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Do Israeli health promoting schools contribute to students' healthy eating and physical activity habits?

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Summary

The Israeli Health Promoting School Network (HPSN) is actively committed to enhancing a healthy lifestyle for the entire school population. This study aimed to explore the contribution of school participation in the HPSN and students' individual characteristics to healthy eating and physical activity habits among Israeli school children aged 10–12 years. A cross-sectional survey was conducted among 4166 students in grades 4–6 from 28 schools. The schools were selected from a sample of HPSN affiliated and non-HPSN schools. The contribution of individual characteristics (grade, gender and subjective self-reported health education activities at school) and school characteristics (school type, population group, deprivation score) to healthy eating and physical activity habits was analyzed using multi-level hierarchical models. Multi-level analysis indicated that student's individual characteristic was significantly associated with healthy eating and physical activity habits. The subjective self-reported health education received at school was statistically significant factor associated with students' health behaviors. The school's affiliation with the HPSN was not associated with higher healthy eating and physical activity scores after adjusting for individual factors. These findings suggest that Israeli HPSN schools do not contribute to children's health behaviors more than other schools. Therefore, health promoting activities in HPSN schools need to be improved to justify their recognition as members of the HPS network and to fulfill their mission.

Key words: health behavior, health promoting schools, diet, evaluation, health education

INTRODUCTION

Schools have been widely accepted as a critical setting for health interventions because of their potential to develop and directly offer students a supportive environment for lifelong dietary, hygiene and exercise habits (Inman *et al.*, 2011; Banfield *et al.*, 2015; Nordin, 2016). Tools and means provided by schools to promote a healthy lifestyle (Samdal and Rowling, 2012; Bennett *et al.*, 2016; Mukamana and Johri, 2016) may include serving healthy food in the cafeteria (French and Story, 2016), publishing newsletters on health matters (Slee and Skrzypiec, 2016), providing an environment and equipment for physical fitness, and teaching classes about various issues related to health (Carlsson and Simovska, 2012; French and Story, 2016; Holland *et al.*, 2016). Researchers have suggested that these activities may not be sufficient and need to be supported by an appropriate policy that elicits cooperation from the entire school community: parents, teachers and students (Boot and de Vries, 2012; French and Story, 2016; Holland *et al.*, 2016; Moynihan *et al.* 2016).

The concept of a health promoting school (HPS) was developed and defined by the World Health Organization as 'one that constantly strengthens its capacity as a healthy setting for living, learning and working' (WHO, 2015). The HPS framework has been advocated as an effective approach to promoting students' health because it helps expand knowledge and improve their attitudes, skills and behaviors on health-related matters (Inman *et al.*, 2011; Boot and de Vries, 2012; Samdal and Rowling, 2012; CDC, 2013). Thus, health promotion in schools has become a central feature of efforts to improve students' health and nutrition (Eldredge *et al.*, 2016; Persson, 2016). Underlying the WHO model is Bronfenbrenner's ecological theory that adopts a whole-school approach to activities, such as integration of sequential and planned nutrition and physical activity programs in the curriculum, and advocates attention to related aspects of the school environment, such as improved nutrition-related policies (Wang *et al.*, 2015; Holland *et al.*, 2016). This model has increasingly been endorsed as an effective way to promote nutrition and physical activity in the school setting (Story *et al.*, 2009; Schölmerich and Kawachi, 2016; Wang *et al.*, 2015).

