaluate the level of exposure to the intervention were drawn up for both axes. In the educational axis these included: participating in the activities, receiving educational material and reading the displays. A score synthesizing exposure to these initiatives was calculated. Each activity or item of material was worth one point, except the (four) displays, which together were worth one point. Thus, the maximum possible score was 12 points: mobilization activities, maximum score four points (1 point for each activity participated in); educational material, maximum score seven points (one point for each item of material received); and messages displayed in the cafeteria: maximum one point (0.25 points for each message read). In order to make the results easy to understand, this score was shown on a scale of zero to ten, calculated as follows: number of “yes” responses multiplied by ten and divided by twelve (maximum score). For the environmental axis of the intervention, indexes were created regarding the workers’ perceptions of the positive changes in the appearance and variety of FV dishes and of the cleanliness of the food served raw.

The association between components of the intervention and each outcome was examined using multiple regression models, with adjustment for potential confounding factors (situation of initial consumption, income, gender, age and education of individuals).

The “Creating intervention strategy at a local level to promote the consumption of fruit and vegetables” project, of which this study is part, was approved by the Ethical Research Committee of the Secretaria Municipal de Saúde e Defesa Civil do Rio de Janeiro, 17th September 2007, protocol n^o 120/07. Only individuals who had signed a consent form participated in the study.

RESULTS

The mean age of the individuals was 40 (standard deviation – sd 8.3). The majority were male (57.4%), married or co-habiting (54.1%), had at least a high school education (54.1%) and had a household income of > 10 minimum wages (58.6%).

Before the intervention, less than half of the group (42.6%) achieved the goal of eating at least 160 g of FV at lunch. Regarding the usual consumption of fruits, leafy vegetables and other vegetables (in days), the mean number varied between 4.2 and 4.9. Regular (≥ 5 days/week) consumption of fruit, leafy vegetables and other vegetables was observed in 60.7%, 47.5% and 44.3% of individuals respectively. A low proportion of individuals brought FV to work: 26.2% habitually brought fruit and 4.9% vegetables.

Upon examining FV consumption according to socio-demographic characteristics, significant differences were observed: regular (≥ 5 days) consumption of leafy vegetables was greater among men (60.0%) compared to women (30.9%) and regular vegetable consumption higher among singles (50.0% for both leafy vegetables and other vegetables) than married (39.4% legumes and 45.5% leafy vegetables).

Around 56.9% of the group studied trusted the cleanliness of the raw FV served, 69.5% considered the dishes served to be varied and 45.3% attractive. The researchers, in turn, observed: little variety and lack of standardization in the total number of dishes and in the hot and cold options; lack of attention to the vegetable dishes’ sensory balance and appearance; and fruit salad being the only option available for this food group.

The average coverage of the educational part of the intervention was 63.5%, and a greater proportion of individuals had access to the educational material (mean of 68.5%) compared to the number who participated in the educational activities (mean of 49.6%). More than $\frac{3}{4}$ had less than 75% exposure according to the score synthesizing exposure to the educational part of the campaign (Table 1). Almost all participants (98.0%) evaluated the educational strategies positively and stated that the activities were fun, educational and interesting and that the material gave practical tips which could be used in everyday life.

Regarding to environmental changes, the dishes’ appearance was the aspect with the highest proportion of reports of positive changes, specially: improvements in presentation, organization and attractiveness of the FV dishes. A greater proportion of individuals reported having observed positive changes regarding vegetables than in relation to fruit. The majority of the workers reported positive changes in at least two of the four aspects examined regarding the appearance and variety of dishes on offer. As for the food served raw,

Table 1. Coverage of the educational activities that comprised the intervention. FV-EMBRAPA Project. Rio de Janeiro, Southeastern Brazil, 2007-2009. (n = 61)

Indicators	%
Participation in the educational activities	
SIPAT 2009 talk	47.5
July Festival	60.7
Radio program	36.1
Healthy store	54.1
Reception of educational material	
“Documents” series	52.5
Recipe flyers	72.1
“Twelve steps” folder	72.1
July Festival Folder	49.2
FV hygiene magnet	80.3
Tips sent over the intranet	90.2
Healthy Eating folder	86.8
Reading of displays	
I	72.1
II	73.8
III	60.7
IV	44.3
Exposure to educational intervention score ^a	
< 5.84 ^b	39.3
≥ 5.84 < 7.5	37.7
≥ 7.5	23.0

^a Score created by summing ‘yes’ responses to each activity or item of educational material, considering the set of displays as one item of educational material (each display read is equivalent to 0.25 of an item of educational material), multiplying the total obtained by ten and then dividing this result by the total number of activities and items of material (12).

