A B S T R A C T

The purpose of the study was to determine the impact of two worksite cardiovascular nutrition education programs. Program 1 focused on information related to the skills needed to change dietary behaviours (1 session, 45 minutes). Program 2 focused on information related to skills as well as cardiovascular risk factors (1 session, 60 minutes). The study sample consisted of office employees at three worksites. The pretest consisted of questions pertaining to: frequency of consumption of high fat foods, knowledge related to the risk and skills components of the program, and self-report of family and personal history of cardiovascular disease. Of employees who completed the pretest, 67% (55/82) in Program 1, 88% (46/52) in Program 2, and 86% (30/35) in the control group completed the post-test (six weeks after the programs). The results of regression analysis indicated that participants of Program 1 (skills only) reduced their frequency of consumption of high fat foods ($p < 0.01$); no other variables were significant. Nutrition education programs for the prevention of cardiovascular disease should focus on information related to skills when limited time is available.

A B R É G É

L'objectif de cette étude était de déterminer l'impact de deux programmes d'éducation nutritionnelle en santé cardio-vasculaire dispensés en milieu de travail. Le programme 1 contenait des informations sur les habiletés nécessaires au changement de comportements alimentaires (1 séance, 45 minutes). Le programme 2 contenait des informations sur les habiletés et sur les facteurs de risque cardio-vasculaires (1 séance, 60 minutes). L'échantillon était constitué d'employé(e)s de bureau dans trois milieux de travail. Au pré-test, le questionnaire a porté sur la fréquence de consommation d'aliments riches en graisses, les connaissances reliées aux facteurs de risque et habiletés faisant l'objet du programme, et sur les antécédents personnels et familiaux de maladies cardio-vasculaires. Parmi les employés ayant complété le pré-test, 67 % (55/82) pour le programme 1, 88 % (46/52) pour le programme 2, et 86 % (30/35) pour le groupe-témoin ont complété le post-test (six semaines après les programmes). Les résultats de l'analyse de régression indiquent que les participants au programme 1 (habiletés seulement) ont réduit leur fréquence de consommation d'aliments riches en graisses ($p < 0,01$); aucune autre variable n'était significative. Un programme d'éducation nutritionnelle pour la prévention des maladies cardio-vasculaires devrait se concentrer sur la transmission d'informations sur les habiletés lorsque le temps disponible est limité.

Impact of Two Cardiovascular Disease Reduction Education Programs Varying in the Type of Nutrition Information Provided

Linda Azancot, MS^c,¹ Irene M. Strychar, EdD,² Michèle Rivard, ScD³

Over the past 20 years, nutrition education programs have been designed to provide consumers with information regarding the association between food, especially saturated fat intake, and cardiovascular disease as well as the means of reducing saturated fat intake. These types of programs can be useful to increase the public's awareness of the importance of nutrition in preventing cardiovascular disease, but several investigators have not found a strong association between knowledge and modification of fat intake.¹⁻⁵ Although numerous factors, including the physical and socioeconomic environment, affect dietary behaviour change, the weak association between knowledge and behaviour may be due to the inadequate conceptualization and measurement of knowledge itself.^{6,7}

National surveys, conducted in the United States by the Food and Drug Administration and the National Heart, Lung and Blood Institute, to assess knowledge of dietary fats and cholesterol found that knowledge of food sources of saturated

and polyunsaturated fats and the effect of those types of fats on cholesterol level improved in the 1980s; however, overall knowledge level was poor and could be considered an obstacle in implementing dietary change.⁸ A Canadian survey by the National Institute of Nutrition found that 70% of participants were able to correctly identify five of eight high-fat foods,⁹ although 97% did not classify white chicken as a low-fat food and 20% did not recognize margarine as a high-fat food. Consumers tend to overestimate the fat content of low-fat foods and underestimate that of foods high in fat.^{10,11}

Knowledge about cardiovascular risk factors was examined in the Stanford Five City Project.¹ The results indicated that less than 30% of respondents could identify avoidance of high-fat foods or foods high in saturated fat as a means of keeping a person from having a heart attack or stroke. In contrast, Avis et al¹² reported that 73% of respondents stated that they should cut fat and cholesterol in their diets in order to reduce their risk of cardiovascular disease (CVD). Similarly, the findings of the Quebec Provincial Cardiovascular Survey¹³ were that 70% believed the best way to lower blood cholesterol levels was to eat less fat.

Contento et al⁷ consider that both motivational knowledge (knowledge related to the positive or negative consequences of behaviour) and instrumental knowledge (knowledge related to the "how-to" or "skills" information, e.g., the fat content of foods) are needed to change dietary behaviour. However, Kristal et al,³ in a study on nutrition and cancer, found that knowledge about the fat content of foods was associated with dietary intake but general knowledge about nutrients and cancer was not found to be related to dietary intake.