In 1986, the Ottawa Charter for Health Promotion established basic principles for promoting health in school settings. According to the charter, an HPS must identify students' needs and set appropriate goals to address them (WHO, 1986; Bennett *et al.*, 2016; Eldredge *et al.*, 2016). The HPS must also assimilate values, perceptions and criteria of health promotion into the formal organizational structure (Boot and de Vries, 2012; CDC, 2013; Joyce *et al.*, 2016; Persson, 2016). Furthermore, an HPS must offer long-term intervention programs that engage the entire school community (parents, teachers and students) and have a positive effect on youth health (WHO, 1986; Boot and de Vries, 2012; Bennett *et al.*, 2016; Eldredge *et al.*, 2016). Previous studies have shown that students' knowledge about diet and nutrition improved significantly following nutrition promotion interventions within an HPS framework, that addressed issues ranging from the importance of eating a balanced diet, the concept of a balanced diet and healthy eating (Arriscado *et al.*, 2015; Nordin, 2016; Persson, 2016), the relationship between diet and health at present and in the future, classification of foods, the recommendations for fruit and vegetable intake, to food hygiene (Langford *et al.*, 2015; Torres and Simovska, 2016).

Some research on HPS support their positive effect on students' health behavior and overall school achievements (Samdal and Rowling, 2012; Banfield *et al.*, 2015). Mũkoma and Flisher (Mũkoma and Flisher, 2004) found major contributions of HPS to school-related outcomes, such as providing high levels of knowledge and attitudes about healthy lifestyle, improved alcohol and drug use, physical exercise and physical fitness, choosing healthy school meals, and developing policy plans (Mũkoma and Flisher, 2004). Kahn *et al.* (Kahn *et al.*, 2002), who investigated the effectiveness of school interventions on increasing students' physical activity, found that environmental and policy approaches to enriching physical education classes increased physical activity in and out of the classroom. Another study found that nutrition promotion interventions using the HPS framework are the most effective multi-level hierarchical method of improving nutrition knowledge for all target populations: students, teachers and parents (Kaisari *et al.*, 2013).

Over a decade ago the Israel Ministry of Education, in cooperation with the Ministry of Health, established a HPS network (HPSN). Schools that wish to join the network are obligated to achieve specific educational objectives, promote student health and improve the quality of life and well-being of the school community: students, teachers and parents. The Israeli HPSN is based on the WHO international network approach and is affiliated with it. There are currently 150 Israeli HPSN schools that provide the infrastructure for inclusion of health as an integral part of the school's educational and social environment and therefore are considered a setting that influences attitudes, and

supports and promotes the healthy behavior of students, staff and administrators. Schools voluntarily apply to become members of the HPSN. Candidates are required to declare their commitment to leading the school community towards implementation of a health promotion policy and to developing a multi-year program, integrated in the curriculum, aimed at forming healthy behavior and promoting a healthy lifestyle. The program must be based on the health promotion standards developed by the Ministry of Education and include goals, objectives, content, activities, follow-up, and evaluation that are consistent with WHO standards (Israeli Ministry of Education, 2016).

Published studies that evaluated the efficacy of using the holistic HPS approach to school-based nutrition and physical activity promotion compared with more traditional curriculum-only based approaches are limited, particularly in Israel. The current study seeks to demonstrate the effectiveness of applying a socio-ecological approach, as provided by the WHO HPS framework, to promotion of healthy eating and physical activity behaviors and improved nutrition knowledge among elementary school students in Israel. The goal of this study is to examine the hierarchical contribution of individual characteristics, including the school's health education activities as reported by the students, and of the school's characteristics, including belonging to the HPSN, to students' reported healthy eating and physical activity habits.

METHODS

Participating students

The participants in the current study were 4166 students, aged 10–12, in the fourth, fifth and sixth grades, studying in Jewish and Arab public elementary schools supervised by the Israeli Ministry of Education.

Participating schools

The Ministry of Education provided a list of schools that we categorized into two groups: (i) HPSN—schools affiliated with the Israeli HPSN; (ii) non-HPSN—schools that are not affiliated with the Israeli HPSN. We randomly selected 10 schools from the HPSN list and 18 from the non-HPSN list. In the second sampling stage, one class was randomly selected from each of the fourth, fifth and sixth grades in each of the schools. The final sample included 28 public elementary schools, selected from a total of 1300 elementary schools from all regions of Israel, and about 150 are HPS. Included were 7 Jewish and 3 Arab schools affiliated with the HPSN, and 12 Jewish and six Arab non-HPSN schools.

