

# Effects of School-based Health Promotion Intervention on Health Behaviors among School Adolescents in North Lima and Callao, Peru

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**Background:** Multicomponent interventions that include both school and family or community involvements have the potential to cause significant changes in the levels of health in adolescents. To this end, KOICA and Yonsei Global Health Center implemented a school-based health promotion program from 2015 to 2016 in Northern Lima and Callao, Peru. The present study aimed to evaluate the effects of a school-based health promotion intervention on the health behaviors of school adolescents in Peru.

**Methods:** Health behaviors were measured using a standard self-administered questionnaire before and after the introduction of a school-based health promotion intervention in 2014 and 2016. The intervention was executed in secondary schools, specifically two schools from Lima and two from Callao, from April 2015 to November 2016. Two schools (one from each area) were selected as control schools. The interventions included health education, screening, and psychological counseling of vulnerable individuals as well as education for teachers and workshops with parents.

**Results:** Descriptive statistics, chi-square test results, and logistic regression values were computed. Sample sizes were 332 and 255 in 2014 and 933 and 599 in 2016 in the intervention and control schools, respectively. Logistic regression analysis revealed significant improvement in the consumption of vegetables and in depression in the intervention schools. Suicide attempts, television-watching, video game use, Internet use, consumption of chips and sugary drinks, and being in fights did not decrease in the intervention group but did increase in the control group. Thus, the intervention might have prevented the worsening of these behaviors in the intervention schools.

**Conclusion:** The intervention had a positive effect on vegetable consumption and feeling depressed as well as on preventing the increase in sedentary behaviors, fighting, and suicide attempts.

**Key Words:** Evaluation, School health promotion intervention, Health behavior, Adolescents, Peru

## INTRODUCTION

Adolescence is the most important transition time for the development of a variety of health behaviors. Alcohol or tobacco use, lack of physical activity, and/or exposure to violence in this period can not only affect adolescents' current health but also their health for years to come. Further, such can even impact the health of these individuals' future children. As such, promoting healthy practices during ado-

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lescence and taking steps to protect young people from health risks are critical for the prevention of health problems in adulthood [1].

A previous study recommended that school-aged youth should participate in 60 minutes or more of moderate to vigorous physical activity daily [2]. Additionally, a separate study found an association between obesity and the consumption of soft drinks [3], while watching television for more than two hours per day was found to be linked with self-rated health and academic performance among adolescents [4]. Television-watching, video game-playing, listening to music, and a lack of sleep promote the over-consumption of food [5]. It is important to integrate health promotion into the school curriculum and policies [6].

One of the mandates of the World Health Organization's (WHO) school policy framework is that school policies and programs should support the adoption of healthy diets and physical activity [7]. Multicomponent interventions that include both school and family or community involvements have the potential to cause significant changes in the levels of physical activity in adolescents [8]. However, several previous studies have revealed the mixed effects of school-based health interventions on different adolescent health behaviors [9-14]. Positive evidence was found in European Union countries via self-reported dietary behavior following the introduction of multicomponent interventions promoting a healthy diet in school-aged children [15]. Furthermore, the effects of school-based alcohol prevention interventions on adolescent alcohol use were small but positive in a study that utilized continuous assessments [16].

The evaluation of health promotion and disease prevention interventions is essential for ensuring their sustainability. To this end, Yonsei Global Health Center implemented a school-based health promotion program from April 2015 to November 2016 in two schools in Northern Lima and two in Callao, respectively, with one school in each region selected as control schools. The objective of the study was to measure the effect of the school-based health promotion intervention on adolescent health behaviors in North Lima and Callao using a pre-post intervention design.

## MATERIALS AND METHODS

### 1. Study design, study area, and sampling

A pre-post intervention design was employed to assess the effect of the school-based health promotion intervention on adolescent health behaviors. Adolescent health behaviors were measured using a standard self-administrated questionnaire administered in October 2014 and November 2016 as a preintervention survey and a postintervention survey, respectively. The school-based health promotion intervention was executed between April 2015 to November 2016 in Northern Lima and Callao, Peru. Out of the 11 schools surveyed at the time of preintervention, four were purposively selected for implementing the intervention and two schools were selected as control schools. Specifically, two schools were selected for intervention and one for control in the areas of Northern Lima and Callao. The study population was composed of secondary level students from six public schools, three schools from Northern Lima and three from Callao. The total sample included for the analysis from the preintervention survey was 557, including 332 from intervention schools and 225 from control schools. Similarly, the total sample size of the postintervention survey was 1,532; of these, 933 were from intervention schools and 599 were from control schools.

### 2. Information collection

The preintervention survey was conducted in October 2014 and the postassessment survey was done in November 2016. Adolescent health behaviors were measured using a standard self-administered structured questionnaire developed based on the WHO Global School-based Student Health Survey Questionnaire modules [17]. The questionnaire was modified and translated into Spanish so that the students could respond in their native language. In addition, the questionnaire was approved through a review by the Ministry of Health, Peru and the Pan American Health Organization/WHO, Korea International Cooperation Agency (KOICA) Peru office.

