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ORIGINAL ARTICLE

Influence of school health promotion on the life habits of schoolchildren☆

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Abstract
Introduction: In recent decades, attention has been directed at global theories that attempt to prevent childhood obesity by exposing them to healthy environments. The aim of this study was to analyse the influence of health-promoting environments in primary schools in Logroño (La Rioja, Spain) on the habits of school children.
Methods: The directors of the 31 primary schools in the city completed a questionnaire which examined the health promotion activities of their schools. In addition, anthropometric measurements, adherence to the Mediterranean diet, and sedentary and physical activity habits were recorded from a representative sample of 329 schoolchildren in the sixth year of primary education (11–12 year-olds).
Results: The majority of schools had developed nutritional and/or physical activity programs (77.4% and 61.3%, respectively); however, teachers had generally not received specific training in that area. Guidelines regarding healthy habits were not formally included in the School Educational Project. Physical activity, which was greater amongst boys ($P < .001$), was mostly promoted after school hours. The major influences on school children's physical activity and dietary habits of the children were training of teachers, existence of guidelines, and access to sports grounds ($P < .05$).
Conclusions: Although further research is required, this study shows that certain modifiable aspects in the organisational or school environment can influence the habits of school children at a fundamental stage of their development.

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PALABRAS CLAVE
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¿Influye la promoción de la salud escolar en los hábitos de los alumnos?

Resumen
Introducción: En las últimas décadas, han cobrado importancia las teorías globales que tratan de prevenir la obesidad mediante ambientes favorecedores de opciones saludables. El objetivo de este estudio fue analizar la influencia de los entornos promotores de la salud de las escuelas de Logroño (La Rioja, España) sobre los hábitos de sus escolares.
Métodos: La promoción de la salud de las 31 escuelas de la ciudad fue valorada mediante un cuestionario que completaron los directivos de cada centro. Por otro lado, se valoraron variables individuales de una muestra representativa de 329 escolares de sexto curso de Educación Primaria (11–12 años) de las citadas escuelas: medidas antropométricas, adhesión a la dieta mediterránea y hábitos sedentarios y de práctica física.
Resultados: La mayoría de los centros desarrollaba programas de nutrición y/o actividad física (el 77,4 y el 61,3%, respectivamente), aunque, en general, su profesorado no recibía formación al respecto. Las directrices para favorecer hábitos saludables no solían recogerse en el Proyecto Educativo de Centro y la actividad física, cuyo nivel fue mayor en los chicos ($p < 0{,}001$), era promovida principalmente tras el horario escolar. A pesar de ello, la formación del profesorado, la concreción de directrices y el acceso a las pistas polideportivas influyeron positivamente sobre los hábitos de práctica física y alimentación de los escolares ($p < 0{,}05$).
Conclusiones: Aunque más investigación es necesaria, nuestro estudio demostró que aspectos como la formación y la coordinación de los maestros o la presencia de pistas deportivas podrían conllevar beneficios sobre los hábitos de los alumnos en una etapa fundamental para la consolidación de los mismos.

Introduction

The World Health Organization estimates that 35 million children in developing countries and 8 million in developed countries have overweight or obesity, although in relative terms the percentages are higher in developed countries.[1] Childhood obesity requires an interdisciplinary approach addressing the current eating habits and physical activity of our youth.

It has been demonstrated that in children and adolescents physical activity reduces blood cholesterol and lipid levels, hypertension, the risk of metabolic syndrome, overweight and obesity, injuries and symptoms of depression,[2] and also improves different aspects of mental and social health.[3] Unfortunately, the level of physical activity in children and adolescents has declined in recent years.[4] Meanwhile, a healthy diet has been associated with an increased probability of being active and a decreased probability of sedentary behaviour and obesity.[5]

While many efforts have been made to improve the eating habits and increase the level of physical activity of the younger population, the impact of these efforts on their body composition is not clear.[6] As a result, new intervention models have been developed with the purpose of providing healthy environments.[7] In the case of children and adolescents, the school, which has a continuous and intensive contact with them, plays a key role in the environment where they develop, and thus should promote healthy habits.[8] The World Health Organization is aware of this fact, and has established a series of recommendations, chief of which are: developing academic curricula that promote physical activity and a healthy diet, managing the food service environments, improving facilities and access to these facilities to promote physical activity, and providing in-service training for school staff.[9] In Spain, the SESPAS report,[10] which is aimed at the prevention of obesity, also emphasises the importance of intervening in the school setting.