Instruments

Questionnaires

A questionnaire was constructed based on questions selected from valid questionnaire of the Israeli National Institute for Testing and Evaluation, that promotes and provides professional guidance for testing and evaluation in Israel (Israeli Ministry of Education, 2016). The questionnaire was developed in Hebrew, and then it was translated to Arabic and back-translated to Hebrew for accuracy and validation.

Each questionnaire took 30–40 min to complete by each student in the sampled classes. We conducted a pilot study with 75 students to ensure the validity and reliability of the questionnaire. The 75 students were randomly selected from the 3 grades in the cities where the main study would be conducted: Haifa, Tel Aviv and Jerusalem. We excluded the students who participated in the pilot from the main study. Following the pilot study, we made minor adjustments to the questionnaire, such as deleting unnecessary reply options and simplifying the language.

Dependent variables

We created two different health behavior markers in order to evaluate health behavior outcomes.

Healthy eating habits. Each student's healthy eating habits were measured by 12 statements related to eating habits and choices (see Appendix 1). Examples of statements included: 'I eat breakfast before school', 'I eat fruit every day' and 'At school I eat fruit and vegetables that I bring from home'. The students' responses to each item were scored 'Yes' = 1 and 'No' = 0. We calculated the sum of each student's 'Yes' responses to obtain a healthy eating habits score ranging from 0 to 12, where a low score indicates a reported level of less healthy eating and a higher score indicates a reported healthier eating level.

Physical activity habits. The physical activity habits score was measured by 12 statements focusing on students' physical activity at school and during leisure time (see Appendix 2), for example: 'I am physically active after school', 'I enjoy physical activity', 'I walk to school, and 'I go to sports classes after school'. Students' responses to each item were scored 'Yes' = 1 and 'No' = 0. The sum of the 'Yes' responses resulted in a score indicating the reported level of physical activity habits, ranging from 0 to 12. A low score indicates less engagement in physical activity while a higher score indicates a greater physical activity level.

Independent variables

1. **Student level variables:**

a. Grade: categorical variable—fourth, fifth or sixth grade

b. Gender: male or female

c. Subjective self-reported health education activities at school: this measure indicates the students' perception of health education provided by the school, and it was ascertained by 12 statements (see Appendix 3), for example: 'In my school I learn about healthy food, so I eat healthy food', 'I learn why it is important to be healthy', 'My class has a special area that provides explanations on topics related to health', 'In school, we learn about healthy food and why it is important to eat breakfast', 'We learn at school that I am responsible for my health'. Responses to each statement were scored 'Yes' = 1 and 'No' = 0. The sum of the 'Yes' responses indicated the students' perception of health education at school, ranging from 0 to 12. We used the sum of each item as an indicator of health behavior, where a higher score means better health behavior.

2. School level variables

d. School type: each school was designated as affiliated with the HPSN or not (non-HPSN).

e. Deprivation score: each school is designated a socio-economic status (SES) by the Ministry of Education. The score is determined by the students' socio-economic status, based on four indicators: parents' education, parents' income, immigration status and country of birth, and the school's peripheral level. The score is based on students' background, but is an aggregated continuous measure for each school ranging from 1 to 10. A lower deprivation score indicates that a school's population has a higher socio-economic status.

Procedure

Data were collected using a validated self-administered anonymous questionnaire distributed to all the students in the sampled classes ($n = 4166$). The questionnaires were distributed by trained research assistants; that entered each sampled classroom on specific dates and asked the students to fill out the questionnaires. Students in the Arab schools, received the Arabic questionnaire and students in Jewish schools received the Hebrew questionnaire.

Data analysis

First, we performed a univariate analysis to describe the research population. Then bivariate analyses were performed using an ANOVA and *t*-test to estimate the differences among the means of healthy eating scores and physical activity scores across the independent variables (i.e. student level and school level). In addition, we used a Pearson correlation test to assess the correlation between reported health education at the school and healthy eating habits and physical activity scores. Rho is presented as a correlation coefficient. Finally, multilevel analysis was used to estimate the association between student and school level data and healthy eating habits and physical activity scores.

