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Evaluation of a School Intervention Program to Modify Sun Exposure Behavior

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Abstract. *Introduction.* Nonmelanoma skin cancer is the most prevalent and incident tumor in the world, being sun exposure the most important risk factor. Childhood and adolescence are the periods where sun exposure is greatest. An intervention to modify sun-related behaviours is essential for skin cancer prophylaxis.
Material and methods. We carried out a quasi-experimental study on a school population of Granada with ages ranging from 11-12 years. The control and study groups completed a questionnaire prior to the intervention with educational program and thereafter. We performed a random conglomerate sampling of 628 teenagers. Statistical analysis was carried out using the Mc Nemar and Wilcoxon tests.
Results. After the intervention, the study group showed marked improvement in the results concerning knowledge about sun exposure and skin (OR = 2.89), sun exposure and environment (OR = 2.23), and sun exposure and health (OR = 1.4) as well as in attitudes and healthy behaviour regarding sun exposure (OR = 4.2). This difference was statistically significant compared to the control group.
Conclusions. 1. Before planning a campaign for primary prophylaxis of skin cancer it is necessary to know the information and knowledge of the target population. *2.* The risk of acute, intermittent sun exposure and the use of different means of photoprotection should be stressed. *3.* In our study group the rate of sun burn has decreased.

Key words: primary prophylaxis, skin cancer, pupils, teenagers.

EVALUACIÓN DE UN PROGRAMA DE INTERVENCIÓN ESCOLAR PARA LA MODIFICACIÓN DEL COMPORTAMIENTO ANTE LA EXPOSICIÓN SOLAR

Resumen. *Introducción*. El cáncer de piel melanoma y no-melanoma es el tumor más prevalente y más frecuente en el mundo, la exposición solar es el factor de riesgo más importante. La infancia y la adolescencia es el periodo de la vida en el cual la exposición solar es mayor. La intervención para modificar hábitos ante el sol es fundamental para la prevención del cáncer cutáneo.
Material y métodos. Realizamos un estudio cuasiexperimental sobre una población escolar de Granada capital de 11 y 12 años con un test previo a casos y controles, intervención con programa educativo a grupo de casos y test posterior a ambos grupos. Muestreo aleatorio por conglomerados. Cuestionario autocumplimentado. Muestra de 628 adolescentes de colegios e institutos de Granada. Estadístico utilizado: Test de Mc Nemar y Wilcoxon.
Resultados. Tras la intervención, el grupo de casos mejoraba ampliamente los resultados tanto en conocimientos sobre sol y piel (OR = 2,89), sol y medio ambiente (OR = 2,23) y sol y salud (OR = 1,4) como en actitudes y conductas sanas con respecto al sol, (OR = 4,2), siendo esta diferencia estadísticamente significativa, frente al grupo control.
Conclusiones. Antes de planificar una campaña de prevención primaria de cáncer de piel es necesario saber los conocimientos y comportamientos de la población a la que se dirige. En segundo lugar se debe insistir en el riesgo de la exposición solar intermitente aguda y en el uso de los diferentes medios de fotoprotección. Por último hay que señalar que en el grupo de nuestro estudio ha disminuido la frecuencia de quemadura solar.

Palabras clave: prevención primaria, cáncer de piel, escolares, adolescentes.

Introduction

There is a high incidence of melanoma and nonmelanoma skin cancer in most countries.[1,3] Epidemiologic studies done in Spain,[4,5] as in other countries,[6] show that sunlight

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exposure is the main modifiable risk factor in Caucasian people.

Increased sunlight exposure is caused by a series of social patterns, models, or working conditions having a cumulative effect that, depending on the individual's characteristics, will lead to the appearance of skin cancer, especially in low phototype patients. Artificial sources of UV radiation, which have come into increasing use in recent years, have to be added to the carcinogenic effects of the sun. Although the cumulative effect of sunlight exposure occurs throughout life, sunlight exposure during infancy plays a key role in the appearance of skin cancer. Children are exposed to the sun 3 times more than adults and before 21 years have received between 50% and 80% of their total solar radiation.[7] Taking all this into consideration, skin cancer can be viewed as a preventable problem if suitable sunscreen and/or sun-protection education measures are applied. We consider the former as the set of measures making it possible to reduce the cumulative skin damage caused by solar radiation and the latter as those aimed at decreasing exposure and preventing or reducing its effects. Primary prevention campaigns are more essential and effective in children and teenagers, not only due to the particular importance of sunlight exposure during this period, but because this is when individuals are more open to changes in attitude and behavior and more receptive to information.