### 3. Measurements of behaviors

All behaviors were measured according to the self-reported responses of respondents through the anonymous

questionnaire. Variables were categorized in a manner designed to elucidate the existence of an effect after intervention. “During the last week, how many days have you eaten a fruit?” was asked to assess fruit consumption; responses to this question were categorized into two groups of two or less times and three or more times, respectively. A similar question was asked regarding vegetable salad consumption, sugary drink consumption, and cookies/chips consumption. The responses received were also categorized in an identical way. To assess smoking behavior, the following question was asked: “During the past 12 months, have you smoked?” An identical question was asked with respect to alcohol use. Regarding illicit drug use, “During your life, have you used narcotics?” was queried. Additionally, the question “During the past 12 months, how many times have you been in a physical fight?” was posed to assess the variable of being in a fight; the responses to this question were grouped into never or one or more times. For the assessment of being attacked, “During the past 12 months, were you attacked physically?” was asked; the responses were none and one or more times. “During the past 30 days, how many days have you been insulted?” was queried to measure being insulted. “In the past 12 months, have you seriously thought about ending your life?” measured the suicidal ideation in terms of yes or no. For the measurement of suicide attempt, “In the past 12 months, have you tried to end your life?” was asked; the responses were none and one or more times. “During the last seven days, on how many days did you work out for at least one hour per day?” was used to measure physical activity. “During a typical day, how many hours do you spend watching television?” was asked to assess television-watching. The responses were assembled into two groups: two or less hours and more than two hours/day. Identical questions were asked for video game use/day and Internet use/day. Lastly, “In the last 12 months, have you had depression troubles or problems such as: feeling yourself have little interest, sadness, problems with sleeping, dullness, being tired without reason, distracted, or having little appetite for continuous two weeks?” was asked to measure feeling depressed.

#### 4. School health promotion intervention

The KOICA-Yonsei Global Health Center’s project team

conducted a preintervention survey in October 2014, based on which KOICA health promotion program was developed through technical committee meetings. The KOICA, the Ministry of Health, and the regional government of Callao, Peru signed a Record of Discussions for the Health Promotion Program in North Lima and Callao (2013-2017). KOICA selected Yonsei University as a Project Management Consultant to implement the program and Yonsei University received a project budget from KOICA and dispatched experts to Peru. It was agreed that the professional organization would include monitoring staff; a health education expert; and a specialist team composed of a psychologist, nurse, nutritionist, and social worker [18].

Between April 2015 and November 2016, the school health promotion program was implemented across the selected public secondary schools, two in Comas and two in Callao, including 2,144 students from Grades 1 through 5. The intervention aimed to improve students’ physical and mental health by improving their health knowledge, perceptions, and behavior. The intervention included health education, psychological counseling for high-risk students, miniature gym (mini-gym) facilities at schools, education for teachers, workshop with parents, a healthy canteen, and health check-up for students. The mini-gym is an exercise facility set up to promote the physical environment for physical activity, which was installed at the ground of each intervention school. It includes horizontal bars, basketball boards, mats, and chess tables. The health education program for students consisted of information on nutrition, physical activity, mental health, smoking, alcohol use, illicit drug use, and sexual health. Health education was provided for 50 minutes in each class, using Powerpoint slides (Microsoft Corp., Redmond, WA, USA) [18-20] (Table 1).

A field manager and monitoring staff; a health education expert; and a specialist team including a psychologist, nurse, nutritionist, and social worker implemented the intervention. These were local professionals hired by the KOICA-Yonsei Global Health Center team. The intervention was monitored through weekly, monthly, and quarterly reports, including data such as the number of sessions carried out at each school, the number of participants, the number of distributed educational materials, and the activities carried out [18].

**Table 1.** Programs carried out in the intervention schools

Program	Number	Contents	Duration
Health education	Mental health: 706 times, nutrition: 341 times, physical activity: 94 times, prevention of harmful lifestyle habits: 433 times	- Mental health, nutrition and healthy eating, physical activity, preventing harmful lifestyle habits (e.g., drug use, drinking, and smoking, sex education, personal hygiene)	4.2015-11.2016
Psychological counseling	2,775 times	- For high-risk students at the school and health center, 30 minutes in each session	4.2015-11.2016
Education for teachers	200 teachers/212 hours	- Orientation on WHO health promotion at school, Strategic approach to mental and physical health, planning and implementation of a project - 160 hours of offline training, 52 hours of online training	9.2016-12.2016
Education for parents	108 times	- Mental health; nutrition and healthy eating habits; physical activity; drug, drinking, and smoking prevention; sex education and reproductive health	4.2015-11.2016
Family workshop	49 times	- Family workshop for parents and children to attend at the same time - Parents and children were taught to improve communication and foster a healthy atmosphere in the family through activities related to understanding conflict, forgiveness, and reconciliation	4.2015-11.2016
Healthy canteen	46 times	- Canteen managers' training was conducted jointly with the local education department - Topics included nutrition and healthy eating habits and food hygiene	4.2015-11.2016
Health check-up	1,960 students in 2015 and 1,049 students in 2016	- Assessment of nutritional, oral health and mental health status; visual acuity test - Medical personnel of each local public health center supported it	1.2015-3.2015/ 1.2016-3.2016
Mini-gym facilities	4	- Exercise equipment was installed at the school ground	4.2015-12.2015

