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Promoting Sufficient Fruit and Vegetable Intake Among Teachers: An Intervention Using the Solomon Four Group Design

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RESEARCH ARTICLE

Abstract

Background: Majority of recent deaths in the Philippines were attributed to noncommunicable diseases. While adequate consumption of fruits and vegetables can potentially decrease the burden of some of these noncommunicable diseases, health promotion and education interventions have also shown to increase the fruit and vegetable intake that will help prevent certain heart diseases and cancer.
Objective: This study aimed to evaluate the impact of a self-management intervention on psychosocial variables and fruit and vegetable intake (FVI) of public school teachers in Negros Oriental, Philippines.
Methodology: The study utilized the Solomon Four Group Design. The psychosocial variables were derived from Bandura's Social Cognitive Theory and Ajzen's Theory of Planned Behavior. FVI was measured using a food frequency questionnaire. An assessment of interaction between the intervention and pretest, group comparison tests, and nested ANOVA approach was performed.
Results: Teachers from 44 schools were included in the analysis; 112 were in the intervention group and 116 in the control group. Results indicate no significant interaction between treatment and pre-test group ($F[1,224]=0.15$, $p=0.703$) and no significant differences in the psychosocial variables scores and FVI of the intervention and control groups ($p=>0.05$). Significant findings in two of four psychosocial variables, particularly diet-related attitude ($t=2.412$, $p=0.009$) and knowledge regarding the recommended FVI (Fisher's exact test $p=0.010$), and mean FVI ($t=1.898$, $p=0.031$) were only found using data from the posttest-only intervention group who were able to attend the lecture-workshop and control group.
Conclusion: The study found no evidence of pretest sensitization. There was insufficient evidence to conclude that there were differences in FVI and psychosocial variables of the intervention and control groups post-intervention.

Keywords: *fruit and vegetable intake, self-management intervention, teachers, Solomon Four Group Design, Bandura's Social Cognitive Theory, Ajzen's Theory of Planned Behavior*

Introduction

Healthy eating, which includes adequate consumption of fruits and vegetables, is an essential component of a healthy lifestyle [1]. Sufficient intake of fruits and vegetables lessens the risk for cardiovascular diseases, stomach cancer, and colorectal cancer [2]. Majority of recent deaths in the Philippines were attributed to noncommunicable diseases (NCDs) [3]. For the prevention of lifestyle-related diseases, recommendations contain the inclusion of more than 5 servings of vegetables and fruits per day [4].

Trends in per capita consumption of fruits and vegetables among Filipino households from 1978-2015 have been on a slow decline [5,6,7]. Fruit and vegetable intake in Central Luzon, Bicol, and Eastern and Central Visayas was lower than the national average [7]. These results highlight the need to institute measures to promote fruit and vegetable intake (FVI) giving priority to areas where FVI is low such as in the Visayan regions of the country.

In the promotion of proper nutrition, teachers were identified as one of the specific groups for nutrition

education [4]. The common risk factors of major NCDs include hypertension, hypercholesterolemia, hyperglycemia, overweight or obesity, smoking, unhealthy diet, physical inactivity, and stress [8]. A high proportion of public school teachers were found to have hypertension, hypercholesterolemia, hyperglycemia, and android obesity in studies conducted by the Philippine Heart Association (PHA) in 2010 to 2013 and 2014. Results of the study conducted in 2010 to 2013 which included 7,528 public school teachers from 53 towns and cities in Luzon, Visayas, and Mindanao showed that 25.3% had elevated blood pressure [9]. In 2014, among 1,893 public teachers from 10 public schools (Luzon: 7 schools, Visayas: 2 schools, Mindanao: 1 school), 26% of the teachers had blood pressure of 140/90 mmHg and above. More than half (56.2%) of the teachers had > 200 mg/dl serum cholesterol level and 36.2% had fasting blood sugar greater than or equal to 126 mg/dl. For a circumference, 49.4% of female teachers had a circumference of 81 cm and above while 6.0% of male teachers had waist circumference of 91 cm and above [10,11]. These results show the considerable proportion of public school teachers with hypertension, diabetes, hypercholesterolemia and/or high waist circumference. Males with waist circumference of > 94 cm and females with > 80 cm are at an increased risk of metabolic complications associated with obesity [12]. These findings call for the need for interventions on health promotion and education which focus on the behavioral risk factors of NCDs. In particular, the promotion of adequate fruit and vegetable intake will be beneficial in promoting the overall health of public school teachers.

Health promotion and education interventions have been shown to increase fruit and vegetable intake (FVI). Increases in fruit and vegetable consumption were consistently seen in interventions involving face-to-face education or counseling, as well as in community-based and worksite multicomponent interventions using face-to-face approaches, printed educational materials, and environmental changes [13].

Self-management is an approach wherein persons assume primary responsibility for health care decisions while health care professionals provide supportive interventions to increase the individuals' capacity to manage their own health [14,15]. Rotheram-Borus and colleagues asserted that “self-management interventions effectively span the continuum of prevention and disease management.” They identified five “essential elements for successful self-management” interventions. These elements include (1) activate motivation to change, (2) apply domain-specific information from education and self-monitoring, (3) develop skills, (4) acquire environmental resources; and 5) build social support [16].