A Generalized Linear Mixed Model (GLIMMIX) was used to calculate the hierarchical effect of individual and school characteristics on healthy eating and physical activity habits. Since we counted the number of events that describe eating habits and physical activity, we used a Poisson regression with a log function.

In our comparison of HPSN schools versus non-HPSN schools, we attempted to account for potential differences across the population groups, but the model did not converge due to the small number of Arab schools. We presented the back transformation of beta and we called it 'Estimate' (Estimate = Exponential of beta) with a 95% Confidence Interval (95% CI) of the Estimate. All the statistical analyses were conducted using SAS version 9.3. A two-sided p value <0.05 was considered statistically significant.

Results

Descriptive statistics of the student level variables according to school type are presented in Table 1. There were more girls (66.0%) than boys (44.0%) in the HPSN schools, and almost the same percentage of boys and girls in the non-HPSN schools. The average score of the reported health education at schools was higher in the HPSN schools 8.08 (SD = 2.1) compared with 7.8 (SD = 2.4) in non-HSPN schools. More Jewish students attended HPSN schools than Arab students. The average deprivation score was higher in the non-HPSN schools than in HPSN schools (4.3 (SD = 2.5) compared with 3.6 (SD = 1.9), respectively.

Bivariate analysis indicated differences in the mean healthy eating scores between boys and girls (see Table 2). Girls achieved higher healthy eating scores than boys (9.44 vs. 9.06, respectively). However, boys achieved higher physical activity scores than girls (8.90 vs. 7.89, respectively). The differences in both scores were statistically significant. Students in the lower grades achieved higher healthy eating and physical activity scores. The mean healthy eating score was 9.53 in the fourth grade, 9.25 in the fifth grade and 8.91 in the sixth grade; the mean physical activity score was 8.90 in the fourth grade, 8.45 in the fifth grade and 7.91 in the sixth grade (see Table 2). Pearson's correlations indicated a positive significant correlation between reported health education at school and healthy eating scores ($\rho = 0.198$, p

Table 1: Descriptive statistics of the study population by school affiliation

		HPSN (n^a, %)	Non-HPSN (n^1, %)
Student level			
Gender	Boys	655 (44.0%)	1305 (49.8%)
	Girls	833 (66.0%)	1316 (50.2%)
Grade			
	4th	481 (31.9%)	891 (33.5%)
	5th	591 (35.4%)	886 (33.3%)
	6th	506 (33.6%)	883 (33.2%)
Subjective self-reported health education activities at school	Mean (STD)	8.1 (2.1)	7.8 (2.4)
	[95%Cl]	[95% CL: 7.9–8.2]	[95% CL:7.7–8.0]
School level			
Population group	Jewish	1221 (81.2%)	2057(77.3%)
	Arab	285 (18.9%)	603 (22.3%)
Deprivation score (n=27)	Mean (STD)	3.6 (1.9)	4.3 (2.5)
	[95% CL[b]]	[3.5–3.7]	[4.2–4.4]

[a]*n* is the number of each student by the school affiliation.
[b]CL: confidence limit of the mean.
[†]HPSN—schools that belong to the health promoting schools network.

Table 2: Differences in the mean healthy eating habit and physical activity scores across the student level characteristics and school level characteristics among Israeli students