The province of Granada (population >700 000) in southern Spain is highly diverse geographically, having a coastline of 71 kilometers bordering the Mediterranean Sea, but with almost half its surface area above 1000 meters. This allows for various types of physical pastimes, including skiing and water sports for most of the year, with more than 3000 hours of sunlight per year. The Granada cancer registry shows that there has been an increase in melanoma incidence in recent years,[8] with nonmelanoma skin cancer accounting for 20% of all cancers.[9]

In the present study, we implemented and assessed a school intervention program to raise awareness and modify wrong behavior regarding sunlight exposure in pupils in Granada, Spain, based on the results of a previous study addressing knowledge, attitude, and behavior of these teenagers regarding the sun.[10]

Material and Methods

The study population consisted of pupils aged 11 to 12 years in the first year of compulsory secondary education in Granada city. The group included 628 pupils from various schools in Granada. They filled in a questionnaire covering personal details and phototype and provided us with data on their knowledge and attitudes regarding the sun. The study was performed in 3 phases. In the first phase, a questionnaire was given to the total sample in May. After analyzing the initial results, a school intervention program was designed to modify behavior, adapting it to needs shown by the survey results. During the second phase, the program was applied only to the intervention group, in May and June. Then, in the third phase, a second survey was given to the total sample in September and October and conclusions drawn.

Description of the Material

Questionnaire

A self-administered multiple-choice questionnaire was used consisting of 3 parts. The first referred to general data. The second part consisted of 15 true/false or yes/no questions aimed at evaluating student knowledge (Table 1). The third consisted of 15 true/false or yes/no questions aimed at identifying pupil behavior regarding the sun (Table 2).

Variables

The following subject sections and their related questions were used as dependent variables:

- Section I: knowledge about sun and skin
- Section II: knowledge about sun and environment
- Section III: knowledge about sun and health
- Section IV: behavior and attitude

Table 1. Summary of Questions on Knowledge

Benefits of sunlight exposure (Is it good to get a lot of sun? Is it good to take the sun for short periods of time but intensely?)
Relationship between skin cancer and sunlight exposure
Differences between the sun in the city, beach, and mountains
The meaning of a tan (Is a tan a sign of being healthy?)
Best time to sunbathe (What is the best time to sunbathe?)
Effect of the sun on different skin phototypes
The relationship between sunlight radiation and moles
Risks of sporadic exposure during vacations
Relationship between the sun and skin aging
Knowledge about the ozone layer and hole
Sunlight exposure and cloudy days (Is there any risk?)

Table 2. Summary of Questions on Attitude and Behavior.

Sunlight exposure in the last few summers
Taking precautions regarding sunlight exposure
Frequency of sunburn in the last few summers
Use of a cap and/or t-shirt in relation to sunlight exposure
Usual times for sunbathing
Taking precautions on cloudy days
Use of sunscreen
Opinions on the best way to sunbathe
Opinions about tans
Use of shade between 11 am and 5 pm
Habits regarding recommending sunscreens to family and friends

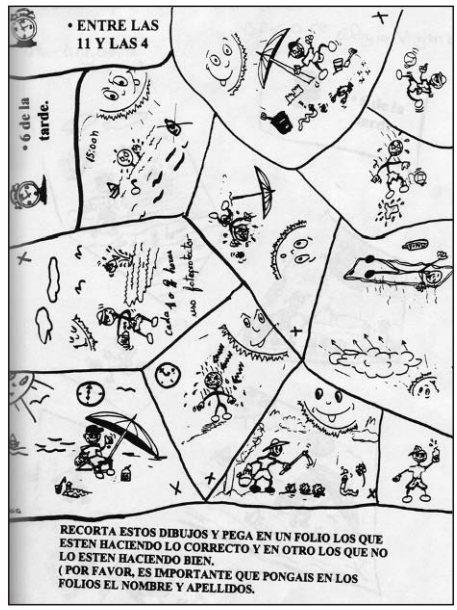

Figure 1. Puzzle

The independent variables were sex, phototype, type of school, and place of vacation.

