Middle-East Journal of Scientific Research 21 (5): 726-732, 2014
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2014.21.05.83231

Effectiveness of Educational Intervention on Physical Activity-Related Knowledge among High School Students in Southern Rural Palestinian Community, in 2012

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Abstract: Low Physical activity during adolescence is recognized as a key public health concern. School-based interventions are thought to be the most globally applicable and effective way to counteract levels of physical inactivity and sedentary behavior. This study aimed to investigate the effects of an eight-week school-based teaching intervention to promote physical activity through increasing the physical activity-related knowledge of high school students in Palestinian national high schools in 2012. Baseline and 3 months post-test data from the Health Knowledge Inventory Survey (HKI) were analyzed for group differences through independent *t* tests and for improvement over time via repeated measures ANOVA. The findings indicated no significant differences between the groups in terms of mean physical activity knowledge scores (P = 0.059) before the intervention. There was a significant difference (P < 0.001) in mean knowledge scores between the intervention and control schools 3 month after intervention follow-up and there was a significant difference in term of gender [male (p=0.028) and female (p=0.007)] and stream of education track (Scientific and non-scientific) in the intervention schools. Whereas significant difference for control group (p<0.001) was found solely between scientific and non-scientific stream students. Media and internet were the two most common sources of physical activity-related knowledge. The evidence suggests the effectiveness of school-based physical activity interventions, given the positive effects on physical activity knowledge. Schools are a suitable setting for the promotion of healthy lifestyles. Additional research on the long-term impact of these interventions is needed.

Key words: Interventions · Physical Activity · Knowledge · School-Based · Palestine

INTRODUCTION

Physical activity has been recorded as one of the major health indicators (objective PA-3) for Healthy People 2020 [1]. Physical inactivity is recognized as a public health concern globally across all ages [2]. Regular physical activity is associated with health improvements and a good deterrent to the risk of developing overweight and obesity [3, 4], various psychological effects [5], diabetes [6], Osteoporosis [7] developing cardiovascular diseases [8- 12], certain cancers [13] and other chronic diseases [14]. Providing opportunities for physical activity and encouraging adolescents to be physically active are important for increasing potential health benefits and longevity [15- 18]. Learning and adopting physical activity behaviors early in adolescence is associated with an active lifestyle in adulthood [19- 21]. Physical activity-related knowledge informs students of the importance and usefulness of developing and sustaining physical fitness. The knowledge, when mastered, can potentially simplify students to practice safely and scientifically. As such, physical activity-related knowledge may possess essential values to be adopted by learners. Also, the association between knowledge of PA and the health benefits was showed to make people physically active [20, 22].

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Given the numerous health benefits of physical activity participation, various public health guidelines have been published on the recommended amount and intensity of physical activity for healthy adults. Recent recommendations propose that school-age youth participate in 60 minutes or more of moderate-to-vigorous physical activity per day [23]. Despite the suggestion that physical activity is beneficial for youth and the inclusion of physical activity in most health promotion recommendations (e.g. Move for Health - Active Youth) [14], large proportions of the adolescents are not meeting these recommendations [24] and physical activity participation tends to decline with age, especially in girls at all ages substantially less active than boys [25]. Furthermore, time for PE in the daily curriculum has been reduced and, in some cases, eliminated [26].

Schools are generally acknowledged a key setting for the promotion of physical activity and healthy lifestyle for several reasons, such as students spend the majority of their day time in schools than any other setting with the exception of their homes and the somewhat controlled environment of the school [22]. According to the latest enrollment data, 1.14 million students were enrolled in public and UNRWA schools in Palestine in 2010 [27]. It is important to build an evidence-base within each country, due to the potential influence of local environmental factors, culture and educational setting on any school-based intervention program. In Palestine and according to our knowledge, no study of this kind has been conducted to date. Therefore, it is important to provide knowledge to this field that is applicable to local circumstances.

The research question asked in this study was how much the physical education lessons from an 8-week progressive education intervention- the *compelling the challenge curriculum*- could be effective for improving physical activity-related knowledge in Palestinian adolescents. Thus, the objectives of this study were to compare changes in mean of physical activity knowledge score among the intervention schools to physical activity levels of schools who only received general curriculum-based physical activity (Controls) and further, to assess sources of physical activity-related knowledge among both intervention and control schools.