Research on these new models of intervention based on healthy environments has increased significantly, especially in recent years[11]; however, these studies usually focus on neighbourhood environments as opposed to school settings. Therefore, the aim of our study was to analyse the eating habits and levels of physical activity of schoolchildren. Our secondary goal was to analyse the levels of physical activity of schoolchildren based on their sex.

Methods

Participants

We designed a cross-sectional study that assessed, on one hand, individual variables related to the students and, on the other, variables related to their school environment. Thus, there were two populations under study:

When it came to the schoolchildren, we obtained a representative sample of students enrolled in the sixth year of primary education (age, 11.7 ± 0.4 years) in the city of Logroño. We randomly selected 372 students from the 31

primary schools of the city, of which 329 (88.4%) agreed to participate in the study. We excluded from the analysis 11 students that did not complete the questionnaires correctly, so the final sample comprised 318 schoolchildren. We obtained the informed consent of their parents or guardians.

At the same time, we requested the collaboration of the management of each of the schools (19 public schools and 12 charter schools). The study took place between February and May of 2012. Participation was voluntary, adhering to the ethical principles for medical research of the Declaration of Helsinki. The study was approved by the Comité Ético de Investigación Clínica (ethics committee for clinical research) of La Rioja.

Anthropometric measurements

Participants self-reported their sex and date of birth through a questionnaire. Their anthropometric measurements were taken following the protocol established by the International Society for the Advancement of Kinanthropometry[12] and by a single anthropometrist with level 2 ISAK accreditation. Weights were measured with a SECA 713 scale (Hamburg, Germany), accurate to 0.1 kg. Heights were measured with a Holtain stadiometer (Holtain Ltd, Dyfed, United Kingdom), accurate to 1 mm. Overweight and obesity were defined according to international standards.[13] Waist circumferences were measured with a flexible Lufkin steel tape (Lufkin W606 PM, Michigan, USA) accurate to 0.1 cm. Triceps and subscapular skinfolds were measured with a Holtain calliper (Holtain Ltd, Crosswell, United Kingdom), accurate to 0.2 mm, with a constant pressure of 10 g/mm^2. The body fat percentage was calculated using the equations of Slaughter et al.[14]

Level of physical activity

The schoolchildren filled out the validated and adapted Spanish version of the Physical Activity Questionnaire for Older Children (PAQ-C).[15] The questionnaire aims to assess moderate to vigorous physical activity in the past 7 days. It consists of 9 items that ask about the type of physical activity and the frequency with which it was performed at different times of the day. The answers are scored on a scale from 1 to 5, scoring higher the more active the child is. The students were also asked about the number of hours of physical activity performed outside of school hours and the time spent watching television, at the computer, or playing videogames. All the questionnaires were administered with the guidance of a specifically trained researcher and under the supervision of 3 collaborators that ensured participants understood the questions.

Adherence to the Mediterranean diet

This was assessed by means of the KidMed questionnaire.[16] It consists of 16 items that refer to Mediterranean dietary patterns, scoring items that are negatively correlated with the Mediterranean diet with a −1 (for example, having sweets several times a day), and items with a positive correlation with a +1 (such as having fruit daily). This leads to a final score that ranges between −4 and 12, and therefore compliance with Mediterranean dietary patterns was rated as high ($\geq$8), moderate (4–7) or low ($\leq$3).

Environmental school variables

For each school, one member of the management completed a validated questionnaire about the environmental characteristics of the school.[17] This questionnaire is comprised of 21 items pertaining to the sociodemographic characteristics of the school, any health-promoting programmes implemented, the specific training of staff on this subject, the specificity of the health promotion measures, the food service environment, the condition and accessibility of sports facilities, the promotion of curricular and extracurricular physical activity, and areas proposed for improvement or perceived as needing improvement.

Statistical analysis

We have expressed quantitative variables as mean $\pm$ standard deviation, and qualitative variables as frequency distributions. We assessed the normality of the data by means of the Kolmogorov–Smirnov test. Quantitative variables were compared by means of Student's *t* test or the Mann–Whitney *U* test, depending on whether their distribution was normal or not, respectively. We analysed the data with the statistical software IBM-SPSS version 21.0 for Windows. The level of statistical significance was set at 0.05.