Determinants of behavior that are addressed in nutrition education programs are often called potential mediators of behavior change [17]. The potential mediators of behavioral change in this study were the psychosocial variables derived from constructs from Bandura's social cognitive theory (SCT) and Ajzen's theory of planned behavior (TPB). From the SCT, self-efficacy and knowledge was studied. From the TPB, attitude as well as behavioural intentions was measured. All of the four psychosocial variables considered in this study were derived from the variable domains that had been shown to influence FVI based on findings of observational and interventional studies among adults [18,19,20,21,22,23].

The study aimed to evaluate the impact of a self-management intervention on psychosocial variables and behavior related to fruit and vegetable consumption of public school teachers in a city in Negros Oriental. The psychosocial variables were knowledge regarding the recommended FVI, diet-related attitudes, dietary self-efficacy, and behavioral intentions related to FVI.

Methodology

Pilot Test

The pilot study was done in a public high school in a city adjacent to the main study site from May to June 2015 in order to (1) provide the learning experience needed as part of the training of project staff, (2) assess the adequacy of the food items in the food frequency list, and (3) identify the logistical problems that might occur during the conduct of the intervention.

Experimental Design and Procedures

The study was conducted in a city in the province of Negros Oriental from June to October 2015. Using the randomized Solomon Four-Group Design, 44 schools were stratified into blocks composed of four schools per block and then randomized by block to form four groups. Two of the groups were pretested while the other two groups were not pretested. One of the pretested groups and one of the unpretested groups received the self-management intervention while the other two were not exposed to the intervention (control condition). All four groups were then posttested (Figures 1 and 2). The randomized Solomon Four-

Group Design was chosen as a measure to decrease the influence of pre-intervention measurement on response.

In this study, the intervention was called the "Have Five Daily" intervention, or simply "Have Five." The "Have Five" intervention was a self-management intervention that utilized strategies that carried out the five elements for self-management interventions enumerated by Rotheram-Borus and colleagues (Box 1). The "Have Five" intervention included five main activities, namely, (1) conduct of lecture-workshops for the teachers, (2) monitoring-follow-up of the self-monitoring forms, (3) display of food pyramid posters in strategic areas in the schools, (4) conduct of FVI seminars for canteen operators, and (5) lobby-dialogue with school administrators to promote increased FVI among the school's constituents especially the teachers. In particular, the content and educational activities of the workshop were linked to strategies that operationalize the psychosocial constructs derived from behavior change theories (Box 2). This approach of linking constructs, strategies and educational activities partly applies the process of designing nutrition education described by [17].

Study Participants

Eligible participants were kindergarten to high school teachers in public schools in the city who were 20 to 59 years of age. The exclusion criteria were diabetes mellitus, hypertension, acute myocardial infarction within past 12 months, gastrointestinal diseases, any contraindication for fruit and/or vegetable consumption, being vegetarian or vegan, pregnancy and lactation. Persons with any of these conditions may need individualized dietary management during the study period which the project could not provide.

The following formula was used to determine the number of teachers who were included in the study:

$$N=\frac{(Z_a+Z_\beta)^2*2*(s)^2}{(d)^2}$$

The computed number of teachers needed was 51.2persons per group. Incorporating a 10% adjustment of the drop-out rate and considering the design effect of 2 as well as the number of groups which was 2, the total number of study participants was 228 teachers.

Measures

Self-administered questionnaires were used to collect data on the following:

Fruit and vegetable intake consumed in the past week was measured using a quantitative food frequency questionnaire (FFQ) developed with the Food Exchange Lists for Meal Planning (FNRI-DOST, 1994) as reference [24].

Behavioral intentions related to FVI was assessed using two open-ended questions derived from the study by Kreausukon and colleagues (2012): ''How many servings of fruit do you intend to eat every day?'' and ''How many servings of vegetables do you intend to eat every day?''.

Diet-related attitudes was measured using five statements with 5-point Likert-type agree/disagree options adapted without modification from the study by Buller and co-investigators (1999). The items were on available nutrition advice, effect of diet on health, importance of fruit and vegetable intake, health information at work, and availability of fruits and vegetables at work. Responses to two items which were stated in the negative were first reversed and then the responses for all of the five items were totaled. The total scores ranged from 5 to 25. High scores meant positive diet-related attitudes.

Dietary self-efficacy was assessed using a four-point Likert scale. The stem (It is important to stick to a healthy diet. How certain are you that you are able to maintain a healthy diet ...) and the three statements that followed were derived from the study by Luszczynska, Tryburcy and Schwarzer (2007) using a scale from 1 ('definitely not') to 4 ('exactly true') which seeks for the level of certainty of maintaining a healthy diet. The total score ranged from 3 to 12. High total scores meant high dietary self-efficacy.

Knowledge regarding the recommended FVI was measured using a single item adapted from the study by Buller and colleagues (1999): "How many servings of fruits and vegetables a person like you should eat each day for good health?"

Ethical Considerations

The study was approved by the University of the Philippines Manila Research Ethics Board Review Panel 2. Teachers who participated signed a consent form prior to the study.