We therefore conducted a study to determine which type of knowledge was

Research Centre Louis-Charles Simard, Notre-Dame Hospital, and Nutrition Department, Université de Montréal

1. Medical student (MD program), Faculty of Medicine, Université de Montréal
2. Researcher, Research Centre Louis-Charles Simard, Notre-Dame Hospital, and Associate Professor, Nutrition Department, Université de Montréal
3. Associate Professor, Department of Social and Preventive Medicine, Université de Montréal

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Correspondence and reprint requests: Dr. Irene Strychar, Notre-Dame Hospital, Pavillon Mailloux, Porte M-8215, 1560 est, rue Sherbrooke, Montréal (Québec) H2L 4M1, Tel: 514-281-6000, ext. 8040, 514-343-2492, Fax: 514-896-4701.

necessary to modify dietary behaviours for the prevention of cardiovascular disease. Specifically, is knowledge about cardiovascular disease risk factors, knowledge about the association between nutrition and risk factors (e.g., that saturated fats increase blood cholesterol levels, monounsaturated fats decrease blood cholesterol levels), and knowledge about food sources of saturated, monounsaturated and polyunsaturated fats (e.g., olive oil is a source of monounsaturated fat) needed to change dietary behaviours. Or is it sufficient to focus on "how-to" or "skills" information to change dietary behaviours, i.e., knowledge about the fat content of foods (without explaining the type of fat), good food choices for heart health, label reading, and practical suggestions on how to reduce fat intake.

We developed two education programs, which varied in the type of information provided, in order to determine the impact on dietary behaviour change. Program 1 (1 session 45 minutes in duration) focused on skill-related information consisting of information pertaining to the fat content of foods and practical ways to reduce the fat content of the diet (skills). Program 2 (1 session 60 minutes in duration) included both skill and motivational material (information regarding nutrition and cardiovascular risk factors). Both programs used similar educational strategies:¹⁴⁻¹⁷ oral presentation with slides; a case study exercise consisting of evaluating a sample one-day food intake based on Canada's Food Guide; a menu modification exercise consisting of identifying ways to reduce a menu's fat content; and print materials. Participants were also asked to identify three heart healthy food habits they wished to adopt after the program. The nutrition and risk factor component of the program consisted of an oral presentation with slides, discussing risk factors, and a class exercise to determine body mass index so that the participants could identify their level of risk for body weight. We hypothesized that participants of Program 2 (risk factors + skills) would be more likely to improve their dietary behaviours than participants of Program 1 (skills only).⁷

METHOD

The study population consisted of City Hall employees in Laval, Quebec. Office

workers were located in three buildings, consisting of 251, 271, and 127 employees. We assigned the two largest worksites to receive the programs; the smallest worksite formed the control group. This research, endorsed by Laval City Hall Health Services, was a pretest-post-test non equivalent control group design.¹⁸

All employees received an invitation to participate in the study, which was sent to them by the worksite courier system. Participants completed a baseline questionnaire (pretest) consisting of self-report information pertaining to dietary behaviour, knowledge, personal and family history of CVD and sociodemographic characteristics. The questionnaire could be completed during work time or at home (20 minutes). Within approximately three weeks, Groups 1 (Program 1: skills only) and 2 (Program 2: risk + skills) participated in the education programs during their lunch break. The programs were given by a dietitian (LA) enrolled in the MSc program at the Nutrition Department, Université de Montréal. Approximately six weeks after the education programs, the three groups completed the post-test questionnaire, similar in content to the pretest. To determine the likelihood of contamination among the three study groups, a question was added to the post-test questionnaire to find out whether employees had discussed the study or its content with a colleague at a different worksite. We were informed by Laval City Hall health services personnel that employee contact between worksites was not very great. Group 3 (control group) received Program 2 at the end of the study period. Overall 26% (169/649) of Laval City Hall employees participated in the study, and this percentage varied for each worksite: 30% (82/271) for the worksite receiving Program 1; 21% (52/251) for the worksite receiving Program 2; and 28% (35/127) for the control group worksite.

Content of the education programs

Topics for the nutrition and cardiovascular disease risk component of the program included 1) brief explanation of heart disease; 2) enumeration of the effects of fats on blood cholesterol levels: saturated fats and dietary cholesterol increase blood cholesterol levels, and monounsaturated fats

and polyunsaturated fats decrease blood cholesterol levels; 3) identification of food sources of saturated, monounsaturated, and polyunsaturated fats, and dietary cholesterol; 4) statement that soluble fibre can decrease blood cholesterol levels together with identification of food sources of soluble fibre; 5) enumeration of ways to reduce blood pressure through diet (decrease salt intake, maintenance of a healthy weight, and moderate consumption of alcohol); and 6) explanation of the concept of healthy weight and determination of participants' body mass index¹⁹ (sheet distributed with calculations already made).