## 5. Statistical analysis

The data were analyzed using SPSS for Windows version 21.0 (IBM Corp., Armonk, NY, USA). The two datasets of 2014 and 2016 were merged into one. The percentage change for each behavior was calculated by subtracting the percentage score for 2016 from that for 2014, then dividing it by the percentage score at baseline (2014) and finally multiplying it by 100. The chi-squared test was used to assess the association of health behavior with the pre- and postintervention surveys. A logistic regression was conducted by adjusting for age, sex, and school to assess the size of change between 2014 and 2016. For the logistic re-

gression analysis, the year 2016 was coded as "1" and the year 2014 as "0," respectively. The change in each behavior was calculated and compared across the intervention and control schools. The level of significance was set at 0.05.

## 6. Ethical approval

Ethical consent for the study was obtained from the institutional review board (IRB) of Wonju Campus, Yonsei University, for the preintervention (IRB No. 1041849-201410-BM-048-02) as well as the postintervention survey (IRB No. 1041849-201410-BM-048-05). In addition, the study was approved by the DIRESA Callao (Dirección Regional de Salud del Callao) state government in Peru.

Consent was also obtained from each school and from all participants' parents or guardians in advance. Informed consent was obtained from individual participant, and an anonymous questionnaire was used.

## RESULTS

In the intervention group, 33.4% of the students were male and 52.1% were aged between 11 years and 14 years. The majority of the students were in the first grade. In the control group, 56.7% were male and 54.5% were aged between 12 years and 14 years (Table 2).

Table 3 shows the percentage of health behaviors in 2014 and 2016 and the extent of change between them. There was a slight increase in the proportion of students who consumed fruits three or more times/week in the intervention group and a slight decrease in fruit consumption in the control group, respectively. The proportion of students who consumed vegetables three or more times/week increased by 33.7% in the intervention group and by 1.3% in the control group. There was a slight decrease in the proportion of students who consumed sugary drinks and cookies/chips in the intervention group. In the control group, the proportion of students who consumed cookies increased by 40.5%. Smoking, alcohol use, and illicit drug use experience slightly

increased by 6.6% and 5.2% in the intervention group, while smoking and illicit drug use experience increased more significantly by 20.5% and 22.3%, respectively, in the control group in 2016. Suicide ideation and suicide attempts increased by 33.7% and 110.6% in the control group and by 3.4% and 20.4% in the intervention group. The tendency to feel depressed decreased by 20.7% in the intervention group but increased by 17.3% in the control group. Being insulted decreased in both groups. There was also a slight decrease in physical activity level in both groups, and the extent of video game and Internet use increased by 108.9% and 76.0%, respectively, in the control group.

Postintervention, the consumption of vegetables three or more times per week improved significantly in the intervention schools. There was no significant difference in the consumption of fruits in the pre- and postintervention surveys among the intervention and control groups. The consumption of sugary drinks and cookies/chips was constant across the two surveys in the intervention group. Television-watching, video game use, and Internet use for more than two hours per day were also constant in the intervention group. However, the consumption of cookies/chips and television-watching and Internet use for more than two hours per day were significantly higher in the control group in the postintervention survey period. Additionally, suicidal

**Table 2.** Age, sex and grade of students in intervention and control groups

Variable	Intervention group			Control group		
	Total (N = 1,265)	2014 (n = 332)	2016 (n = 933)	Total (N = 854)	2014 (n = 255)	2016 (n = 599)
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
<b>Sex</b>						
Male	420 (33.4)	97 (29.2)	323 (34.9)	480 (56.7)	180 (70.6)	300 (50.7)
Female	838 (66.6)	235 (70.8)	603 (65.1)	367 (43.3)	75 (29.4)	292 (49.3)
Unknown	7 (0.6)	0 (0.0)	7 (0.8)	7 (0.8)	0 (0.0)	7 (1.2)
<b>Age group (in years)</b>						
11-14	661 (52.8)	142 (42.8)	519 (56.4)	321 (54.5)	443 (52.5)	122 (47.8)
15-20	592 (47.2)	190 (57.2)	402 (43.6)	268 (45.5)	401 (47.5)	133 (52.2)
Unknown	12 (0.9)	0 (0.0)	12 (1.3)	10 (1.2)	0 (0.0)	10 (1.7)
<b>Grade</b>						
1 <sup>st</sup>	282 (22.3)	53 (16.0)	229 (24.5)	177 (20.7)	44 (17.3)	133 (22.2)
2 <sup>nd</sup>	259 (20.5)	67 (20.2)	192 (20.6)	178 (20.8)	51 (20.0)	127 (21.2)
3 <sup>rd</sup>	241 (19.1)	62 (18.7)	179 (19.2)	175 (20.5)	50 (19.6)	125 (20.9)
4 <sup>th</sup>	273 (21.6)	86 (25.9)	187 (20.0)	151 (17.7)	44 (17.3)	107 (17.9)
5 <sup>th</sup>	210 (16.6)	64 (19.3)	146 (15.6)	173 (20.3)	66 (25.9)	107 (17.9)