Educational Materials Used in the Intervention

All the materials used were original, specifically created by our research group, and consisted of a series of slides about the sun, its nature, dangers, and benefits, an educational video, work material with games and a puzzle on subjects about behavior regarding the sun (Figure 1), reminder leaflets with the "9 key points on the pact with the sun" (Table 3), game solutions, and various samples of sunscreen to explain what they are.

Description of the Methodology

For the purposes of the study, we adopted the points considered in successive consensus conferences on health education regarding the sun,[11-13] where strategies and programs were outlined, as well as methods for assessing their effectiveness. After thoroughly reviewing the specific literature, we designed a quasiexperimental study with a preintervention and a postintervention and a control group. Previous experiences in an infant population were taken into account when designing the intervention program.[14-19] The questionnaires used by the Skin Cancer Foundation[20] were used as a reference when preparing our own.

Random cluster sampling (educational centers) was applied to a population of first-course compulsory secondary education pupils in Granada. The sample calculated for each study group (intervention and control) consisted of 213 students, making it possible to detect a 12-percentage-point difference between the 2 groups at the end of the intervention in relation to the percentage of correct answers in the knowledge sections (specifically, 59% in the intervention group and 47% in the control group), with a 95% confidence interval (CI) and 80% power. The sample was increased to 628 students (47%) to counteract possible losses during follow-up. The cluster sample was formed by 9 educational centers selected via simple random sampling.

The first phase was done by telling the students, once they were in the classrooms, that they were going to take part in a survey. All the surveys were administered by the same researcher/dermatologist, who only provided general instructions on how to fill in the questionnaire correctly, so that data collection was homogeneous and conducted in the same way in all the schools.

Students were considered to have a good level of awareness or behavior when they correctly answered a number of questions higher than half plus 1 in each section (Table 4). Once the results from the first phase were analyzed, we designed the intervention program, highlighting those points where difficulties had been encountered. We also took into account proposals regarding priority issues when preparing campaigns, developed for the national skin cancer agenda[12] and by the Sun Safety Conference.[13]

The second phase, program development, was applied to the intervention group only, during the pre-summer-vacation period in all the centers. Two researchers/dermatologists from our team introduced and presented the intervention, taking a total of 3 days to do this in each school. The works of several authors were

Table 3. Key Points on the Pact With the Sun.

1.	Avoid sunlight exposure between 12 o'clock midday and 5 o'clock in the afternoon
2.	Use lots of sunscreen higher than factor 15 during sunlight exposure (apply every 2 hours)
3.	Use shade and wear a cap and t-shirt during recreational activities involving sun exposure
4.	The sun is also dangerous on cloudy days
5.	If you have light eyes and fair skin you have to be especially careful
6.	Avoid using UV sunlamps
7.	Remember that snow, swimming pools or sea water, and sand reflect sun rays and increase damage
8.	Remember, **"Me, burn? No thanks!"**
9.	Remember, **"Don't build up a lot of hours in the sun during your lifetime."**

used as guidelines regarding the timing of the intervention.[15,17,21-23]

On the first day of the intervention, the nature, benefits, and dangers of the sun, as well as the way the students could protect themselves, were explained through a 30-minute talk with slides. Awareness was raised on the fact that preventing skin cancer depends on how we act from the outset. The influence of sunlight exposure on physical appearance (blemishes, premature wrinkles, etc) was particularly stressed. The messages transmitted were positive and nonalarmist.

On the second day, an educational video was shown highlighting the most important points of the first day's talk and giving practical examples of how to use sunlight protection. The students were also given a puzzle with a series of drawings about a character created by us with different habits and behavior, to cut out and group into good and bad practices (Figures 2 and 3). On the third day, there were classroom activities and the work done by the students was displayed (Figure 4). The activities included identification of each student's phototype, how to protect themselves from the sun, what can happen if a person gets sunburned, presentation of personal experiences, and what had been learned. They were given the solutions and a reminder leaflet with 9 key points on sunlight protection; then, a discussion was held where the students asked questions and were encouraged to actively participate.