Box 1. *Elements for self-management interventions and strategies of the "Have Five Daily" intervention*

Elements	Strategies of the "Have Five Daily" Intervention
1) Activate motivation to change	▪ During the lecture-workshop for teachers: (1) Provision of nutrition-related information and materials, (2) Awareness of recent FVI, (3) Sampling of FV for snacks/meals ▪ Placement of posters in strategic areas of the school
2) Apply domain-specific information from education and self-monitoring	▪ Provision of information about the recommended daily FVI during the lecture- workshop for the teachers ▪ Provision of self-monitoring tool with follow-up after the workshop
3) Develop skills	▪ During the lecture-workshop for teachers: (1) Provision of recipes, (2) FVI planning, (3) Provision of self-monitoring tool, and (4) Demonstration and group return demonstration of FV preparation
4) Acquire environmental resources	▪ FVI planning during the lecture workshop ▪ Lobby-dialogue with school administrators on the implementation of school policies supportive of FVI ▪ Seminar for school canteen operators ▪ Placement of posters in strategic areas of the school
5) Build social support	▪ FVI Seminar for school canteen operators ▪ Lobby-dialogue with school administrators

Box 2. *Constructs, Strategies and educational activities of the lecture-workshop for the teachers*

Theory Constructs	Strategies	Educational Activities/ Content/Messages
Social Cognitive Theory Self-efficacy Knowledge	▪ Provision of food and nutrition-related information ▪ Improving FV preparation skills ▪ Building social support	▪ Scientific evidence regarding dietary practices and health or disease risk recommended daily FVI ▪ Provision of tips to increase FVI ▪ Demonstration and group return demonstration of raw FV preparation ▪ Provision of recipes, sample FV for snacks/meals
Theory of Planned Behavior ▪ ·Intentions ▪ Attitude	▪ Reflection on affect/feelings ▪ Self-monitoring	▪ Statements regarding the recommended FVI and attitude about FVI ▪ FVI planning ▪ Provision of FVI self-monitoring tool

Data Processing and Data Analysis

The psychosocial variable scores and FVI of the teachers before and one month after the intervention were examined. Group comparison tests were done to analyze the psychosocial variable scores of the intervention and control groups. For the analysis of FVI, the steps outlined by Braver and Braver (1988) for the statistical treatment of the Solomon Four-Group Design was utilized [25]. However, instead of the Stouffer's Z method, the nested ANOVA approach was performed [26].