Results

Tables 1 and 2 summarise the most relevant results of the questionnaires completed by school administrators. Most schools partook in nutrition and/or physical activity programmes, although only some of them had had their staff specifically trained in these areas (16.1% and 38.7%, respectively). Health-promotion policies were not usually reflected in the school's educational goals, and less than half of the schools offered some type of organised physical activity during recess (48.4%) or lunch break (22.6%). In this regard, the improvement of outdoor spaces and equipment (which nearly 80% considered important or very important), and the involvement of families and students (with values approximating 90%) were the most highly rated aspects in relation to increasing physical activity.

Table 3 shows the main characteristics of the schoolchildren sample by sex, with particular emphasis on issues related to their activity habits. Boys reported significantly higher levels of activity than girls for every item pertaining to physical activity ($P < .05$), except during lunch break and between 6 and 10 pm. In addition, we did not find any significant differences between sexes in the daily hours of screen time.

The associations between individual and environmental variables are summarised in Table 4. This table only presents data for the aspects of school health promotion that had an impact on one or more health indicators in participants. Thus, schoolchildren whose teachers had received training

Table 1 School characteristics related to health promotion (percentages).

	Yes	No
In the past 3 years, which programmes or projects has the school participated in?		
Schools for Health in Europe network	9.7	93.3
Physical activity programme	61.3	38.7
Nutrition programme	77.4	22.6
In the past 3 years, has the school offered some kind of training for teachers in any of the following areas?		
Nutrition	16.1	83.9
Physical activity	38.7	61.3

	Written policies	Unwritten policies	No
Has the school implemented any interventions to reduce (first 3 items) or increase (last 2 items) the consumption of the following foods and drinks during school hours?			
Sweets	25.8	64.5	9.7
Sugary drinks	16.1	61.3	22.6
Snacks	12.9	51.6	35.5
Fruits	22.6	74.2	3.2
Vegetables	22.6	58.1	19.4
Has the school implemented any interventions to increase physical activity during school hours?			
Phys. activity	25.8	38.7	35.5

	No	2–3 days/month	1–2 days/week	3–5 days/week
Number of extracurricular physical education classes per week offered by the school:				
	45.2	9.7	32.3	12.9
Does the school organise physical activities?				
At lunch time	77.4	9.7	3.2	9.7
During recess	51.6	25.8	9.7	12.9
After school hours	41.9	3.2	25.8	29.0

on nutrition in recent years showed higher levels of physical activity ($P = .010$), a greater degree of compliance with the Mediterranean diet ($P = .020$) and fewer daily hours of screen time ($P = .016$) compared to peers whose teachers had not received such training. Meanwhile, schoolchildren attending schools with written or unwritten policies aiming at increasing the consumption of fruits and vegetables reported a higher compliance with Mediterranean dietary patterns ($P = .017$) and fewer hours of screen time per day ($P = .023$). Lastly, when it came to the physical environment, it is worth noting that students whose schools had sports facilities within the school grounds or in the vicinity showed higher levels of physical activity than students that did not have access to such facilities ($P = .023$).

Table 2 Factors that influence the levels of physical activity in schoolchildren (percentages).

	1	2	3	4	5
¿Which would be the most important changes that would help increase the level of physical activity of the school's student body (with 1 being irrelevant and 5 very important)?					
Increased financial resources	3.2	3.2	19.4	54.8	19.4
Improving outdoor spaces	3.2	12.9	6.5	61.3	16.1
Increased indoor space for physical activities	3.2	16.1	12.9	38.7	29.0
More sports facilities in the vicinity	3.2	6.5	29.0	45.2	16.1
More/better equipment	3.2	3.2	16.1	61.3	16.1
Greater involvement of school staff	3.2	3.2	16.1	61.3	16.1
Greater involvement of parents/guardians	3.2	0.0	9.7	48.4	38.7
Greater involvement of students	3.2	3.2	3.2	51.6	38.7
More structured time devoted to physical activity	0.0	0.0	19.4	58.1	22.6
Better training of school personnel	3.2	6.5	25.8	58.1	6.5
Increased resources for supervision	6.5	3.2	41.9	41.9	6.5
Higher priority in the objectives of the management	6.5	0.0	22.6	48.4	22.6

Table 3 Characteristics of schoolchildren, by sex.