The third phase was carried out after the summer vacation, where the same questionnaire was given to all the students in both groups (intervention and control) in identical conditions to the first phase.

Figure 2. Student work. A set of healthy behaviors

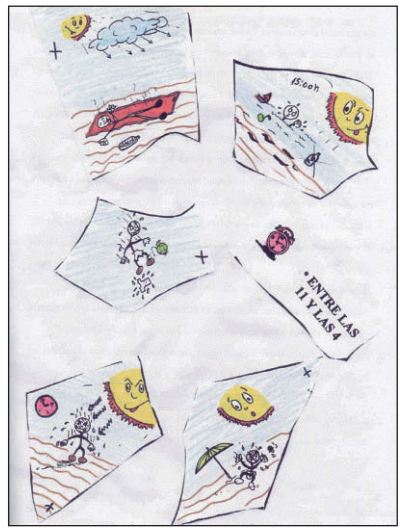

Figure 3. Student work. A set of unhealthy behaviors

Table 4. Scoring Parameters in the Question Sections

Section I.	Knowledge about the sun and skin (8 questions) Correct knowledge, more than 4 correct answers
Section II.	Knowledge about the sun and environment (4 questions) Correct knowledge, more than 2 correct answers
Section III.	Knowledge about the sun and health (3 questions) Correct knowledge, more than 1 correct answer
Section IV.	Behavior and attitude regarding the sun (15 questions) Suitable behavior and attitude, more than 8 correct answers

Figure 4. Student work (*Me, burn? No thanks!*)

Statistical Analysis

Initially, a descriptive univariate analysis was done to identify the sociodemographic characteristics of the study population, with descriptive statistics (measures of central tendency and dispersion) and frequency tables. Relationships between qualitative variables and intervention or control groups were assessed via contingency tables, using the χ^2 test and Fisher exact test (as a nonparametric test). The Student *t* test and Mann-Whitney U test (as a nonparametric test) were used for quantitative variables. This analysis was done before and after the intervention. The McNemar test (for qualitative variables) and Wilcoxon test (for quantitative variables) were used to detect changes produced before and after the intervention in both study groups. The odds ratio (OR) with 95% CI was calculated to measure the differences in improvement after the intervention between the intervention and control groups. Statistical significance in all the analyses was established at $P<.05$. The following programs were used: Sample-Power 2.0 (sample size and power calculation), EpiInfo 2000 (educational center selection), and SPSS 12.0 (statistical analysis).

Results

The ages ranged between 11 and 16 years (mean ± SEM, 12.6 ± 0.63); although the study population consisted of students between 11 and 12 years, the sample obtained also included older students (repeaters). There were 367 boys (58.4%) and 261 girls (41.6%). The group contained mostly white students (98.2%), along with 9 Roma (1.43%), and 2 black (0.31%) children. A total of 352 (85.8%) pupils were high phototype (dark eyes and hair) versus 58 (14.1%) low phototype. More than half the sample (55.6%) took their vacations by the beach and 21.3% in the countryside (Table 5).

Table 5. Characteristics of the Study Population

Variable/Categories	*Statistic*
Age	*Range, 11-16*[a] *Mean ± SEM, 12.6 ± 0.63*
Sex	
Boy	58.4%
Girl	41.6%
Race	
White	98.2%
Roma	1.43%
Black	0.31%
Eye color	
Brown	68.4%
Green	19.3%
Blue	7.6%
Black	3.5%
Gray	0.5%
Hair color	
Brown	60%
Black	21.2%
Blonde	17.7%
Red	1.1%
Phototype	
High (dark hair and eyes)	85.8%
Low (fair hair and light eyes)	14.1%
Place of vacation	
Coast	55.6%
Countryside	21.3%
Traveling around	12.3%
City	7%
Unknown/unanswered	3.8%

[a] The sample includes ages higher than 12 years due to including some repeaters.