Figure 1. *Use of the randomized block design and Solomon Four-Group Design*

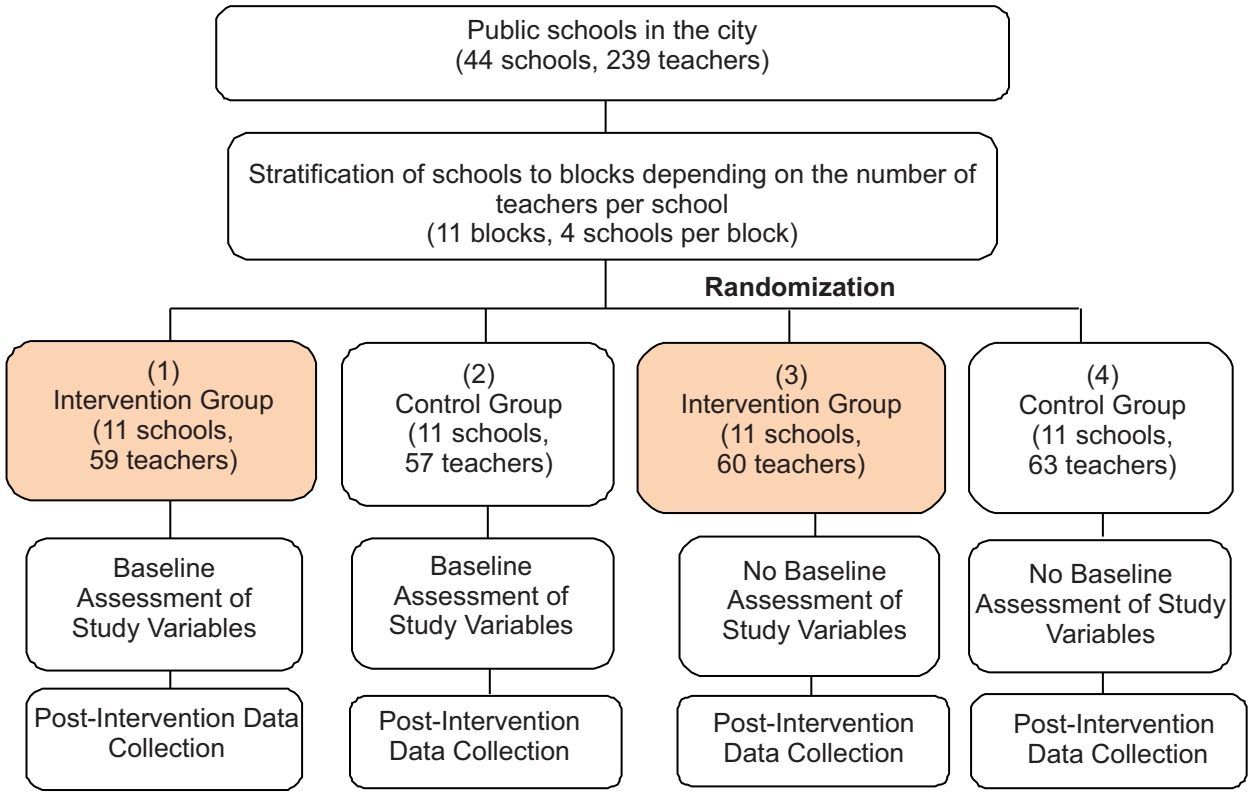

Figure 2. *Flow of study participants*

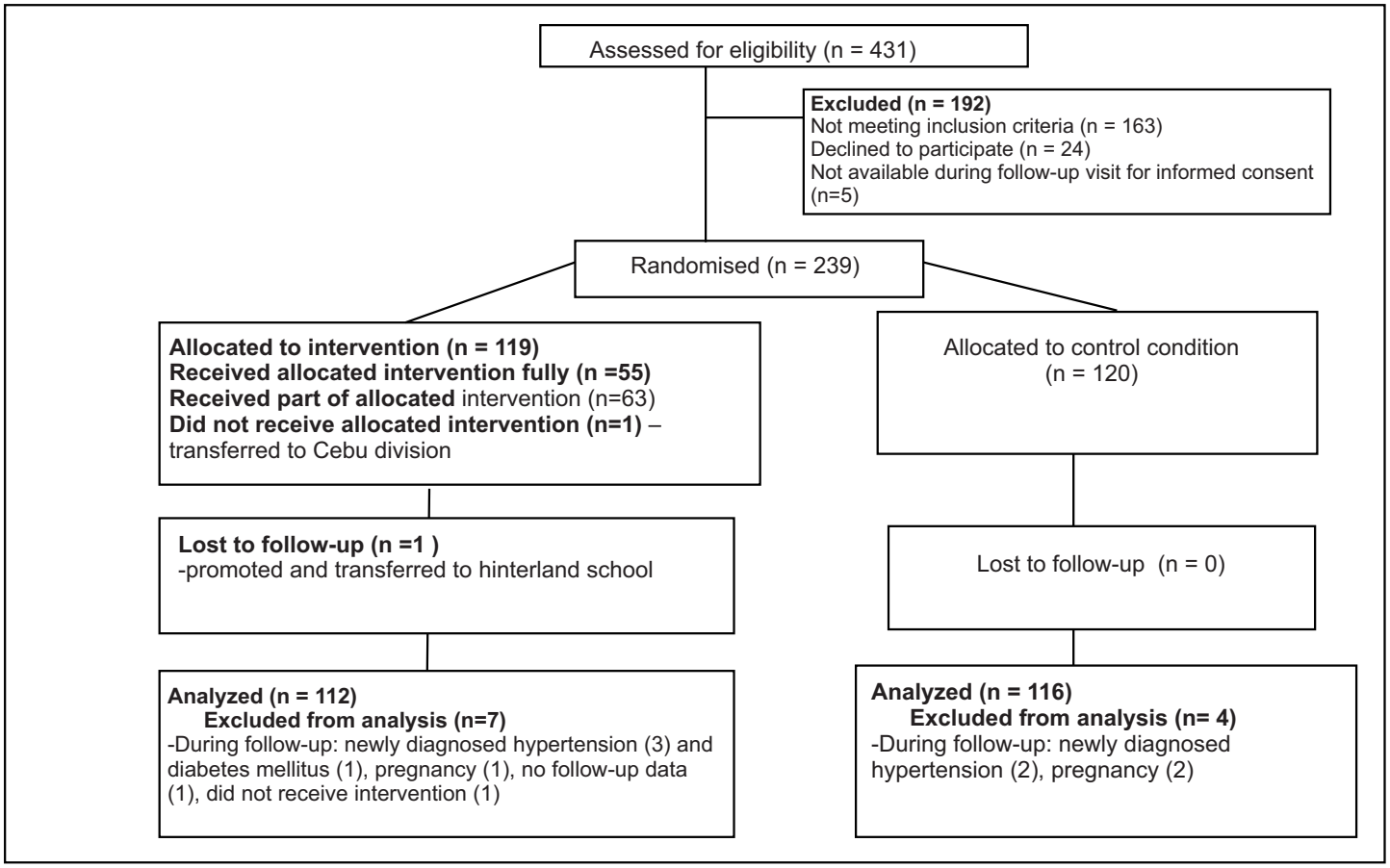

Table 1. *Socio-demographic characteristics of the teachers*

Variable		All	Intervention group	Control group
No. of participants (%)		**228(100%)**	**112(100%)**	**116(100%)**
Age	Mean (SD)	39.21 (9.67)	39.45 (9.34)	38.99 (10.05)
Male	n(%)	41 (17.98%)	14 (12.50%)	27 (23.28%)
Female	n(%)	187 (82.02%)	98 (87.50%)	89 (76.72%)
Marital status				
Never married	n (%)	45 (19.74%)	21 (18.75%)	24 (20.69%)
Married	n (%)	171 (75.00%)	84 (75.00%)	87 (75.00%)
Widowed	n (%)	6 (2.63%)	2 (1.79%)	4 (3.45%)
Separated	n (%)	6 (2.63%)	5 (4.46%)	1 (0.86%)
Home garden				
No fruit trees and vegetables	n (%)	52 (22.81%)	24 (21.43%)	28 (24.14%)
With fruit trees and/or vegetable garden	n (%)	176 (77.19%)	88 (78.57%)	88 (75.86%)
Educational attainment				
College degree	n (%)	198 (86.84%)	97 (86.61%)	101 (87.07%)
Master's degree	n (%)	30 (13.16%)	15 (13.39%)	15 (12.93%)
Teaching assignment				
Kindergarten	n (%)	17 (7.46%)	9 (8.04%)	8 (6.90%)
Elementary	n (%)	115 (50.44%)	63 (56.25%)	52 (44.83%)
High school	n (%)	96 (42.11%)	40 (35.71%)	56 (48.28%)
Household members <18 years old				
Household members >18 years old	Mean (SD)	1.74 (1.39)	1.71 (1.31)	1.77 (1.46)
	Mean (SD)	3.55 (1.60)	.51 (1.55)	3.59 (1.66)
Total household members	Mean (SD)	5.29 (2.23)	5.21 (2.13)	5.36 (2.32)
	Min-max	1-13	1-12	2-13
Religion				
Roman Catholic	n (%)	206 (90.35%)	101 (90.18%)	105 (90.52%)
Born Again Christian	n (%)	6 (2.63%)	3 (2.68%)	3 (2.59%)
Church of Latter Day Saint	n (%)	4 (1.75%)	2 (1.79%)	2 (1.72%)
Other Christian denominations	n (%)	12 (5.26%)	6 (5.36%)	6 (5.17%)
No. of Participants		**217 (95.18%)**	**103 (91.96%)**	**114 (98.28%)**
Monthly household income (Php)	Mean (SD)	24,243.63 (13,594.44)	22,916.75 (13,785.86)	25,442.48 (13,366.32)

Results

The Teachers

A total of 431 teachers from the city division was assessed for inclusion in the study, 239 teachers from 44 schools were randomized to either the intervention or control conditions, and 228 teachers were included in the analysis (Figure 2, Table 1).

At the time of school visit for anthropometric measurement, 225 of the 228 (98.68%) teachers were available (Table 2). The mean BMI for both intervention and control groups was 25. Sixty-one (54.95%) intervention group and 55 (48.25%) control group participants had a BMI