**Table 3.** Percentage change in health behaviors

Variables	Intervention group			Control group		
	2014	2016	Change*	2014	2016	Change*
	(%)	(%)	(%)	(%)	(%)	(%)
<b>Food habits</b>						
Consumption of fruits $\geq$ 3 times/week	61.4	65.4	6.5	65.5	61.6	-5.9
Consumption of vegetables $\geq$ 3 times/week	36.7	49.1	33.7	45.1	45.7	1.3
Consumption of sugary drinks $\geq$ 3 times/week	39.5	38.6	-2.3	42.0	48.4	15.2
Consumption of cookies/chips $\geq$ 3 times/week	40.7	39.2	-3.7	36.5	51.3	40.5
<b>Substance abuse</b>						
Smoking in the past year	13.6	14.5	6.6	16.1	19.4	20.5
Alcohol use in the past year	24.7	27.0	9.3	26.3	26.4	0.4
Experience of drug abuse	5.7	6.0	5.2	9.4	11.5	22.3
<b>Violence and injury</b>						
Being in a fight	33.1	35.2	6.3	35.7	43.6	22.1
Being insulted	34.9	25.8	-26.0	43.5	31.6	-27.3
Being physically attacked	24.4	21.8	-10.6	22.0	23.4	6.3
<b>Psychological distress</b>						
Suicidal ideation	26.5	27.4	3.4	19.6	26.2	33.7
Suicide attempt	18.1	21.8	20.4	12.2	25.7	110.6
Feeling depressed	61.7	48.9	-20.7	43.3	50.8	17.3
<b>Physical activity</b>						
60 min walking for 5 or more days in a week	28.0	24.3	-13.2	30.2	28.7	-4.9
TV viewing > 2 hours/day	22.9	21.7	-5.2	12.9	23.9	85.2
Videogame use > 2 hours/day	7.8	11.9	52.5	6.7	14.0	108.9
Internet use > 2 hours/day	34.3	39.8	16.0	18.8	33.1	76.0

\*Formula = (midline - baseline) / baseline  $\times$  100.

ideation and suicide attempts were constant in the intervention group; however, these two indicators significantly increased in the control group in the postintervention survey period. Feeling depressed was significantly decreased in the intervention group after the intervention (Table 4).

Table 5 shows that, in the intervention schools, the adjusted odds ratio (AOR) for the consumption of vegetable salad three or more times per week was 1.62 in 2016 as compared with baseline [AOR: 1.62; 95% confidence interval (CI): 1.24-2.11]. The AOR for the consumption of cookies/chips and sugary drinks three or more times/week was constant in the intervention schools; however, the same increased significantly in the control group. Engaging in physical activity for at least 60 minutes/day, television-watching for more than two hours/day, video game use for more than two hours/day, and Internet use for more than two hours/day were all constant in the intervention group. However, there was a significant increase in television-watching for more than two hours/day, video game use for

more than two hours/day, and Internet use for more than two hours/day in the control group. Being insulted one or more times was significantly reduced in both groups. Being in a fight one or more times was found to be significantly higher in the control schools (AOR: 1.78; CI: 1.28-2.48). The tendency to feel depressed was reduced significantly in the intervention group (AOR: 0.66; CI: 0.50-0.87). Suicidal ideation and suicide attempts did not decrease in the intervention schools; however, in the control schools, the incidence of suicide attempt was 1.94 times higher in 2016 as compared with in 2014. This indicates that the intervention might have prevented an increase in suicide attempts.