In the first survey more than 60% (577) of the students satisfactorily answered 80% of the questions on knowledge, in contrast to responses on behavior and attitude, where more than 60% answered incorrectly, indicating some unhealthy attitudes and behavior regarding sunlight exposure. In particular, getting sunburned the previous summer, not taking precautions on cloudy days, and not using sunscreens stood out, and it was noteworthy that 14.6% did not know what a sunscreen was. This situation was fully reported in the first part of our study.[10] There were no differences between the intervention and control groups in awareness or attitudes before the intervention. In September, after the intervention phase, a second survey was administered showing that more than 70% of the intervention group students scored well (more than 80% correct answers) on knowledge versus 60% in the control

Table 6. Results of the Program in the Intervention and Control Groups

Information Sections	*Variable* [a]	*Percentage of Correct Answers*	
		Intervention group	*Control group*
Knowledge	Question no. 3c	81.7%	72.9%
	Question no. 4d	76.6%	63.2%
	Question no. 5e	90.2%	69.4%
	Question no. 7c	91.4%	85.51%
	Question no. 8d	64.7%	53.8%
	Question no. 10b	91.4%	86.5%
	Question no. 11e	91.7%	71.8%
Attitude	Question no. 2d	72.6%	57.7%
	Question no. 6e	58.6%	34.7%
	Question no. 8e	52.1%	39.2%
	Question no. 9e	79.9%	54.2 %
	Question no. 11e	11.9%	3.8%
	Question no. 12e	64.5%	42.7%
	Question no. 13b	59.4%	56.3%
	Question no. 14d	74.1%	63.5%
	Question no. 15e	68%	46.5%

[a] See Tables 7 and 8 for the questions. [b] $P<.1$; [c] $P<.05$; [d] $P<.01$; [e] $P<.001$. Variables with $P>.1$ are not shown.

Table 7. Questions on Knowledge With the Most Significant Answers After the Intervention

No. 3. Do you think the beach or mountains are better than the city because you can get a tan?
No. 4. A permanent or frequent suntan is sign of good health
No. 5. What is the best time to sunbathe?
No. 7. The sun can affect moles
No. 8. People who only sunbathe during vacations do not have to take any precautions
No. 10. People with dark skin and dark eyes are at more risk of skin cancer
No. 11. Lots of sun ages the skin

Table 8. Questions Relating to Attitude and Behavior With the Most Significant Answers After the Intervention

No. 2. Have you taken precautions against sunlight when have you been in the open air?
No. 3. What time did you sunbathe this summer?
No. 8. Did you protect yourself on cloudy days this summer?
No. 9. Did you use a sunscreen this summer?
No. 11. In which of these situations did you use sunscreen?: a) only on sunny days on the beach; b) always on the beach; c) when doing things in the open air, trips in the mountains, sports, etc; and d) never
No. 12. Indicate which of the choices is the best to protect you from the sun: *a)* use a low factor sunscreen; *b*) cover myself up with clothes; *c)* avoid the sun and stay in the shade; *d)* have a swim to freshen up and then carry on having fun; *e)* visit the doctor; *f)* be careful about diet; and *g*) use a high factor sunscreen
No. 13. I feel healthier when I have a good tan
No. 14. I have tried to avoid the sun when it is hotter (between 11 am and 4 pm)
No. 15. Have you ever advised your friends to use a sunscreen?

group. However, a surprising result was obtained regarding attitudes and behavior: 77% of the intervention group students achieved good results versus 23% in the control group. Table 6 shows the results comparing the intervention and control groups regarding knowledge and attitude after completing the program, indicating a higher percentage of correct answers, both in knowledge and attitudes, in the intervention group versus control, with the greatest difference being found in relation to attitude and behavior (Tables 6, 7, and 8).

The same results were found in the subject sections. The estimated OR using the control group as the reference category were as follows (Table 9):

- Section I: knowledge about sun and skin. Students who received the program considerably improved their knowledge about sun and skin (OR, 2.89; 95% CI, 1.2-6.9).
- Section II: knowledge about sun and environment. Although the 2 groups improved, there were significant differences in favor of the intervention group.

Those participating in the educational program reached a level of awareness significantly higher than nonparticipants. (OR, 2.23; 95% CI, 1.53-3.23).