^b Values refer to the cutoff point of the terciles of the score distribution.

26.8% of the workers started to trust its cleanliness, totaling 78.6% who trusted it at the post-intervention assessment (Table 2).

The individuals’ impressions of the changes in the environment concurred with those observed by the researchers. Improvements were observed in all of the aspects recorded in the pre-intervention assessment with better presentation (more attractive salads), better organization of the dishes (fewer items in the salads and better cut vegetables), more equal distribution between vegetables served hot and cold, vegetables available up until the end of the lunch shift and fresh fruit available as a complementary option to the fruit salad.

A significant increase in the consumption of FV was observed for several of the indicators examined, both on those referred to the consumption at the workplace and on those referred to usual consumption, namely: the quantity of FV and (V) consumed in the company cafeteria on the day of the study, mean number of days

Table 2. Workers’ evaluations of the environment. FV-EMBRAPA Project. Rio de Janeiro, Southeastern Brazil, 2007-2009. (n = 61)

Perceptions of positive changes in the meals offered	
Variety of fruit	13.1
Variety of leafy vegetables (“greens”)	60.7
Variety of other vegetables	85.2
Appearance of the dishes	91.8
Perceptions of changes relating to the environment	
≤ 1 aspect	13.1
2 aspects	23.0
> 2 aspects	63.9
Trust in the cleanliness of the raw food	
Continue to trust	51.8
Start to trust	26.8
Continue to distrust	16.1
Start to distrust	5.3

when FV were usually eaten and regular (≥ 5 days/week) vegetable consumption and the habit of bringing F and V to work (Table 3).

The multiple regression models showed significant results for the direct association of: positive changes in confidence in the cleanliness of the raw food with variation in FV consumption in the company cafeteria ($p = 0.03$); level of exposure to the educational part of the intervention with variation in LV consumption in the company cafeteria ($p = 0.05$); and perception of positive changes in the variety and presentation of the FV dishes with variation in the mean of the days when legumes were eaten ($p = 0.03$).

DISCUSSION

There was an increase of 53.6 g (38%) in FV consumption in the meal evaluated, corresponding to an increase of 0.66 of a portion of FV. Other studies undertaken on workplaces show similar results, although of a lesser magnitude. A study carried out in the United States showed a 7% increase in daily FV consumption in the group exposed only to the workplace intervention and a 19% increase in the group whose intervention also included activities aimed at the family.⁷ Another study recorded a 0.7 portion increase in daily FV consumption after an 18-month-intervention aimed at individuals.³ A recent study in Brazil observed an increase of 11 g in FV consumption in one meal as a result of an intervention which used environmental and individual strategies.¹

In this study, the greatest variations were recorded for the vegetable group. These findings may be linked to the environmental component of the intervention, as the changes regarding the appearance and variety of the food were more perceptible for vegetables than for

Table 3. Consumption of fruit and vegetables by the workers before and after the intervention and variations in this consumption in this period. FV-EMBRAPA Project. Rio de Janeiro, Southeastern Brazil, 2007-2009.

Indicators of fruit and vegetable consumption	Before 95%CI	After 95%CI	Variation	p
Consumption on the day studied (g)				
Fruit	37.9 17.6;58.1	53.7 32.1;75.3	15.8	0.27
Vegetables	103.8 79.48;128.0	142.3 116.3;168.2	38.5	0.03
Fruit and vegetables	141.6 109.8;173.5	195.2 162.5;229.4	53.6	0.01
Reached goal (%)	42.6 30.0;55.0	54.1 41.0;67.0	11.5	0.23
Mean number of days this food group was consumed (days)				
Fruit	4.9 4.3;5.5	4.8 4.2;5.4	-0.1	0.74
Leafy vegetables ("greens")	4.2 3.6;4.8	4.6 4.0;5.2	0.4	0.15
Other vegetables	4.4 3.8;5.0	5.6 5.0;6.1	1.2	< 0.01
Regular \geq 5 days/week consumption (%)				
Fruit	60.7 48.0;73.0	55.7 43.0;69.0	-5.0	0.61
Leafy vegetables ("greens")	44.3 31.0;57	50.8 38.0;64.0	6.5	0.48
Other vegetables	47.5 35.0;60.0	72.1 61.0;84.0	24.6	< 0.01
Habit of bringing to work (%)				
Fruit	26.2 15.0;38	44.2 31.0;57.0	18	0.01
Vegetables	4.9 1.0;11.0	24.6 13.0;36.0	19.7	< 0.01