		Healthy eating habit score Mean and CL[a]	*p* value	Physical activity score Mean and CL[a]	*p* value
Student l level (n=4166)					
Gender	Boys	9.06 (8.91–9.11)	0.006	8.90 (8.81–8.99)	<0.001
	Girls	9.44 (9.35–9.53)		7.89 (7.80–7.99)	
Grade	4th	9.53 (9.42–9.65)	<0.001	8.78 (8.67–8.90)	<0.001
	5th	9.25 (9.13–9.37)		8.45 (8.33–8.56)	
	6th	8.91 (8.80–9.03)		7.91 (7.79–8.04)	
School level (n=28)					
School type			0.001		0.199
	HPSN[b]	10.41 (10.34–10.51)		8.43 (8.31–8.55)	
	Non-HSPN	10.11 (10.03–10.20)		8.34 (8.25–8.42)	
Population group	Jewish	9.17 (9.10–9.25)	<0.001	8.33 (8.25–8.42)	0.027
	Arab	9.43 (9.29–9.56)		8.51 (8.38–8.64)	

[a]CL= confidence limit of the mean.
[b]HPSN—schools that belong to health promoting schools network.

value < 0.001), as well as physical activity scores ($\rho = 0.210$, p value < 0.001) (data not presented in a table).

On the school level, the *t*-test indicated that mean healthy eating scores were distributed differently across the school types. Schools affiliated with the HPSN had a higher mean healthy eating score (10.41) than non-HSPN schools (10.11) (p value < 0.001) (Table 2). However, physical activity scores were not distributed differently across school types. HPSN schools reported a higher mean physical activity score (8.43) than non-HSPN schools (8.34), but the difference in the means was not statistically significant (p value = 0.2) (Table 2).

Furthermore, there was a statistical difference in the healthy eating scores between students in the Arab schools versus students in the Jewish schools. The mean healthy eating score of Arab students was higher than that of Jewish students (9.43 vs. 9.17, respectively, p value <0.001). Similarly, the mean physical activity score of Arab students was higher than that of Jewish

students (8.51 vs. 8.34) (Table 2). We found no significant correlation between the deprivation scores and the healthy eating scores ($\rho = -0.026$, p value = 0.115), however, there was a significant negative correlation between deprivation scores and physical activity. This implies that students in schools with a higher deprivation score are less physically active ($\rho = -0.05$, p value = 0.002) (data not presented in a table).

The results of six hierarchical models are presented in Tables 3 and 4: individual, school and combined models. As displayed in Table 3, the individual level analysis indicated that student characteristics contributed to healthy eating scores. Girls reported higher healthy eating scores (Estimate = 1.03, 95% CI = 1.0–1.07) than boys. Fifth graders reported lower healthy eating scores than fourth graders (Estimate = 0.94, 95% CI = 0.91–0.98), and sixth graders also reported lower healthy eating scores than fourth graders (Estimate = 0.95, 95% CI = 0.92–0.98). Subjective self-reported health education activities at school was associated with an estimated 2% increase in healthy eating scores (Estimate = 1.02, 95% CI = 1.01–1.03) (Table 3, Model 1).

The school level variables revealed that neither the school type, HPSN or non-HPSN, (Estimate = 1.02, 95% CI = 0.98–1.06), nor the deprivation score (Estimate = 0.99, 95% CI = 0.99–1.01) contributed to healthy eating habits (Table 3, Model 2). According to the combined model, which included the individual level and school level characteristics, the individual characteristics contributed to healthy eating scores, while school level variables, i.e. school type and deprivation score, did not contribute to the full model (Table 3, Model 3) (Estimate= 1.02, 95% CI = 0.98–1.00; Estimate = 0.99, 95% CI = 0.98–1.00, respectively).

Table 4 presents factors associated with physical activity. Girls reported lower physical activity scores than boys (Estimate = 0.88, 95% CI = 0.86–0.91). Fifth graders reported lower physical activity scores than fourth graders (Estimate = 0.92, 95% CI = 0.88–0.96), and sixth graders reported lower physical activity scores than fourth graders (Estimate = 0.97, 95% CI = 0.94–1.01). Reported health education at school was associated with an estimated 3% increase in physical activity score (Estimate = 1.03, 95% CI = 1.02–1.04) (Table 4, Model 1). Again, the school level variables revealed that a school's affiliation with the HPSN does not contribute to students' physical activity habits (Estimate = 1.01, 95% CI = 0.95–1.07), nor does the deprivation score (Estimate = 0.99, 95% CI = 0.99–1.01) (Table 4, Model 2). According to the combined model that included the individual level and school level characteristics, the individual characteristics contributed to physical activity scores, while school level variables (i.e. school type, deprivation score) did not contribute to the full model (Table 4, Model 3).