	Boys ($n = 160$)	Girls ($n = 158$)
Age (years)	11.71 ± 0.37	11.77 ± 0.37
Body mass index (kg/m²)	19.70 ± 3.49	19.47 ± 2.75
Waist circumference (cm)	67.02 ± 7.67**	64.17 ± 6.12
Body fat percentage	24.11 ± 11.69*	25.04 ± 7.62
KidMed score	7.12 ± 1.95	7.22 ± 1.70
Overall PAQ-C score	3.16 ± 0.55***	2.81 ± 0.52
Physical activities and sports practised by student	1.78 ± 0.37***	1.65 ± 0.34
In physical education classes	4.24 ± 0.78***	3.91 ± 0.91
During recess	4.17 ± 0.91***	3.25 ± 1.13
Before and/or after lunch	2.14 ± 1.21	1.89 ± 1.15
Up to 6 pm	3.18 ± 1.26*	2.84 ± 1.13
From 6 to 10 pm	2.99 ± 1.18	2.95 ± 1.12
At the weekend	3.25 ± 1.06**	2.92 ± 1.00
Overall for the week	3.34 ± 0.97***	2.89 ± 1.00
On different days of the week	3.30 ± 0.69***	2.97 ± 0.65
Hours of daily physical activity after school hours	1.58 ± 0.74***	1.23 ± 0.69
Hours of television, computer and videogames per day	1.60 ± 0.93	1.55 ± 0.81

KidMed, score obtained in the adherence to the Mediterranean diet questionnaire; PAQ-C, score obtained in the physical activity questionnaire.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

Discussion

The results showed that while few schools are members of the Schools for Health in Europe network (SHE network), most were implementing projects related to nutrition and physical activity. However, despite the fact that one of the keys to the success of such programmes is training the individuals that carry them out,[18] we observed that teachers were given specific training in fewer than half of the schools. According to a study conducted on teachers that participated in these programmes, another key factor for success is that they be embedded in the educational goals or the mission of the school.[19] However, most of the time the interventions to reduce consumption of unhealthy foods or increase healthy habits in the analysed schools stemmed from policies that were not specified in the school's educational goals. These trends were similar to those found in previous studies conducted in Spain[20] and in the Health Behaviour in School-aged Children study, which was conducted in 364 schools throughout Spain in 2006.[21]

More than half of the schools organised physical or sports activities in the evening after school hours, but

Table 4 Influence of the school environment on the individual variables in schoolchildren.

	N	BMI (kg/m²)	WC (cm)	% Body fat	PAQ-C	Screen time (hours)	KidMed
Teaching staff trained in nutrition within the past 3 years							
No	248	19.57 ± 3.19	65.67 ± 7.22	24.69 ± 9.99	2.95 ± 0.58	1.63 ± 0.86	7.05 ± 1.91
Yes	70	19.54 ± 2.77	65.29 ± 6.14	23.73 ± 9.06	3.12 ± 0.51	1.37 ± 0.90	7.61 ± 1.60
P value	.861	.825	.536	.010*	.016*	.020*	
Schools with policies for increasing consumption of fruits and vegetables							
No	55	19.08 ± 3.22	64.88 ± 7.18	24.32 ± 10.38	2.92 ± 0.61	1.82 ± 0.88	6.56 ± 2.03
Yes	263	19.66 ± 3.07	65.74 ± 6.97	24.52 ± 9.69	3.00 ± 0.56	1.53 ± 0.86	7.30 ± 1.80
P value	.119	.355	.721	.213	.023*	.017*	
Access to courts to practise various sports							
No	48	19.76 ± 3.50	65.77 ± 7.67	24.90 ± 9.89	2.84 ± 0.57	1.52 ± 0.77	7.15 ± 1.56
Yes	270	19.53 ± 3.03	65.56 ± 6.89	24.42 ± 9.79	3.01 ± 0.56	1.59 ± 0.89	7.18 ± 1.91
P value	.994	.909	.809	.023*	.521	.726	

BMI, body mass index; KidMed, score obtained in the adherence to the Mediterranean diet questionnaire; PAQ-C, score in the physical activity questionnaire; WC, waist circumference.
* $P < .05$.