Table 2. *Frequency distribution of study participants based on WHO body mass index classification and risk category (n=225)*

Classification	Body mass index cut-off points	Intervention group (n=111)	Control group (n=114)	Total (n=225)
Underweight	<18.50			
Mild Thinness	17.00 - 18.49	1 (0.90%)	2 (1.75%)	3 (1.33%)
Normal range	18.50 - 22.99	35 (31.53%)	33 (28.95%)	68 (30.22%)
	23.00 - 24.99	26 (23.42%)	22 (19.30%)	48 (21.33%)
Obese	≥30.00			
Obese class I	30.00 - 32.49	5 (4.50%)	4 (3.51%)	9 (4.00%)
	32.50 - 34.99	4 (3.60%)	3 (2.63%)	7 (3.11%)
Obese class II	35.00 - 37.49	0 (0.00%)	2 (1.75%)	2 (0.89%)
	37.50 - 39.99	0 (0.00%)	0 (0.00%)	0 (0.00%)
Obese class III	≥40.00	1 (0.90%)	0 (0.00%)	1 (0.44%)
Body Mass Index	Mean (SD)	25.13 (3.88)	25.175 (3.66)	25.15 (3.76)
Risk				
Increased risk	23–27.49	49 (44.14%)	55 (48.25%)	104 (46.22%)
High risk	≥ 27.50	26 (23.42%)	24 (21.05%)	50 (22.22%)

within the normal range. On the other hand, 49 (44.14%) intervention group and 57 (50.00%) control group participants were overweight (BMI ≥25.00) based on the WHO BMI classification [27]. The WHO BMI classifications reflect the risk for type 2 diabetes and cardiovascular diseases. In Asian populations, additional trigger points for public health action were identified as 23–27.5 kg/m2 representing increased risk and 27.5 kg/m2 or higher representing high risk [28]. Based on these risk categories, 104 (46.22%) of study participants were at an increased risk and 50 (22.22%) were at high risk for type 2 diabetes and cardiovascular diseases.

The Have Five Daily Intervention

The two-way between groups ANOVA conducted showed that there was no significant interaction between treatment and pre-test group (F[1,224]=0.15, p=0.703). Nearly half (49%) of the intervention group teachers were able to attend the lecture-workshop (Box 3).

Psychosocial Variables and FVI

The test results indicate that there was no significant difference (p values > 0.05) in the diet-related attitude, dietary self-efficacy, knowledge regarding the recommended FVI, behavioral intentions related to FVI and FVI of the intervention and control groups (Tables 3 and 4).

Significant findings in two of four psychosocial variables, particularly diet-related attitude (t=2.412, p=0.009, one-tailed), knowledge regarding the recommended FVI (Fisher's exact test *p*-value = 0.010), and a significant difference in mean FVI (*t*=1.898, *p*=0.031) were only found using data of the posttest-only intervention group teachers who were able to attend the lecture-workshop and control group (Table 5).