In conclusion, we found that students' individual characteristics contribute to healthy eating and physical activity habits, whereas the school's affiliation with the HPSN does not contribute to healthy eating habits or to physical activity over and above the individual level.

DISCUSSION

The main goal of the current study was to examine the contribution of a school's affiliation with the Israeli HPSN on students' healthy eating and physical activity habits. Our findings that affiliation with the HPSN does not contribute to students' healthy eating and physical activity habits are supported by a systematic review conducted recently indicating that, although the WHO HPSN improved some aspects of students' health, the effect of a school's affiliation with the network was negligent (Langford *et al.*, 2015).

The results of the current study indicate that individual characteristics, such as gender and grade, are associated with the healthy eating and physical activity habits of students. Gender and grade are known factors that affect the adoption of healthful eating patterns among adolescents (Gorely *et al.*, 2009; Story *et al.*, 2009). In our study, more girls reported healthier eating habits than boys, a result that is consistent with the literature on gender differences in eating habits (McGraw *et al.*, 2000; Sallis *et al.*, 2003; Mallick *et al.*, 2014). This can be explained by studies of gender differences in self-perceptions of being overweight: more females than males perceived themselves as overweight (Brener *et al.*, 2004).

In our study, boys reported higher levels of physical activity than girls, a finding that is also consistent with research by Haase *et al.* (Haase *et al.*, 2004). They found that a higher proportion of men than women meet the weekly physical activity recommendations across 23 countries (Haase *et al.*, 2004). Lower levels of body satisfaction predict higher levels of dieting and unhealthy weight control behaviors and lower levels of physical activity. Among males, lower levels of body satisfaction predict higher levels of dieting, unhealthy weight control behaviors and binge eating (Neumark-Sztainer *et al.*, 2007). In addition, Sallis *et al.* (Sallis *et al.*, 2003) found that school environmental and policy interventions were effective for boys but less so for girls.

Our research indicated that students in lower grades reported healthier eating habits, a result that is also

Table 3: Estimates of the association between school type and healthy eating habits score

		Healthy eating habits score		
		Model 1[a]	**Model 2[a]**	**Model 3[a]**
Student level		Estimate[b] (95% CI)	Estimate[b] (95% CI)	Estimate[b] (95% CI)
Gender	Boys	Ref		Ref
	Girls	1.03† (1.00–1.07)	–	1.03† (1.00–1.07)
Grade	4th	Ref		Ref
	5th	0.94† (0.91–0.98)	–	0.94† (0.91–0.98)
	6th	0.95† (0.92–0.98)	–	0.96† (0.92–0.99)
Subjective self-reported health education activities at school		1.02† (1.01–1.03)	–	1.02† (1.02–1.03)
School level				
School type	Non-HPSN		Ref	Ref
	HPSN[c]		1.02 (0.98–1.06)	1.02 (0.98–1.06)
Deprivation score		-	0.99 (0.99–1.00)	0.99 (0.98–1.00)

[a]Model 1—estimate for the association between individual level characteristics and healthy eating habit score. Model 2—estimate for the association between school level and healthy eating habit score. Model 3—estimate for the association between individual level, school level and healthy eating habits score.
[b]Estimate = exponential of Beta estimate.
[c]HPSN—belongs to the health promoting schools network.
†*p* value <0.05.