## DISCUSSION

This study examining the effectiveness of a school health promotion program implemented in Northern Lima and Callao found that the program had a positive effect on ado-

**Table 4.** Health behavior in pre and post intervention survey in intervention and control group

Variables	Intervention group			Control group		
	2014	2016	p	2014	2016	p
<b>Food behavior</b>						
Consumption of fruits*						
0-2 times	128 (38.6)	321 (34.5)	0.183	88 (34.5)	228 (38.2)	0.308
≥3 times	204 (61.4)	610 (65.5)		167 (65.5)	369 (61.8)	
Consumption of vegetable salad*						
0 to 2 times	210 (63.3)	475 (50.9)	0.000	140 (54.9)	325 (54.3)	0.863
≥3 times	122 (36.7)	458 (49.1)		115 (45.1)	274 (45.7)	
Consumption of sugary drinks*						
0-2 times	201 (60.5)	573 (61.4)	0.77	148 (58.0)	309 (51.6)	0.084
≥3 times	131 (39.5)	360 (38.6)		107 (42.0)	290 (48.4)	
Consumption of cookies/chips*						
0-2 times	197 (59.3)	567 (60.8)	0.646	162 (63.5)	292 (48.7)	0.000
≥3 times	135 (40.7)	366 (39.2)		93 (36.5)	307 (51.3)	
<b>Physical activity and sedentary behavior</b>						
Television watching/day						
≤2 hours	196 (72.1)	653 (76.4)	0.150	158 (82.7)	407 (74.0)	0.015
>2 hours	76 (27.9)	202 (23.6)		33 (17.3)	143 (26.0)	
Video game use/day						
≤2 hours	106 (80.3)	489 (81.5)	0.750	95 (84.8)	278 (76.8)	0.070
>2 hours	26 (19.7)	111 (18.5)		17 (15.2)	84 (23.2)	
Internet use/day						
≤2 hours	148 (56.5)	476 (56.2)	0.934	127 (72.6)	327 (62.3)	0.014
>2 hours	114 (43.5)	371 (43.8)		48 (27.4)	198 (37.7)	
Physical activity						
≥5 days	93 (28.0)	227 (24.3)	0.185	77 (30.2)	172 (28.7)	0.663
≤4 days	239 (72.0)	706 (75.7)		178 (69.8)	427 (71.3)	
<b>Psychological distress</b>						
Suicide ideation						
No	244 (73.5)	677 (72.6)	0.743	205 (80.4)	442 (73.8)	0.045
Yes	88 (26.5)	256 (27.4)		50 (19.6)	157 (26.2)	
Suicide attempt						
None	272 (81.9)	730 (78.2)	0.155	224 (87.8)	445 (74.3)	.000
1 or more times	60 (18.1)	203 (21.8)		31 (12.2)	154 (25.7)	
Feeling depressed						
Yes	205 (61.9)	456 (48.9)	0.000	113 (45.2)	304 (50.8)	0.140
No	126 (38.1)	477 (51.1)		137 (54.8)	295 (49.2)	
<b>Bullying and violence</b>						
Being in a fight						
None	218 (66.25)	605 (64.8)	0.59	160 (63.7)	338 (56.4)	0.48
≥1 times	110 (33.5)	328 (35.2)		91 (36.3)	261 (43.6)	
Being insulted						
None	204 (63.8)	690 (74.1)	0.000	140 (55.8)	408 (68.3)	0.000
≥1 times	116 (36.3)	241 (25.9)		111 (44.2)	189 (31.7)	
Being attacked						
Yes	247 (75.3)	730 (78.2)	0.273	197 (77.9)	459 (76.6)	0.695
No	81 (24.7)	203 (21.8)		56 (22.1)	140 (23.4)	

**Table 4.** Continued

Variables	Intervention group			Control group		
	2014	2016	p	2014	2016	p
Substance abuse behavior						
Alcohol use						
None	250 (75.3)	681 (73.0)	0.412	188 (73.7)	441 (73.6)	0.975
≥1 times	82 (24.7)	252 (27.0)		67 (26.3)	158 (26.4)	
Alcohol use in the past month						
None	253 (76.2)	762 (81.7)	0.032	191 (75.5)	463 (77.3)	0.569
≥1 times	79 (23.8)	171 (18.3)		62 (24.5)	136 (22.7)	
Smoking						
None	287 (86.4)	798 (85.5)	0.682	214 (83.9)	483 (80.6)	0.256
≥1 times	45 (13.6)	135 (14.5)		41 (16.1)	116 (19.4)	
Illicit drug use						
None	313 (94.3)	877 (94.0)		231 (90.6)	530 (88.5)	
≥1 times	19 (5.7)	56 (6.0)		24 (9.4)	69 (11.5)	

\*per week. \*\*p value.