School-based education interventions designed to increase physical activity levels have wide-ranging public health implications. Research projects designed to evaluate the effectiveness of school-based health education interventions in lowering chronic diseases have included physical activity components in their ducational design. The educational component of The *Compelling the Challenge* Curriculum (CTC) included recommendations for increased physical activity, although changes in activity level were not evaluated. The CTC has included educational messages regarding increased physical activity and has collected sufficient data to assess the effects of the intervention with respect to changes in physical activity-related knowledge. This report provides information regarding the effectiveness of the intervention on increased physical activity-related knowledge.

MATERIALS AND METHODS

Sampling, Setting and Participants: The present intervention study examined the population of male and female students in the eleven and twelve grade of governmental high schools in Tarqumia. This study was part of an 8-weeks research endeavor on a culturally tailored school-based health education curriculum, in rural schools in the south of Palestine. The curriculum emphasized constructing health-related knowledge including fitness and nurturing personal and social responsibility for healthful living.

Tarqumia had two boys and two girls' high schools; all of them had 11 and 12 grades. Therefore, all high schools in Tarqumia were qualified for the study, so the control and intervention schools were randomly assigned, two of the high schools (one male and one female) were randomly assigned to the intervention group and the other schools were considered as the control group. All high schools were at the same level in terms of economic, social, cultural and educational conditions and were geographically close to each other.

A G-power calculation was performed prior to the beginning of the study and indicated that at least 108 students in the intervention group and 108 in the control group is required with 92% power to detect a significant difference ($p<0.05$) in physical activity knowledge between the two groups, the researcher enlarged the sample size to 240 to allow for loss of subjects. The final sample consisted of 240 students (n=120 for intervention; n=120 for control).

The researcher employed a stratified random sampling with grades, gender and stream of education track selected proportional to enrollment size and size of students in classes (Proportional allocation), then simple random sampling without replacement was applied. All students in selected classes are eligible for participation and surveys can be administered during one regular class

period. Questionnaires were completed in 4 public high schools with an overall response rate of 98%. Four questionnaires were excluded and discarded because they were incomplete. A pre-tested self-administered questionnaire consisting of three sections: (1) Demographic data, (2) their knowledge of physical activity and (3) their source of health knowledge, was administered to the students.

The intervention started immediately after baseline measurements. All students in the 11 grade of the participating intervention schools received the intervention; written students' consents were acquired prior to data collection. The participants were informed about their right to decline or withdraw from the study, any time in the process. The data were analyzed using SPSS version 20 computer software. The independent *t*-test, two-way ANOVA and two-way repeated measures ANOVA were used to calculate difference in knowledge.

Assessment of Physical Activity Knowledge: Physical activity knowledge was assessed from the sum of correct answers to ten self-administered questions imbedded in the Health Knowledge Inventory Survey (HKI). These questions included items regarding knowledge about: 1) After a strenuous workout a person should; 2) When a person is in very good physical condition, their hear; 3) Exercises that pit one muscle, or body part against another or against a fixed object in a strong but motionless pressing or contracting are called; 4) Which statements is not true?; 5) Exercise that makes the cardiovascular and respiratory system strong is; 6) …… is the capacity of a muscle to exert a force against a resistance; 7) More than normal body exercise is; 8) Which statement about aerobic exercises is true? 9) A term that means "without oxygen " or not requiring oxygen is; and 10) the condition known as "runners' high" has been associated with the release of brain chemicals known as? Internal consistency for these variables, as represented by Cronbach's alpha, was 0.92.

The number of physical activity-related knowledge questions was 10, in a multiple-choice format. Each question had only one correct answer and the percentage-correct score was used as the knowledge score. Knowledge scores were assessed and then entered in the same SPSS data set. During the assessment, we referred to an answer key established previously. We scored responses dichotomously, with correct answers scoring ''1'' and wrong answers scoring ''0.'' We then computed the percentage of correct scores and entered these values in the data set, for each participant, to indicate their understanding of physical activity-related knowledge.