this percentage dropped significantly for recess and lunch breaks. When asked about the factors that influence physical activity in students, school administrators underscored the involvement of parents and students and the improvement of facilities, equipment and activities. In terms of parental and student involvement, a recent health promotion project implemented in 12 schools in the north east of Spain achieved positive results by formulating their strategies based on the opinions of parents and schoolchildren through committees that met regularly.[22] As for the second factor, previous studies have found higher levels of physical activity in schools that had facilities, policies, and opportunities available for the improvement of these levels. Thus, boys that attended schools that scored high on these areas engaged in physical activity during school hours 53% more than their peers in lower-scoring schools, while in the case of girls the percentage of physical activity during spare time rose to 62%.[23]

As for the levels of physical activity, we observed higher values in boys, consistent with previous evidence for schoolchildren of similar ages ($P < .001$).[24] The differences between the sexes were particularly marked for the overall weekly activity and for activity at specific times of day, such as recess. While some authors advocate the promotion of physical activity during recess,[25] these differences had been observed in the past, with a larger percentage of boys engaging in vigorous physical activity and a lower percentage engaging in sedentary activities ($P < .001$ in both cases).[26] However, previous studies have described similar benefits for both sexes, despite the lower levels of activity reported by girls,[27] which may suggest the need to adjust physical activity recommendations based on sex.

While recent studies have associated neighbourhood features (access to parks, presence of fast food restaurants...) with the body composition of its inhabitants,[28,29] the literature is not consistent when it comes to the effects of the school environment, although there is evidence that it influences the habits of students.[6] In this regard, previous studies show that interventions that combined educational and environmental elements were more effective.[30] This fact was demonstrated in a nationwide study conducted in Spain in which the physical activity of schoolchildren was directly correlated to the promotion policies of the schools they attended, so that 47.4% of students in schools with high levels of promotion met the recommendations for physical activity, while only 33.1% of students did in schools with low health promotion levels.[31]

In our study, students whose schools had multi-sport game courts reported higher levels of physical activity than students who did not have access to such facilities. The association between conducive environments and the practise of physical activity have been studied in the past. Access to playgrounds after school hours was associated with the total amount of physical activity in adolescents in the United States ($P = .016$).[32] Similarly, moderate or vigorous physical activity was also influenced by the school physical environment in Canadian children ($P < .005$).[33] However, none of these studies found an association with body composition, which is consistent with a recent review that did not find conclusive results concerning the availability/adequacy of the multi-sport game courts and the body mass index of the schoolchildren.[34]

Last of all, students whose teachers had received training on nutrition not only scored higher on their compliance with the Mediterranean diet, but showed higher levels of physical activity and fewer hours of screen time per day. This may be explained by the observed association between sedentary behaviours, physical activity and eating habits.[5] Likewise, schoolchildren whose schools had written or unwritten policies regarding the consumption of fruits and vegetables also reported fewer hours of screen time per day and a greater compliance with the Mediterranean diet, which demonstrates the influence of the coordination of school staff. The education and recommendations that students receive about their diet are significant insofar as the food service environment was associated with the body composition of the schoolchildren.[35]

The results we obtained emphasise the importance of schools on lifestyle habits and the prevention of overweight and obesity, and thus on the future health of our young.

Strengths and limitations

Our study analysed the association of school health promotion in all primary schools of the city with different individual variables in a representative sample of Logroño schoolchildren. The study had a number of limitations. The lack of objective measures in the assessment of the diet, physical activity and the school environment may lead to overestimation or underestimation in the results. However, all the questionnaires we used have been used in multiple previous studies and demonstrated high reliability and validity. Furthermore, the cross-sectional design of the study precludes establishing causality in the observed association, so more longitudinal studies, and especially experimental studies, are required in this regard.

Conclusions

Most of the schools had health-promoting programmes, although there was room for improvement, for instance in staff training or the promotion of physical activity during school hours. In spite of this, some elements like the training and coordination of the teaching staff or the availability of multi-sport courts were positively correlated with the physical activity and eating habits of the students, thus influencing their health. Considering the age of the schoolchildren and the continued and intensive contact they have with their school, the latter affords an optimal setting for health promotion. Therefore, the school and health authorities should work in close collaboration to facilitate the creation of healthy environments in schools.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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