**Table 5.** Logistic regression on the change in health behaviors in 2016 as compared to those in 2014

Variables <sup>†</sup>	Intervention group	Control group
	AOR (95% CI)	AOR (95% CI)
Food habit		
Consumption of fruits ≥ 3 times/week	1.16 (0.89-1.52)	0.83 (0.61-1.15)
Consumption of vegetable salad ≥ 3 times/week	1.62 (1.24-2.11)*	1.05 (0.78-1.42)
Consumption of sugary drink ≥ 3 times/week	0.97 (0.74-1.26)	1.44 (1.06-1.96)***
Consumption of cookies/chips ≥ 3 times/week	0.96 (0.74-1.25)	1.63 (1.19-2.22)***
Substance abuse		
Alcohol use in the past year	1.33 (0.99-1.80)	1.06 (0.74-1.50)
Alcohol use in the past month	0.79 (0.57-1.08)	0.91 (0.63-1.31)
Smoking in the past year	1.26 (0.86-1.85)	1.18 (0.79-1.77)
Drug use experience	1.09 (0.61-1.93)	1.30 (0.78-2.17)
Physical activity and sedentary behavior		
Physical activity for at least 60 minutes/day	0.94 (0.89-1.00)	1.01 (0.95-1.07)
TV watching > 2 hours/day	0.80 (0.58-1.10)	1.57 (1.02-2.41)***
Video game use > 2 hours/day	0.90 (0.54-1.49)	1.97 (1.09-3.56)***
Internet use > 2 hours/day	1.18 (0.88-1.59)	1.54 (1.04-2.27)***
Violence		
Being in a fight one or more times	0.99 (0.74-1.31)	1.78 (1.28-2.48)***
Being intimidated one or more times	0.60 (0.45-0.79)*	0.57 (0.42-0.78)**
Being attacked	0.85 (0.63-1.14)	1.11 (0.78-1.60)
Psychological distress		
Suicidal ideation	1.14 (0.85-1.53)	1.13 (0.77-1.65)
Suicide attempts	1.31 (0.94-1.82)	1.94 (1.25-3.00)**
Feeling depressed	0.66 (0.50-0.87)**	1.12 (0.83-1.53)

\*p-value < 0.001, \*\*p-value < 0.01, \*\*\*p-value < 0.05.

<sup>†</sup>Adjusted for age, sex and school; AOR: adjusted odds ratio; CI: confidence interval.

lescent health behaviors in the intervention schools as compared with in the control schools. Even though some health risk behaviors did not decrease in frequency or significance

in the intervention schools, the same were found to have increased in the control schools. This indicates that the program may have helped to prevent an increase in those



health risk behaviors.

Previous studies conducted in Europe provide strong evidence that multicomponent interventions can have a positive effect on fruit and vegetable intake [15]. In the present study, the tendency to consume vegetables three or more times a week increased significantly in the intervention schools. However, in contrast, the tendency to consume fruits remained constant in both of the groups. This finding might be due to the fact that the intake of fruits is generally associated with a family's food habits and food security. A study among Korean children from low-income families in urban areas showed that food insecurity was associated with dietary intake, indicating that a school-based intervention alone may not be sufficient for changing the dietary behavior of children and adolescents [21]. A school-based intervention conducted in 11 primary school classes from five schools in Umbria also revealed positive effects on children's food habits and enhanced the concept of school-family alliances for healthy life styles [22]. A review study reported that interventions for more than one year, parental involvement, the introduction of nutrition education into the regular curriculum, and the provision of fruits and vegetables by school food services helped to increase fruit and vegetable consumption [23]. Further, the intake of sugary drinks and cookies/chips three or more times a week was found to be constant in the intervention group, while it increased significantly in the control group. This may indicate that the introduction of the intervention may have been effective in preventing a further increase of such health risk behaviors in the intervention schools. One prior study reported that body mass index increased significantly in the control group but not in the intervention group following a four-month dietary intervention with school breakfast [24]. Another school-based education program produced a modest reduction in the number of carbonated drinks consumed in England and a positive effect in Oman, respectively [25,26]. Evidence from previous studies revealed that a school-based program for substance abuse prevention had a good impact [27,28]. However, a review study assessing the effectiveness of the Health Promoting Schools Framework in improving the health and well-being of students reported no evidence in terms of fat intake, alcohol use, drug use, mental health, violence, and bullying of oth-

ers [13]. Alcohol use in the last 30 days was reduced significantly in the intervention schools in the present study. However, we did not observe any significant improvement in the prevalence of smoking and alcohol consumption in the last 12 months.

The mental health intervention in the present study included health education on unconditional self-acceptance, anger recognition, anger management techniques, understanding of self-worth and social value, types of violence, conflict resolution and decision-making, bullying prevention, self-esteem and strengthening of self-assertiveness, and the prevention of suicidal ideation and suicide attempts. Furthermore, the identification and counseling of high-risk students by psychologists as well as peer education, family workshops, and campaigns were conducted in the intervention schools. Posters and pamphlets on mental health were also developed and distributed at each school.

Even though suicide attempts did not decrease in the intervention schools, they increased significantly in the control schools in the year 2016. Being in a fight was found to be one of the problems faced by adolescents, which has been reported to be associated with suicide attempts [29]. In this regard, it is important to note that being in fight one or more times also increased significantly in 2016 in the control schools. A previous study showed that all types of school-based violence prevention interventions had a positive effect [30].