- Section III: knowledge about sun and health. There were significant differences (P=.0015) before and after the study in the intervention group and nonsignificant differences in the control group (P=.9230). The students

Table 9. Estimates of Odds Ratio for the Intervention Group Compared to the Control Group[a]

Subject Sections	Intervention Group		Control Group		OR	95%CI	
	Before	After	Before	After			
Section I	92.4%	97.5%	92.4%	93.1%	2.89	1.2	6.9
Section II	51%	78.8%	51.4%	62.5%	2.23	1.53	3.23
Section III	88.5%	93.9%	90.3%	91.7%	1.4	0.73	2.65
Section IV	55.4%	88.1%	56.9%	63.9%	4.2	2.7	6.4

Abbreviations: OR, odds ratio; CI, confidence interval.
[a] Data are shown as the percentage of correct scores according to the scoring parameters for each section.

Table 10. Results of the intervention by sex[a]

Subject Section	Intervention Group				Control Group			
	Before		After		Before		After	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Section I	86.8%	100%	96.9%	98.3%	90.4%	95.5%	91%	96.4%
Section II	49.1%	53.8%	78.6%	79%	47.8%	57.3%	59%	68.2%
Section III	85.5%	92.4%	91.8%	96.6%	88.8%	92.7%	90.4%	93.6%
Section IV	51.6%	60.5%	89.3%	86.6%	50.6%	67.3%	60.7%	69.1%

[a] Data are shown as the percentage of correct scores according to the scoring parameters for each section.

who did not receive the program did not demonstrate correct knowledge regarding the relationship between sun and health. This was not found in the students participating in the program (OR, 1.4; 95% CI, 0.73-2.65).

- Section IV: behavior and attitude. Although all the students improved their behavior, only those participating in the educational program succeeded in changing and improving their attitude and behavior toward the sun in a significant way. In this case, there were large statistically significant differences versus the control group (OR, 4.2; 95% CI, 2.7-6.4).

Regarding the results of the intervention by sex (Table 10), in the first phase of the study girls obtained better results than boys due to being more aware of the issue; thus, female sex was a protective factor. However, after the intervention, boys' scores increased to the point of equalizing the girls' scores and even surpassed them in the behavior section. If female sex as a protective factor is eliminated, belonging to the intervention group constitutes a protective factor versus the control group. When comparing the sections by sex, the first survey shows there were no significant differences between the intervention and control groups, demonstrating that the sample was homogeneous. After the intervention program, it was found that the differences between sexes in the control group were maintained, whereas in the intervention group the differences between sexes almost disappeared. In the control group these differences were found in all sections and reached significance, in favor of the girls, in sections III and IV (P=.021 and P=.02, respectively). Although there were strong differences in favor of the girls in sections I and II, these did not reach statistical significance. The same situation was repeated in the intervention group, but only in section I were there significant differences (in favor of the girls). After the intervention, the differences were always maintained between sexes in the control group, always in favor of the girls, who demonstrated better knowledge and behavior than the boys. The situation was very different in the intervention group, where the differences between sexes narrowed considerably. However, the statistically significant differences continued to be in favor of the girls in sections I (P=.001) and III (P=.004). Girls formed the reference category in relation to the sections by sex.

According to the status of the educational center (Table 11), in general, state and independent schools obtained poorer results in the first phase, whereas private schools obtained better results. After the second questionnaire, the behavior and results of the control group stayed the same as described before: they improved compared to how they

Table 11. Results of the Intervention According to the Type of Educational Center[a]

Subject Section	Intervention Group						Control Group					
	Before			After			Before			After		
	Sta	Ind	Priv	Sta	Ind	Priv	Sta	Ind	Priv	Sta	Ind	Priv
Section I	93.8%	90.3%	97.9%	98.5%	98.8%	91.7%	86.6%	93.7%	95.7%	95.5%	93.7%	87%
Section II	38.5%	52.7%	62.5%	62.9%	82.4%	79.2%	44.8%	57.1%	39.1%	44.8%	70.3%	58.7%
Section III	89.2%	87.9%	89.6%	93.8%	95.2%	89.6%	88.1%	90.9%	91.3%	91%	92%	91.3%
Section IV	52.3%	55.8%	58.3%	80%	90.9%	89.6%	40.3%	68.6%	37%	59.7%	70.9%	43.5%

Abbreviations: Sta. state; Ind. independent; Priv. private.
[a] Data are shown as the percentage of correct scores according to the scoring parameters for each section.