Discussion

Almost half (47.11%) of the study participants were overweight (BMI ≥25.00) and majority (68%) were at risk for type 2 diabetes and cardiovascular diseases. The proportion of study participants who were overweight was higher than the nationwide prevalence in 2011 based on the FNRI survey result which was 30.31% among adults 20-59 years of age [29]. These findings highlight the need for the promotion of healthy diet. The results suggest that the FVI of the intervention group was not significantly different from the control group at baseline. This study

Box 3. *Coverage of intervention activities*

Intervention activities	Coverage
Lecture-workshops for teachers	Fifty-five (49%) teachers from 18 of the 22 schools that comprised the intervention group attended the lecture-workshop
Seminar for canteen operators	10 of 12 attendees came from 6 (27%) out of 22 intervention group schools
Monitoring and follow-up of FVI self-monitoring	17 of 55 (31%) teachers who attended the lecture-workshop were able to use the self-monitoring form and show the form during the monitoring visits.
Display of food pyramid posters	All of the 22 intervention group schools provided two copies of the daily nutrition guide pyramid for Filipino adults. During the follow-up school visit one month after the lecture workshop, 7 (32%) of the intervention group schools were able to display the posters.
Lobby-dialogue with school administrators	The suggestions provided by the teachers during the lecture-workshop on how FVI can be promoted were communicated to the school heads of all the 22 intervention group schools through a letter. In early September 2015, new school heads were assigned to 9 (41%) intervention group schools. The researcher was able to seek the feedback of 16 (73%) school administrators by school visit and/or phone call during the study period.

also found no significant interaction between treatment and pre-test group which indicated that there was no evidence of pretest sensitization.

The study found no significant difference in the psychosocial variables and FVI of the intervention and control groups post-intervention. Results of additional analysis indicate that the mean FVI, as well as the diet-related attitude and knowledge regarding the recommended FVI of the posttest-only intervention group teachers who attended the lecture-workshop, were significantly higher than the control group. However, non-significant results were found using data from the pretested intervention and control groups. These findings could be brought about by (1) barriers to buying and eating fruits and vegetables, (2) low proportion of study participants who received the allocated intervention fully, (3) the short duration of implementation of intervention activities, and (4) class size.

Certain barriers to buying and eating fruits and vegetables

The intervention group teachers who were able to attend the lecture-workshop identified certain barriers to buying fruits and vegetables which included unavailability, lack of time, and high price. The barriers to eating fruits and vegetables were unavailability, taste preference, lack of time to prepare, and high price. The solutions identified by the teachers to address the barriers to buying and eating fruits and vegetables were personal efforts such as allocating money and time to buy/prepare FVs, bringing FVs to school, self-discipline, and planting. The barriers identified by the teachers were similar to the factors described in the food choice in relation to fruit and vegetable intake framework developed by Pollard, Kirk, and Cade which specified factors affecting food selection and people's ability to buy and consume [30]. The barriers to buying and eating fruits and vegetables need to be addressed in future studies.

Low proportion of study participants who received the allocated intervention fully

Less than half (49%) of intervention group participants were able to attend lecture-workshop, 17 (15%) out of 112 teachers in the intervention group were able to monitor their intake using self-monitoring form, six (27%) out of 22 intervention group schools had attendees for the seminar for canteen operators, and during the study period, seven (32%) of the intervention group schools were able to display the food pyramid posters. In 2015, the city division was preparing intensively for the implementation of the K-12 program of the government the following school year and the teachers had to attend several trainings, at times, during weekends. Consequently, scheduling another lecture-

Table 3. *Psychosocial variable scores and FVI of study participants (n=228)*

Psychosocial variables and FVI		Baseline		Post-intervention			
				Groups with Pretest		Post test-Only Groups	
		Intervention group (n= 56)	Control group (n=55)	Intervention group (n= 57)	Control group (n=55)	Intervention group (n= 55)	Control group (n=61)
Diet-related attitude	Mean (SD)	18.00 (2.20)	17.64 (2.70)	18.16 (2.40)	17.95 (2.14)	18.24 (3.03)	17.72 (2.01)
	Mann-Whitney U-test value, *p* value	z=1.216, *p*=0.224		z=1.326, *p*=0.185		z=1.589, *p*=0.112	
Dietary self-efficacy	Mean (SD)	9.27 (2.12)	9.80 (1.61)	9.81 (1.60)	9.75 (1.71)	9.87 (1.59)	9.13 (2.39)
	Independent t test value, *p* value	t=-1.278, *p*=0.204		t=0.141, *p*=0.444		t=1.645, *p*=0.051	
Behavioral intentions related to FVI	Mean (SD)	3.12 (1.79)	3.06 (1.25)	3.12 (1.53)	3.04 (1.44)	3.37 (1.60)	3.00 (1.30)
	Mann-Whitney U-test value, *p* value	z=0.713, *p*=0.476		z=0.071, *p*=0.944		z=0.909, *p*=0.364	
Knowledge regarding the recommend ed FVI	> 5 servings per day n (%)	0 (0%)	2 (4%)	4 (7%)	2 (4%)	3 (5%)	0 (0%)
	< 5 servings per day n (%)	56 (100%)	53 (96%)	53 (93%)	53 (96%)	52 (95%)	61 (100%)
	Fisher's exact test *p* value	0.243		0.357		0.104	
Fruit and vegetable intake	Mean (SD)	4.90 (3.61)	3.80 (2.68)	4.35 (3.47)	3.82 (2.75)	5.38 (3.37)	4.60 (3.25)
	Independent t test	t=1.714, *p*=0.089				t=1.223, *p*=0.112	
	ANCOVA			F=0.00, *p*=0.980			
	Mann-Whitney U-test on "gain"			z= -0.961, *p*=0.336			
	Repeated measures ANOVA			treatment (p=0.199) and time (*p*=0.405) as factors			
	Nested ANOVA			intervention, F(1,184)=0.26, *p*=0.612; and pretest, F(1,184)=0.41, *p*=0.524			