Topics for the skills component of the program included 1) enumeration of general nutrition recommendations for heart health: eat less fat, less salt, moderate alcohol consumption, maintain healthy weight, eat more fibre; 2) review of Canada's Food Guide: portion sizes; 3) identification of sources of high-fat foods in each group of the food guide; 4) practical tips to reduce dietary fat intake, such as avoiding high-fat foods, substituting low-fat foods for high-fat foods, modifying preparation and cooking techniques to reduce fat content of recipes and meals; 5) advice for purchasing low-fat foods and label reading; 6) advice for selection of low-fat foods while eating out; and 7) discussion of 10 practical ways to reduce fat (summary of the above).

Description of the questionnaires

Dietary behaviours were assessed using a French language adaptation²⁰ of Ammerman's food frequency questionnaire.²¹ A score for each food category was determined: 0 points for "doing well", 1 point for "needs work", and 2 points for "problem". A total score was obtained by summing category scores and dividing by the number of questions answered. The knowledge measure consisted of two subscales. The first subscale (14 items: risk factors) consisted of identification of the three principal CVD risk factors; identification of ways to control blood cholesterol through diet (e.g., eating less fat, eating fewer foods containing cholesterol, eating more fibre, consuming fewer calories); effect of saturated, monounsaturated, and polyunsaturated fats and fibre on blood cholesterol levels; identification of ways to

TABLE I
Characteristics of the Three Groups at the Pretest

Variable	Group 1: Program 1 n=55	Group 2: Program 2 n=46	Group 3: Control n=30
Age (mean $\pm$ SD)	44 $\pm$ 9	41 $\pm$ 10	43 $\pm$ 10
BMI (mean $\pm$ SD)	25 $\pm$ 6	23 $\pm$ 3	23 $\pm$ 6
Knowledge score: risks (mean $\pm$ SD)	53% $\pm$ 13	58% $\pm$ 14	56% $\pm$ 15
Knowledge score: skills (mean $\pm$ SD)	59% $\pm$ 16	60% $\pm$ 16	60% $\pm$ 14
Adapted Ammerman's Score (mean $\pm$ SD)*	0.447 $\pm$ 0.177	0.467 $\pm$ 0.176	0.484 $\pm$ 0.177
Sex			
Women	58%†	80%†	93%†
Men	42%†	20%†	7%†
Marital status			
Married/common law	78%	70%	63%
Living alone	22%	30%	37%
Years of education			
$\leq$ 11 years	42%	56%	47%
$\geq$ 12 years	58%	44%	53%
Type of job			
Office workers	60%†	72%†	87%†
Management	40%†	28%†	13%†
Tobacco use			
Smokers	7%	18%	23%
Non-smokers	93%	82%	77%
Physical activity			
Active	88%	88%	83%
Not active	12%	12%	17%
Family history CVD			
Yes	13%	9%	13%
No	87%	91%	87%
High blood cholesterol			
Yes	26%	13%	13%
No	74%	87%	87%
High blood pressure			
Yes	26%	12%	23%
No	74%	88%	77%

* Scores ranged from 0-2 (lower scores indicated lower frequency of consumption of high-fat foods, that is, better eating habits).
† $p \leq 0.05$

reduce blood pressure through diet (lose weight, reduce salt and alcohol intake); food sources of saturated, monounsaturated, and polyunsaturated fats; and food sources of fibre. The second subscale (19 items: skills) consisted of number of recommended portions of the four food groups of Canada's Food Guide; the size of food portions from the food groups; nutrition labeling information related to fat (e.g., cholesterol claim on labels, percentage fat in dairy products); identification of foods with a high fat content. One point was accorded for each correct answer; the sum was converted into a percentage of the possible score. Content validity was assessed by a dietitian who reviewed the content of the nutrition education programs and compared it with the knowledge test questions for each subscale. The following information was also obtained from the pretest questionnaire: age; sex; marital status (married/common law or living alone); education (primary/secondary or vocational school/university); employment

(office workers or management); smokers (yes/no); physical activity (yes/no); self-report height and weight (body mass index kg/m^2); family history of heart disease (yes/no); personal history of high levels of blood cholesterol (yes/no); personal history of hypertension (yes/no).

Statistical analysis

The data were analyzed using the SPSS.PC program.²² Analyses of variance (for continuous variables) and Pearson chi-square tests (for categorical variables) were conducted to determine differences among the three groups at the pretest. A linear multiple regression model was used to determine the impact of the education programs on changes in dietary behaviours. The dependent variable was the difference in pre-post-test scores on the French language adapted Ammerman dietary measure. The independent variables were exposure to the nutrition program (Groups 1, 2, 3), pretest knowledge scores (risk and skills subscales), age, sex, employment, education, marital

status, body mass index, physical activity, family history of CVD, personal history of high blood cholesterol and blood pressure.