We did not observe any improvement in the level of self-reported physical activity in the intervention and control groups. After a one-year intervention, significant differences were found in physical activity and soft drink consumption in primary school children [31]. Therefore, Kobel et al. suggested that active parental involvement is vital for successful school-based health promotion interventions. Previous studies have shown that coordinated efforts among multiple organizations such as schools; businesses; policy, advocacy, nutrition, recreation, planning, and transport agencies; and health care organizations can increase the effectiveness of intervention to promote physical activity [32]. Previous studies also found enough evidence of school-based interventions based on theories about behavioral change for health promotion. Furthermore, there exists some evidence that encourages performing interventions that include envi-

ronmental changes and dealing with social influences. Physical activity and healthy eating behaviors were improved in Europe [33]. Physical activity is affected by a large number of social influences [14]; therefore, we may have not observed significant changes in the present study. Regarding sedentary behaviors, even though there was no significant improvement in the intervention schools, television-watching for more than two hours, Internet use for more than two hours, and video game use for more than two hours significantly increased in the control schools, indicating that the intervention may have prevented the growth of these behaviors in the intervention schools. A review study of randomized control trials reported that intervention programs in schools decreased the screen time of schoolchildren [34]. Another school-based interdisciplinary intervention reduced television hours among girls and boys and increased fruit and vegetable consumption among girls [35]. However, a cluster-randomized controlled trial on screen time showed that a program-specific approach was essential for reducing screen time [36].

The present study used a pre-post intervention design in both experimental and control groups, using the same measurement instrument. However, this study has some limitations. The study evaluated self-reported responses for the measurement of adolescents' health behavior; thus, there may be sufficient room for methodological bias. Additionally, the project focused on a multicomponent school health program implemented for a large number of students simultaneously, making it difficult to assess the effectiveness of an individual aspect on a particular health behavior.

## CONCLUSION

The present study revealed the positive effect of a school-based health intervention on psychological distress, violence indicators, sedentary behaviors, and food habits in selected intervention schools. Thus, school-based health interventions can be useful to address substance abuse, mental health, poor dietary habits, and violence-related behaviors among adolescents. However, it is important to note that school-based interventions alone may not be sufficient to improve adolescent health behaviors such as inadequate

physical activity, sedentary behaviors, substance abuse, and mental health indicators.

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## REFERENCES

1. WHO: Adolescents: health risks and solutions [Internet]. World Health Organization 2017. Available from: <http://www.who.int/mediacentre/factsheets/fs345/en/>.
2. Strong WB, Malina RM, Blimkie CJ, Daniels SR, Dishman RK, Gutin B, Hergenroeder AC, Must A, Nixon PA, Pivarnik JM, Rowland T, Trost S, Trudeau F. Evidence based physical activity for school-age youth. *J Pediatr* 2005;146:732-7.
3. James J, Kerr D. Prevention of childhood obesity by reducing soft drinks. *Int J Obes* 2005;29:S54.
4. Sharma B, Cosme Chavez R, Jeong AS, Nam EW. Television viewing and its association with sedentary behaviors, self-rated health and academic performance among secondary school students in Peru. *Int J Environ Res Public Health* 2017;14:383.
5. Chaput JP, Klingenberg L, Astrup A, Sjodin AM. Modern sedentary activities promote overconsumption of food in our current obesogenic environment. *Obes Rev* 2011;12:e12-e20.
6. Mūkoma W, Flisher AJ. Evaluations of health promoting schools: a review of nine studies. *Health Promot Int* 2004;19:357-68.
7. World Health Organization. School policy framework: Implementation of the WHO global strategy on diet, physical activity, and health. WHO: Geneva, Switzerland. 2008.
8. Van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents systematic review of controlled trials. *BMJ* 2007;335:703.
9. Haerens L, De Bourdeaudhuij I, Maes L, Cardon G, Deforche B. School-based randomized controlled trial of a physical activity intervention among adolescents. *J Adolesc Health* 2007;40:258-65.
10. Haerens L, De Bourdeaudhuij I, Maes L, Vereecken C, Brug J, Deforche B. The effects of a middle-school healthy eating intervention on adolescents' fat and fruit intake and soft drinks consumption. *Public Health Nutr*