Table 4. *Psychosocial variable scores of intervention group teachers who were not able to attend the lecture-workshop and control group at baseline and post-intervention (n=175)*

Psychosocial variables and FVI		Baseline		Post-intervention			
				Groups with Pretest		Posttest-Only	
		Intervention group (n= 22)	Control group (n=55)	Intervention group (n= 22)	Control group (n=55)	Intervention group (n= 37)	Control group (n=61)
Diet-related attitude	Mean (SD)	17.77(2.65)	17.64(2.70)	18.23(2.45)	17.95(2.14)	17.89(3.53)	17.72 (2.01)
	Mann-Whitney U-test value, *p*-value	z=0.337, *p*=0.736		z=1.301, *p*=0.193		z=0.590, *p*=0.555	
Dietary self-efficacy	Mean (SD)	9.05(2.32)	9.80(1.61)	9.64(1.53)	9.75 (1.71)	9.86 (1.57)	9.13 (2.39)
	Independent t test value, *p*-value	t=-1.382, *p*=0.171		t=-0.356, *p*=0.639		t=1.402, *p*=0.082	
Behavioral intentions related to FVI	Mean (SD)	2.80 (1.52)	3.06 (1.25)	2.94 (1.53)	3.04 (1.44)	3.38 (1.63)	3.00 (1.30)
	Mann-Whitney U-test value, *p*-value	z=1.405, *p*=0.160		z=0.416, *p*=0.677		z=0.770, *p*=0.441	
Knowledge regarding the recommended FVI	> 5 servings per day n (%)	0 (0%)	2 (4%)	1 (5%)	2 (4%)	0 (0%)	0 (0%)
	< 5 servings per day n (%)	22 (100%)	53 (96%)	21 (95%)	53 (96%)	37 (100%)	61 (100%)
	Fisher's exact test *p*-value	0.508		0.641		-	
Fruit and vegetable intake	Mean (SD)	4.72 (3.51)	3.80 (2.68)	4.20 (3.47)	3.82 (2.75)	4.99 (3.54)	4.60 (3.25)
	Independent t-test	t=1.053, *p*=0.296				t=0.467, *p*=0.321	
	ANCOVA			F=0.10, *p*=0.754			
	Mann-Whitney U-test on "gain"			z= -0.643, *p*=0.520			
	Repeated measures ANOVA			treatment (*p*=0462.) and time (*p*=0.442) as factors			
	Nested ANOVA			intervention, (F(1,135)=0.64, *p*=0.425); and pretest, (F(1,135)=0.11, *p*=0.744)			

Table 5. *Psychosocial variable scores of intervention group teachers who were able to attend the lecture-workshop and control group at baseline and follow-up (n=169)*

Psychosocial variables and FVI		Baseline		Post-intervention			
				Groups with Pretest		Post test-Only	
		Intervention group (n= 34)	Control group (n=55)	Intervention group (n= 35)	Control group (n=55)	Intervention group (n= 18)	Control group (n=61)
Diet-related attitude	Mean (SD)	18.15(1.88)	17.64(2.70)	18.11(2.41)	18.94(2.14)	18.89(3.53)	17.72 (2.01)
	Mann-Whitney test value, *p*-value	z=1.491[a], *p*=0.136		z=0.936[a], *p*=0.349		t=2.412[b], *p*=0.009	
Dietary self-efficacy	Mean (SD)	9.41(2.00)	9.91(1.65)	9.64(1.53)	9.75 (1.71)	9.89 (1.68)	9.13 (2.39)
	Independent test value, *p*-value	z=-0.521[a], *p*=0.602		z=0.275[a], *p*=0.783		t=1.116[b], *p*=0.134	
Behavioral intentions related to FVI	Mean (SD)	3.32 (1.93)	3.06 (1.25)	3.23 (1.61)	3.04 (1.44)	3.36 (1.59)	3.00 (1.30)
	Mann-Whitney U-test value, *p* value	z=0.031[a], *p*=0.975		z=0.407[a], *p*=0.684		z=0.701[a], *p*=0.483	
Knowledge regarding the recommended FVI	> 5 servings per day n (%)	0 (0%)	2 (4%)	3 (9%)	2 (4%)	3 (17%)	0 (0%)
	< 5 servings per day n (%)	34 (100%)	53 (96%)	32 (91%)	53 (96%)	15 (83%)	61 (100%)
	Fisher's exact test *p*-value	0.379		0.294		0.010	
Fruit and vegetable intake	Mean (SD)	5.01 (3.72)	3.80 (2.68)	4.45 (3.35)	3.82 (2.75)	6.18 (2.93)	4.60 (3.25)
	Independent t-test	*t*=1.718, *p*=0.089				*t*=1.898, *p*=0.031	
	ANCOVA			*F*=0.10, *p*=0.758			
	Mann-Whitney U-test on "gain"			z= -0.643, *p*=0.520			
	Repeated measures ANOVA			treatment (*p*=0.179) and time (*p*=0.547) as factors			