RESULTS

Of the Laval City Hall employees who participated in the study, 67% (55/82), 88% (46/52), and 86% (30/35) in groups 1, 2, and 3 respectively completed both the pretest and post-test and, when applicable, the education session, for an overall participation rate of 78%. There were no statistical differences among the three study groups for pretest knowledge and food frequency scores, self-report CVD risk factors, or sociodemographic characteristics, with the exception of sex and type of employment (Table I). The participants of Group 1 (receiving only skills components of the program) consisted of a higher percentage of men as well as individuals in a management position. Although the difference was not statistically significant, Group 1 had fewer smokers and a higher percentage of individuals reporting high levels of blood cholesterol. Fewer than 10 individuals reported discussing the program with a colleague from a different worksite; the majority of discussions took place between colleagues in the control group and the two groups that had received the program.

From a list of cardiovascular risk factors, elevated blood cholesterol was chosen as one of the three major CVD risk factors by 79% of respondents, hypertension by 62%, and smoking by 51%. Only 18% of respondents were able to identify all three major risk factors. Seventy percent identified "eating less fat" as the best way to control blood cholesterol levels; however, only 41% correctly answered "false" to the statement that consuming saturated fats can help reduce blood cholesterol, indicating that many individuals are not aware that the type of fat is important for the prevention of CVD. Less than 25% knew that monounsaturated and polyunsaturated fats can help reduce blood cholesterol levels.

Forty-three percent of respondents did not identify butter as being rich in saturated fat. Only 15% correctly identified corn oil and 21% identified sunflower oil as being rich in polyunsaturated fat. Furthermore, only 10% and 6% respectively correctly identified olive oil and canola oil as rich in

monounsaturated fat. Approximately one third of respondents thought that an oil labeled "cholesterol-free" is lower in fat than other oils and that products labeled "cholesterol-free" are low in fat. Twenty-eight percent incorrectly answered "false" to the statement that a cheese containing 30% fat is a high-fat cheese; and 36% incorrectly thought that a yogurt containing 4% fat is a low-fat yogurt. Close to 50% thought that butter contains more fat than margarine.

Among several lists consisting of different categories of foods both high and low in fat, 89% of respondents were able to identify five out of six breakfast items rich in fat, 58% identified at least four out of five entrées rich in fat, 66% identified two out of three desserts rich in fat, and 92% identified three out of four snack foods rich in fat. From these lists of high- and low-fat foods, the following foods were not identified as being high in fat: spinach quiche (59%), carrot and nut cake (60%), and mixed nuts (75%). Pretzels and chicken breast were incorrectly selected as being high in fat by 72% and 74% respectively of respondents.

Results of multiple regression analysis indicated that employees who participated in Program 1 (skills only) were more likely to reduce their frequency of consumption of high-fat foods (scores on the adapted Ammerman dietary measure) from the pre- to the post-test periods. No other independent variables were found to be statistically significant ($p > 0.05$).

DISCUSSION

Contrary to our expectations, participants receiving the nutrition education program focusing on skills improved their dietary behaviours more than participants of the program focusing on both risk and skills. These findings may be due to the fact that less information was provided to Group 1 (skills only) and so there was no information overload, or they may be due to the content of the two programs. Even though Group 1 consisted of more men, more individuals in a management position, fewer smokers, and more individuals who reported having high blood cholesterol levels, these factors were controlled for statistically in the regression analysis. However, it must be noted that our study

sample was likely to be a motivated group of individuals interested in nutrition, since less than 30% of the total worksite population participated in the nutrition programs. Furthermore, the average scores on the Ammerman's dietary assessment measure indicated that this group of individuals had good eating habits.

Overall, 70% of study participants knew that the best way to lower blood cholesterol levels was to eat less fat, results similar to those of the Quebec provincial survey.¹³ In contrast, knowledge about food sources of polyunsaturated and monounsaturated fats was limited, with less than 25% being able to identify food sources of these fats. These findings are congruent with the results of the National Institute of Nutrition Study^{9,10} which revealed that approximately 50% of Canadians were not familiar with the terms "polyunsaturated" and "monounsaturated" fats. Confusion also remains about labeling information on the percentage fat content of cheese and yogurt as well as the meaning of "cholesterol free" products, as noted in other studies.^{9,23}

In conclusion, when only a limited time is available, we recommend that the focus of the program should be on information related to the skills component of changing dietary behaviours (rather than risk factors): fat content of foods, labeling information, and practical suggestions on how to reduce dietary fat intake. If information on dietary-related risk factors is omitted, we may still expect to see an improvement in dietary behaviours. Further research should be conducted with a group of individuals with poorer dietary behaviours and with different groups of worksite populations.

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