Intervention: This school-based intervention was the physical education lessons from an 8-week progressive education intervention- the *compelling the challenge* (CTC) curriculum. CTC is a culturally tailored intervention for Palestinian adolescents, focusing on 10 dimensions of health behavior (Physical activity, nutrition, communicable diseases, chronic diseases, mental health, consumer health, environmental health, aging and death, accident and safety and substance use) for chronic diseases prevention. The intervention started immediately after baseline measurements. As part of the intervention, information was disseminated regarding the benefits of physical activity and promotional efforts were begun to encourage increased levels of physical activity behavior. The intervention lessons focused on creating awareness and knowledge of the need to practice regularly, the health benefits of regular physical activity, educational messages regarding increasing physical activity and ways of carrying out a safe and effective physical activity program. The intervention program included materials and programs were implemented: Arabic print materials and brochures were developed by the researcher who supplied relevant information on physical activity.

RESULTS

Description of the Sample: A total of 236 students in the eleventh (n = 116) and twelfth grades (n = 120) from 4 high schools contributed self-reporting and knowledge data both in the pre-test and post-test study (Table 1). This sample represented students from diverse education track backgrounds (scientific stream: n = 89 or 37.7%, 44 in the intervention and 45 or in the control groups and non-scientific stream: n = 147 or 62.3%, 72 in the intervention and 75 in the control groups) and both genders (Male: n = 116, 56 in the intervention and 60 in the control groups and female: n = 120, 60 in the intervention and 60 in the control groups). The mean age of the students was 16.9 years (Range 16 - 18 years), with both gender and stream of education track almost equally distributed.

Physical Activity-related Knowledge: Table 2 shows the pre- and post-intervention respondents' knowledge about physical activity. Knowledge of physical activity health problems is defined in terms of the ability of the respondents to correctly answer the physical activity health issue in question. The source of data collection about the intervention and control groups' physical activity-related knowledge was the same and there was no difference between intervention and control groups in this regard. The comparison of their knowledge about physical

Table 1: Socio-demographic characteristics of the respondents (n = 236)

	Intervention group (n=116)		Control group (n = 120)	
Characteristics	No. of students (n)	(%)	No. of students (n)	(%)
Age (years)				
1				
16	35	30.2	36	30.0
17	63	54.3	64	53.3
18	18	15.5	20	16.7
Gender				
Male	56	48.3	60	50.0
Female	60	51.7	60	50.0
Stream of education track				
Scientific	44	37.9	45	37.5
Non-scientific	72	62.1	75	62.5
Grade in school				
11th	116	100.0	00.0	0.00
12th	00.0	0.00	120	100.0
Total	116	100.0	120	100.0

Table 2: Comparing mean and standard deviation of knowledge score in terms of physical activities before and 3 months after the intervention in the students of control and intervention groups

	Time				
	Before intervention		3-months after intervention		
	Indicator				Significance level of
Group	Mean	Standard deviation	Mean	Standard deviation	R.M. ANOVA test
Intervention (n=116)	3.78	1.8	6.41	1.3	<0.001
Control (n=120)	3.67	1.6	3.34	1.6	0.813
Significance level of independent t-test	0.059		<0.001	-	

Table 3: Comparing mean and standard deviation of knowledge score in terms of physical activities before and 3 months after the intervention in the male and female students of control and intervention groups

	Time						
	Before intervention			3-months after intervention			
	Gender			Gender			
	Mean (SD)		P value	Mean (SD)		P value	
			Independent			Independent	Significance level of
Group	Male	Female	t-test	Male	Female	t-test	R.M. ANOVA test
intervention	3.46 (1.8)	4.08 (1.7)	0.066	6.16 (1.3)	6.65 (1.2)	0.041	0.028
control	3.58 (1.8)	3.15 (1.3)	0.129	3.37 (1.8)	3.32 (1.3)	0.865	0.287

Intervention group (n=116, 56 male and 60 female).

Control group (n=120, 60 male and 60 female).

SD = standard deviation.