[a] Used Mann- Whitney U-Test [b] Used independent t test

workshop for teachers and seminar for canteen operators for those who were not able to attend was not possible at the time.

Higher participation could result in improved FVI. In the Working Well Trial by Sorensen and others, the overall employee participation in the trial activities targeting nutrition outcomes was 82%. The trial was conducted in 111 worksites in the United States for 80-125 weeks [31]. The activities included worksite kickoff events, interactive activities, posters and brochures, self-assessments, self-help programs, campaigns and contests, and direct education through classes and groups [32]. A strong relationship between attendance at the nutrition sessions and changes in consumption was observed in the study by Havas and colleagues. Women who attended all three nutrition sessions increased fruit and vegetable consumption by 1.25 ± 0.22 servings, those who attended two sessions increased by 0.91 ± 0.25 servings, those who attended 1 session increased by 0.68 ± 0.21 servings, and those who had no sessions increased fruit and vegetable consumption by 0.15 ± 0.15 servings [33].

Improving the level of participation of teachers and canteen personnel in intervention activities by conducting nutrition education sessions at least two or three times within six months for canteen personnel and teachers, respectively, and provision of learning materials to promote FVI can increase the FV consumption of teachers. Conducting the lecture-workshop for teachers as well as the seminar for canteen operators during the summer break may be more acceptable to the participants and administration.

Short duration of implementation of intervention activities

The systematic review by Pomerleau and co-authors included studies with at least 3-month follow up and increases in fruit and vegetable intake were reported. Most of the studies included in this review had at least 500 participants, both genders, and had follow-up times of at least 6 months [13]. The trial conducted by Sorensen and colleagues took at least 80 weeks while the 5-A-Day Promotion Program studied by Havas and co-authors was done for 6 months. Pem and Jeewon pointed out in their narrative review that in order for nutrition education to be successful, it should be more comprehensive, addressing food preferences, sensory affective factors, person-related factors such as perceptions, beliefs, and attitudes, meanings and social norms as well as environmental factors, apart from providing basic nutrition information. To be effective nutrition interventions should have a behavioral focus aimed at reducing the targeted risk factors using developmentally and culturally appropriate strategies. The determinants of intake as well as barriers to health preventive behaviors need to be considered and solutions should be planned [34].

Due to time and resource constraints, the self-management intervention activities were designed and conducted for a period of one month and follow-up was done one month after the lecture-workshop. The findings of this study point to the need to increase the duration of intervention activities in order to provide ample time for the enhanced strategies to be employed. Furthermore, due consideration should be given to the suggestions of study participants for the improvement of the activity such as spending more time for the lecture, and cooking demonstration, actual measurement of food, use of videos, provision of individual week meal plan, and, if possible, not conducting the session on a holiday should be given due consideration to improve the participation and the activities. Apart from these suggestions, including the teachers themselves in the planning of specific intervention and nutrition education session activities will likely promote ownership of the program, encourage creativity, address more personal and environmental factors, improve learning outcomes, and increase FVI. The longer the intervention activities, the more time they will address the many factors influencing fruit and vegetable intake and provide more support for the study participants to acquire positive behavioral change.

Class Size

The lecture-workshop for the pretested intervention group had 35 attendees while the session for the posttest-only intervention group was attended by 20 teachers. The results suggest that there was no significant difference in the FVI of the pre-tested intervention group teachers who were able to attend the lecture-workshop and control group. On the other hand, for the posttest-only groups, test results indicate that the mean FVI of the intervention group teachers who were able to attend the lecture-workshop was significantly higher than the mean FVI of the control group (Table 5). Though the characteristics of those who attended the lecture-workshop may differ from non-attendees, being in a smaller group during the lecture-workshop may have positively influenced learning. In the study by Stadler and colleagues, high intake of fruits and vegetables up to two years after the intervention was reported. The intervention consisted of one 2-hour long small group meeting with a

trained interventionist together with two to five participants or individually if unable to attend the group session [35]. In future studies, use of small groups during nutrition education sessions for adults may provide more benefit than large group sessions.

Conclusion

This study found no sufficient evidence to conclude that compared with the control group, the teachers who received the self-management intervention had higher scores on knowledge regarding the recommended FVI, diet-related attitudes, dietary self-efficacy, and behavioral intentions related to FVI. The study results indicate that there was no sufficient evidence to conclude that compared with the control group, the teachers who received the self-management intervention were able to consume more fruits and vegetables.

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