- 2007;10:443-9.
11. Kropski JA, Keckley PH, Jensen GL. School-based obesity prevention programs: an evidence-based review. *Obesity* 2008;16:1009-18.
  12. Singh AS, Paw MJ, Brug J, van Mechelen W. Dutch obesity intervention in teenagers: Effectiveness of a school-based program on body composition and behavior. *Arch Pediatr Adolesc Med* 2009;163:309-17.
  13. Langford R, Bonell CP, Jones HE, Pouliou T, Murphy SM, Waters E, Komro KA, Gibbs LF, Magnus D, Campbell R. The WHO Health Promoting School framework for improving the health and well-being of students and staff. *Cochrane Database Syst Rev* 2014;4:CD008958.
  14. Lima-Serrano M, Lima-Rodríguez JS. Impact of school-based health promotion interventions aimed at different behavioral domains: a systematic review. *Gac Sanit* 2014;28:411-7.
  15. Van Cauwenberghe E, Maes L, Spittaels H, van Lenthe FJ, Brug J, Oppert JM, De Bourdeaudhuij I. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: Systematic review of published and 'grey' literature. *Br J Nutr* 2010;103:781-97.
  16. Strøm HK, Adolfsen F, Fossum S, Kaiser S, Martinussen M. Effectiveness of school-based preventive interventions on adolescent alcohol use: a meta-analysis of randomized controlled trials. *Subst Abuse Treat Prev Policy* 2014;9:48.
  17. World Health Organization. Global School-Based Student Health Survey (GSHS), Questionnaire Modules. WHO: Geneva, Switzerland. 2013.
  18. Yonsei Global Health Center. Annual report for KOICA health promotion program in Lima North and Callao. Wonju, Korea: Yonsei University. 2015.
  19. Yonsei Global Health Center. Annual report for KOICA health promotion program in Lima North and Callao. Yonsei University: Wonju, Korea. 2016.
  20. Yonsei Global Health Center. Annual report for KOICA health promotion program in Lima North and Callao. Yonsei University: Wonju, Korea. 2017.
  21. Oh SY, Hong MJ. Food insecurity is associated with dietary intake and body size of Korean children from low-income families in urban areas. *Eur J Clin Nutr* 2003;57:1598-604.
  22. Piana, N, Ranucci, C, Buratta, L, Foglia E, Fabi M, Novelli F, Casucci S, Reginato E, Pippi R, Aiello C. An innovative school-based intervention to promote healthy lifestyles. *Health Educ J* 2017;76:716-29
  23. Silveira JAC, Taddei JAAC, Guerra PH, Nobre MRC. Effectiveness of school-based nutrition education interventions to prevent and reduce excessive weight gain in children and adolescents: a systematic review. *J Pediatr (Rio J)* 2011;87:382-92.
  24. Ask AS, Hernes S, Aarek I, Johannessen G, Haugen M. Changes in dietary pattern in 15 year old adolescents following a 4 month dietary intervention with school breakfast-a pilot study. *Nutr J* 2006;5:33.
  25. James J, Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ* 2004;328:1237.
  26. Shama ME, Abdou SS. Evaluating the impact of health promoting school initiative on dietary habits and BMI of students in Oman. *J Egypt Public Health Assoc* 2009;84:119-39.
  27. Griffin KW, Botvin GJ, Nichols TR. Effects of a school-based drug abuse prevention program for adolescents on HIV risk behavior in young adulthood. *Prev Sci* 2006;7:103-12.
  28. Albarracín D, Gillette JC, Earl AN, Glasman LR, Durantini MR, Ho MH. A test of major assumptions about behavior change: a comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. *Psychol Bull* 2005;131:856-97.
  29. Sharma B, Nam EW, Kim HY, Kim JK. Factors associated with suicidal ideation and suicide attempt among school-going urban adolescents in Peru. *Int J Environ Res Public Health* 2015;12:14842-56.
  30. Park-Higgerson HK, Perumean-Chaney SE, Bartolucci AA, Grimley DM, Singh KP. The evaluation of school-based violence prevention programs: a Meta-Analysis. *J Sch Health* 2008;78:465-79.
  31. Kobel S, Wirt T, Schreiber A, Kesztyus D, Kettner S, Erkelenz N, Wartha O, Steinacker JM. Intervention effects of a school-based health promotion programme on obesity related behavioural outcomes. *J Obes* 2014;2014:476230.
  32. Heath GW, Parra DC, Sarmiento OL, Andersen LB, Owen N, Goenka S, Montes F, Brownson RC, Lancet Physical Activity Series Working Group. Evidence-based intervention in physical activity: lessons from around the world. *Lancet* 2012;380:272-81.
  33. De Bourdeaudhuij I, Van Cauwenberghe E, Spittaels H, Oppert JM, Rostami C, Brug J, Van Lenthe F, Lobstein T, Maes L. School-based interventions promoting both physical activity and healthy eating in Europe: a systematic review within the HOPE project. *Obes Rev* 2011;12:205-16.
  34. Friedrich RR, Schuch I. Effect of intervention programs in schools to reduce screen time: a meta-analysis. *J Pediatr (Rio J)* 2014;90:232-41.
  35. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, Laird N. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet

Health. *Arch Pediatr Adolesc Med* 1999;153:409-18.  
36. Andrade S, Verloigne M, Cardon G, Kolsteren P, Ochoa-Aviles A, Verstraeten R, Donoso S, Lachat C. School-based intervention on healthy behaviour among

Ecuadorian adolescents: effect of a cluster-randomized controlled trial on screen-time. *BMC Public Health* 2015;15:942.