Table 4: Sources of Knowledge regarding physical health for the respondents (N = 236; males = 116, females 120)

Source of Health knowledge	Health area: Physical activity: Strongly agree (n and %)	Agree (n and %)	Total (n and %)
Father	67 (28.4)	61 (25.8)	128 (54.2)
Mother	40 (16.9)	43 (18.2)	83 (35.2)
Brother	72 (30.5)	62 (26.3)	134 (56.8)
Sister	82 (34.7)	52 (22.0)	134 (56.8)
Peer	74 (31.4)	36 (15.3)	110 (46.6)
Relatives	78 (33.1)	61 (25.8)	139 (58.9)
School	38 (16.1)	28 (11.9)	66 (28.0)
Personal reading	43 (18.2)	34 (14.4)	77 (32.6)
Media	101 (42.8)	50 (21.2)	151 (64.0)
internet	132 (55.9)	30 (12.7)	162 (68.6)

activity-related knowledge in the pretest step indicated lack of any significant differences in the beginning of the study between the two groups. Independent *t*-test confirmed this issue that before the intervention, there was no significant difference between the means of knowledge scores between the intervention and control groups (P = 0.059) (Table 2). However, 3-monthe after the educational intervention, the mean of knowledge score in the intervention group significantly increased while that level was not significant in the control group. The result of repeated measures ANOVA demonstrated a significant difference between the mean knowledge scores in the intervention and control group three-months after the intervention (P < 0.001). Repeated measures ANOVA revealed a significant difference between mean knowledge score before the intervention and in the follow-up intervals in the intervention group (P < 0.001); whereas, this test did not revealed significant differences in the follow-up intervals in the control group (P = 0.813). Another comparison was done between the intervention and control group based on gender of the participants. The results showed that, there was no significant difference in the mean of physical activity-related knowledge scores between male and female students in both the intervention and control groups at baseline. In contrast, there was a significant difference of the mean of physical activity-related knowledge scores between male and female students in the intervention group, whereas, the results did not revealed significant difference among the control group at post-test (Table 3).

Source of Health Knowledge: Regarding source of physical activity-related knowledge, the results showed that, the most common sources of nutrition knowledge in rank order were internet 162 (68.6%) and media 160 (68.0%), while the least common sources were school 66 (28.0%) and personal reading 77 (32.6%) (Table 4)

DISCUSSION

This school-based intervention in 16-18 year-old adolescents indicated that, there was no significant difference between boys and girls in both the intervention and control groups or between the intervention and control groups in their physical activity-related knowledge, whereas there was a significant difference between scientific and non-scientific stream students in both the intervention and control groups at baseline. At post-test, significant changes in the mean of knowledge score among the students of the intervention group showed the effectiveness of the educational intervention program in increasing the physical activity-related knowledge of this group. Along with the results of the present study, the knowledge improvement of participants in the educational programs has been observed in many previous studies. These school-based studies [28-33], had comparable results to the ones of this study and reported significant increase in the knowledge score of the intervention group compared with the control group after educational intervention. The post-test gender differences may be attributed to female adolescents' more concern about their weight and bodies compared to adolescent males, so they paid more attention and interest. With regard to the number of educational lessons for the intervention and control group, the improvement in physical activity-related knowledge in the intervention group and lack of significant improvement in the control group indicating lack of educational intervention were also the objectives of the study which were fulfilled. This result was of high significance since having knowledge is considered a key condition for building a correct attitude and espousing proper behaviors.

The strengths of this intervention lie in the cooperation of the schools administrations and teachers. Moreover, the intervention was delivered accurately by the researcher, its fit with the demands of the national curriculum and its flexible design which respected the autonomy of researcher by allowing him to decide how and when he would use the intervention material. These characteristics improve the scope for the future sustainability of the intervention.

CONCLUSIONS

The comparison of before and after intervention in this study revealed that, there was a statistically significant differences in the physical activity-related knowledge in the intervention group. It is important to notice that, the lower correct response rate for the post-test over the pre-test in physical activity-related knowledge may indicate that the students in the control group were guessing at the answers for the pre and post-test indicating little to no knowledge was gained throughout the students' years in high school. The above results suggested that schools are potentially attractive settings in which to promote positive health behaviors because students spend large amounts of time in the school environment. Schools should assume a leadership role through delivering evidence-based health-related PE programs that has the potential to motivate and ensure young people engage in adequate amounts of physical activity each day. Finally, the study results reassure that, PE should be taught by certified and highly qualified PE teachers at all school levels.

Competing Interests: The authors declare that they have no competing interests.

Funding: This work is self-sponsored.

ACKNOWLEDGEMENT

The authors of this paper would like to thanks to the Department of Community Medicine, Universiti Sains Malaysia. As well as, would like to thank all participants of this study. Also the authors would like to thank the Palestinian Ministry of Education Board committee for their assistance during this study. This study was self-sponsored.

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