fruit. Another important finding was the increase in usual vegetable consumption, shown by two indicators: regular (\geq 5 days/week) vegetable consumption (from 47.5% to 72.1%), and mean number of days when vegetables were usually eaten, which went from 4.4 to 5.6 days.

There was an association between the environmental component and the educational part of the intervention with some indicators of the outcomes studied, notably the link between those referring to vegetable consumption and the positive change in levels of trust in the cleanliness of the raw food. Changing the nutritionist and the positive changes in the presentation of the vegetable dishes may have influenced the workers' opinions on the quality of the service provided. This

was reflected in the greater proportion of workers who reported trusting the cleanliness of the raw food in the post-intervention assessment, even though they had not seen the preparation process of the meals.

This findings are corroborated by the educational axis of the intervention, which placed greater emphasis on promoting vegetable consumption, as initial levels of consumption lower than those of fruit were found in the pre-intervention assessment. The association between this axis of the intervention and changes in vegetable consumption in the company cafeteria was statistically significant.

The relationship between the positive change in trust in the cleanliness of the raw food served and more people acquiring the habit of bringing vegetable to work shows

the importance of trusting in the cleanliness (among those who did not change their opinion, 22.0% started bringing vegetable in from home; and among those who had changed their opinion, 6.7% acquired this habit).

Exposure to the educational part of the intervention was associated with one of the outcomes: variation in vegetable consumption in the company cafeteria. One hypothesis is that the synthesized index created may not adequately discriminate between different levels of exposure to the intervention. Another is that this component, in isolation (as the regression model controlled for the effects of other components of the intervention), did not have a strong enough association to alter the statistical significance of the test used, but may have influenced individuals' responses to the changes in the environment.

The educational strategies were designed based on issues raised in the focus group. The literature indicates the strategies which are planned and executed with the involvement of managers and employees have a greater chance of producing positive results.⁸ Moreover, individuals evaluate this approach positively.

The association found between aspects of the two axes of this intervention and some of the outcomes reiterates the findings of the literature on the relevance of carrying out interventions with multiple components, which combine strategies aimed at the environment with educational and motivational activities aimed at the individual.^{4,6,8}

This is a plausibility study⁵ and, therefore, it may be that the increase in FV consumption is not due to the intervention carried out. However, three aspects reinforce the hypothesis that these changes are the result, at least in part, of the intervention: the change in FV consumption was significant and higher than that recorded in

interventional studies in the work place environment; an association was found between components of the intervention and the variation in FV consumption in the group studied; and no population-level increase in FV consumption was recorded during the period of the intervention (external control suggesting that the changes observed in the group studied were not observed). Results from the latest Family Budget Surveys (2002-2003 and 2008-2009) indicate stable FV consumption in Brazil.^{ij}

The FV consumption profile observed in the pre-intervention could have altered before the beginning of the intervention itself, considering the interval of time which had passed. Changes in FV consumption might have biased the results. If this change occurred towards decreasing the consumption of FV, this would imply an underestimation of the results found, i.e. the real positive change in FV consumption would be higher than that found. If the change occurred towards increasing the consumption of FV, this would imply that the findings were overestimated, i.e. the positive change in FV consumption was smaller than that shown in the results. Although the possibility of some bias in the results cannot be completely ruled out, there is no empirical evidence to suggest that there was a change in FV consumption between the pre-intervention and intervention period, considering the stability of FV consumption in the Brazilian population as a whole at this time.

To conclude, consumption of fruit and vegetables increased among workers who were exposed to an intervention promoting consumption of these foods which included educational and motivational activities and changes in the environment. The multiple component design of this intervention seems to have contributed to the study's findings.

ⁱ Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2002/2003: aquisição alimentar domiciliar per capita, Brasil e grandes regiões. Rio de Janeiro; 2004.

^j Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008/2009: avaliação nutricional da disponibilidade de alimentos no Brasil. Rio de Janeiro; 2010.

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