Table 12. Results of the Intervention According to Place of Vacation[a]

Subject Section	Intervention Group				Control Group			
	Before		After		Before		After	
	Beach/Coast	Other	Beach/Coast	Other	Beach/Coast	Other	Beach/Coast	Other
Section I	94%	90.2%	98.2%	96.4%	92.4%	92.3%	93.1%	93%
Section II	49.4%	53.6%	74.7%	84.8%	51%	51.7%	57.9%	67.1%
Section III	87.3%	90.2%	93.4%	94.6%	88.3%	92.3%	91.7%	91.6%
Section IV	52.4%	59.8%	86.1%	91.1%	53.8%	60.1%	64.8%	62.9%

[a] Data are shown as the percentage of correct scores according to the scoring parameters for each section.

were at the beginning, but not significantly, and always less than the intervention group. In the intervention group, the state and independent schools obtained the best results in all sections.

Regarding place of vacation (Table 12), the students from both groups (intervention and control) who spent their summer vacation at the beach were more aware of the risks of sunlight exposure than those spending their vacation in other places. Nevertheless, the group following the intervention program and who spent the summer vacation at the beach considerably improved their knowledge and attitude to sunlight exposure compared with the control group or students in the intervention group who spent their summer vacation in the mountains or countryside.

Finally, with the aim of distinguishing the students' phototype, we split this variable into 4 categories: light eyes and fair hair, dark eyes and dark hair, dark eyes and fair hair, and light eyes and dark hair. Only the first 2 categories (low and high phototype, respectively) were used in the analysis, as they were the ones that could provide the greatest difference. Thus, no statistically significant differences in knowledge and attitudes were found between the control and intervention groups before the program, in both high or low phototypes; however, higher scores in knowledge and attitudes were found in low phototypes than in high (60.3% of the low-phototype children had good scores in the behavior and attitude section versus 54% of the high-phototype children). After the intervention, the percentage of correct answers tended to be the same in the high and low phototypes in the intervention group, whereas this was not observed in the control group (Table 13).

Discussion

As in our study, most health education programs geared toward children and teenagers have chosen schools as the most suitable context in which to apply them.[24-28] We implemented a preintervention and postintervention study with a control group to achieve maximum scientific rigor.[21,22,29,30] This was designed to check self-reported knowledge and behavior before and after the intervention. Belonging to one group or another was defined in our study by belonging to class A or B, as assigned in alphabetic order by the school's head staff, and thus, no differences were involved. The results were interpreted according to the effects obtained and what would have happened if the program had not been applied (control group).

Table 13. Results of the Intervention According to Phototype[a]

	Intervention Group		*Control Group*	
	High Phototype	*Low Phototype*	*High Phototype*	*Low Phototype*
Section I	100%	96.6%	92.3%	94.3%
Section II	75%	79%	65.4%	60.2%
Section III	90.6%	93.8%	92.3%	90.3%
Section IV	81.3%	88.6%	84.6%	60.8%

[a] Data are shown as the percentage of correct scores according to the scoring parameters for each section.

Other similar studies have used this type of design, also obtaining similar results.[21-23,25,26,29,30-32]

We think it essential to the success of the program that it be attractive and provide information suited to each age group. Large programs, such as Slip, Slop, Slap,[33] did not reach the teenage population as the message was not adapted to this age group.[34]

The average age (12 years) of our students was similar to that in other studies conducted in England,[17] New Zealand,[35] and the United States.[26,36] We selected this course (1st year, compulsory secondary education) as being the one likely to involve the fewest losses, since the previous and subsequent courses involved the risk of losing most of the students in the second survey due to changing the school year and possibly the school as well.