Table 4: Estimates for the association between school type and physical activity habits score

		Physical activity habits score		
		Model 1[a]	**Model 2[a]**	**Model 3[a]**
Student level		Estimate[b] (95% CI)	Estimate[b] (95% CI)	Estimate[b] (95% CI)
Gender	Boys	Ref		Ref
	Girls	0.88† (0.86–0.91)	–	0.88† (0.86–0.91)
Grade	4th	Ref		Ref
	5th	0.92† (0.88–0.96)	–	0.92† (0.88–0.96)
	6th	0.97 (0.94–1.01)	–	0.97 (0.94–1.01)
Subjective self-reported health education activities at school		1.03† (1.02–1.04)	–	1.03† (1.02–1.04)
School level				
School type	Non-HPSN		Ref	Ref
	HPSN	–	1.01 (0.95–1.07)	1.01 (0.94–1.07)
Deprivation score		–	0.99 (0.98–1.01)	0.99 (0.97–1.01)

[a]Model 1—estimate for the association between individual level characteristics and healthy eating habit score. Model 2—estimate for the association between school level and healthy eating habit score. Model 3—estimate for the association between individual level, school level and healthy eating habits score.
[b]Estimate = exponential of Beta estimate.
[c]HPSN—belongs to health promoting schools network.
†*p* value < 0.05.

supported by the literature. For example, Kaisari *et al.* (Kaisari *et al.*, 2013) found that younger students are more likely to report healthier eating. This may be due to their lower level of independence compared with students in the upper grades, and thus, lower grade students are less likely to be influenced by their friends and less exposed to peer pressure. Subjective self-reported health education activities at school appear to be correlated with their eating habits and physical activity levels regardless of school type. This may indicate that health education influences students or, since this is a cross-sectional survey, it may suggest that those children with better eating and physical activity habits report higher levels of health education.

In conclusion, the World Health Organization's concept of HPS may be a promising approach to improving children's lifestyle as it incorporates actions addressing the school's physical activity and social environment, and not only health education. However, the results of the current analysis indicate that affiliation with the Israeli HPSN did not have a significant impact on students' eating habits and physical activity over and above the individual variables. Our study and the existing literature imply that affiliation with the HPSN may not be sufficient to influence students' behavior. Intensive health promotion intervention programs that engage parents, the community, and school staff, accompanied by a formal evaluation, may improve school aged children's health and require further investigation. In this study we did not have an objective measure of the level of activities related to health promotion in the schools. Therefore, although schools may be registered in the HPSN network this does not ensure that they are actively engaged in health promotion and education. Even where interventions are conducted, if they reach only a small number of students they do not have a huge impact on students' behavior. The current study contributes to the literature by assessing the effect of a school's affiliation with the HPSN on healthy eating habits and physical activity of elementary school students in Israel.

Further research is needed to explore the association between the HPSN and students' healthy eating habits and physical activities that takes into consideration additional variables such as family background, the social environment, and the actual health promoting interventions performed at the schools.

LIMITATIONS

Our research is a cross-sectional study, precluding causality and temporality. Student level data were self-reported and subject to information bias. Furthermore, the study did not have an objective measure of health promotion activities at the school and did not include social and environmental factors that might contribute to healthy eating habits and physical activity. Since we added measures to the original questionnaire related to healthy eating and physical activity habits, they might not be objective enough to measure the contribution of HPSN to healthy eating and physical activity habits. Therefore, more work should be performed on validating these measures in different settings or countries. Finally, although we questioned a large number of students, our study included a small number of schools, which might also affect the results in the direction of null significance.

CONCLUSIONS

Individual characteristics have a significant impact on healthy eating and physical activity habits regardless of school type. In Israel, students' demographic characteristics and subjective reporting of health education at school are more influential than whether the school is affiliated with the HSPN.

Based on the students' self-report of health education, offering health education programs that can be reported by the students may have a greater impact and help them maintain a healthy lifestyle. The results of our study indicate that eating habits were poorer with increasing grade level, thus it is important to focus nutrition education on students in the higher grades. School interventions to promote and raise awareness of healthy lifestyles should begin at younger ages so that healthy behavior is adopted early and can be sustained as children age. Israel's Minister of Health and the Ministry of Education support early interventions among younger children and they encourage schools to provide nutrition education from preschool through 12th grade. Since our study indicated that gender was related to differences in healthy eating habits and physical activity, we recommend that intervention programs should be tailored based on gender.

An integrative program in schools that facilitates the translation of health promotion policies into practice may be a promising approach for behavioral change. On the school level, the Israeli HPS experience indicates that an integrated, comprehensive approach that includes students, their parents and teachers, may provide a more effective approach to promoting a healthy lifestyle than one that addresses only students.

ETHICAL APPROVAL

The study was approved by the Israeli Ministry of Education and the Ethics Committee of the University of Haifa.

AUTHORS' CONTRIBUTIONS

S.H. led all the study aspect including writing, conducted the analysis interpreted the findings and discussions. R.T., S.B., R.E., C.S. and M.K. contributed to the study design, data collection and preparation of the study sample. R.T. and S.B. contributed to the writing and the discussion. I.L. and Y.H.-F. contributed to the finding and discussions as Subject Matters Experts. O.B.-E. initiated the study, co-led the all study aspects including the study design, data collection, data analysis and writing the paper. All the authors participated in the study design and critically reviewed the paper and confirmed the final version.

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APPENDIX 1. QUESTIONNAIRE ITEMS FOR STUDENTS' HEALTHY EATING HABITS

	Items	Yes	No
	Do you agree with these statements:		
1.	In general, I eat everything without thinking if it is healthy or not.[a]		
2.	I learn at school about healthy foods, therefore I have a healthy diet.[a]		
3.	I eat breakfast before school.		
4.	I eat fried foods, like French fries, at least twice a week.[a]		
5.	I eat fresh vegetables every day.		
6.	I eat fresh fruit every day.		
7.	I eat salty foods every day.[a]		
8.	I eat sweet foods every day.[a]		
9.	Fruits and vegetables have a lot of vitamins.		
10.	My mid-morning snack includes salty or sweet snacks.[a]		
11.	I have a sandwich for my mid-morning snack.		
12.	At school I eat fruit and vegetables that I bring from home.		

[a]For this item, the score included the students that reported not making healthy choices (the score includes the opposite value of the reported response).

APPENDIX 2. QUESTIONNAIRE ITEMS FOR STUDENTS' PHYSICAL ACTIVITY HABITS

	Item	Yes	No
	Do you agree with these statements:		
1.	I am physically active after school.		
2.	I enjoy physical activity.		
3.	I normally walk to school.		
4.	I normally walk to my friend's house.		
5.	I bike more than twice a week.		
6.	I have a physical activity class after school.		
7.	I play different games after school.		
8.	I play or chat with friends on a cell phone or tablet.[a]		
9.	I watch TV more than 2 hours every day.[a]		
10.	I participate in the physical activity break at school.		
11.	During the break, I remain in my classroom.[a]		
12.	During the break, I play outside.		

[a]For this item the score included the students that reported not being physically active, such as, playing on tablets or watching TV more than 2 h, or remaining in class during the break.

APPENDIX 3. ITEMS DESCRIBING HEALTH PROMOTION AND EDUCATION ACTIVITIES AT SCHOOL

	Item	Yes	No
1.	At school I learn about the importance of being healthy.		
2.	It is important for me to drink water at school.		
3.	At school there are water fountains everywhere.		
4.	At school there is cafeteria that sells soft drinks.[a]		
5.	At school there is a cafeteria that sells healthy food, fruits, and vegetables.		
6.	At school there is a cafeteria that sells whole wheat sandwiches.		
7.	In my class there is an area with information related to health.		
8.	I am allowed to bring sweet snacks to school.[a]		
9.	I learn about health in different classes such as math, science, and gym.		
10	At school we learn that we are responsible for our health.		
11.	In class we discuss health.		
12	In class we discuss what we should and should not eat.		

[a]For this item the score included students that reported not having a health promotion and education environment at school, such as having a cafeteria that sells soft drinks or being allowed to bring sweet snacks to school.