In our study, we found that low-phototype children have a higher level of awareness and better behavior than high-phototype children, a finding that is consistent with other studies.[13,37-39] This may be due to low-phototype children being more aware of the issue due to their experience with sunlight and thus developing better and more frequent protection habits. However, in a study done in Great Britain, it was found that having a skin that was difficult to tan (low phototype) was associated with sunburn.[40] High phototypes predominated in our sample, unlike in other studies.[17,18,21] This difference is explained by the predominant phenotype in the Andalusian population. The positive effect of our program is shown by improved scores in knowledge and attitudes in both high and low phototypes, with any differences found before the intervention disappearing.

Analyzing the results obtained in the first survey shows that our data coincide with many studies,[18,21,36,41-44] and this indicates that, despite good levels of knowledge, children and teenagers are relatively unaware of the risks of sunlight exposure, are almost obsessed with getting tanned, and generally fail to protect themselves against either solar or artificial UV light. Recent studies indicate that the general public is knowledgeable regarding sunlight exposure,[45-48] although the relationship between this and behavior is not very consistent.[41,42,45,49,50] This situation is also found when studying children and teenagers; thus, another study found that 70% of a sample of teenagers did not use any type of sunscreen and that their knowledge about skin cancer was not associated with better sun-protection measures.[42] Our results are fully in line with those obtained in most studies, especially regarding the lack of association between the level of knowledge and behavior adopted. Other studies conducted in Spain are not completely comparable, since the samples involved much younger[52] or older subjects.[51] Furthermore, those studies were undertaken in northern Spain, where the number of hours of sunlight per year is less than in Andalusia and the phototypes different. Nevertheless, those studies also showed that girls have a better level of awareness than boys[51] and that knowledge and behavior improved after the intervention.[52]

The second survey demonstrated great improvements in knowledge and behavior in the intervention group, indicating that the intervention had been effective in increasing knowledge and modifying unhealthy behavior regarding sunlight exposure, as in other programs.[17,21,23,25,31,32,38,44,52-58] On the other hand, other works have stated that both groups improve, with no differences,[25,59,60] or even that there are no behavioral changes after implementing the program.[33,36,43,61]

Interestingly, we found that the control group also improved their knowledge and behavior in the second survey in our study. This may have been due to changes inherently relating to the amount of time passing between the first and second survey, known as the maturation effect, although other factors may exist, such as the simple fact of being watched stimulating them to explore the subject. This situation may cause the students to adopt different behavior or claim they behave differently simply because they are feeling watched by the researcher, a phenomenon known as the Hawthorne effect. Students may become interested in the subject during the implementation of the program. The pretest by itself could not facilitate knowledge, an opinion also corroborated in other studies,[26,62] and thus, the possibility of the questionnaire influencing knowledge has been discarded; what in fact happened to the students is that the pretest motivated them to explore the subject of sunlight protection. Even so, without having done the pretest, the very fact that their classmates had received information about this would lead pupils to ask them things about sunlight protection. We confirmed that other skin cancer prevention campaigns had not been undertaken in the city during that period, to rule out the possibility that they could have influenced improvements in the control group,.

We think that the improvements in the control group were due to a combination of several factors, as reported

by others.[63] Since losses during the study are difficult to control, we chose a sample in which this was least likely to occur (1st year, compulsory secondary education). Even so, there was a total of 62 losses, which was not significant and did not alter the results of the descriptive or statistical analyses. This contrasts with other studies that were in fact affected by losses.[17,60]

As in other studies, the girls in our study had better knowledge and behavior than the boys,[17,28,38,42,64] although these differences tended to even out after the intervention, with results similar to other experiments.[17,23,44] Other authors state that boys are more aware[38,39] or that there are no differences regarding sex.[23,26,44]

We can, in fact, confirm the success of our program by focusing on and discussing some specific points:

- Students taking the program displayed greater awareness of the dangers of the sun, as shown in other studies.[30,38,44,53,55,60,65] According to some authors, the main reason why teenagers sunbathe is to get tanned in order to look more attractive.[66] We found that after taking the program students thought that a permanent tan is not a sign of good health, unlike the students in the control group, who continued to think of it as something healthy. This has also been found in other studies.[26,55]
- Teenagers tend expose themselves to the sun during the hours of maximum sunlight, either unconsciously (during games, school breaks, trips, etc) or else consciously while trying to get a tan.[67] The students who participated in our program are now aware of the risk of sunlight exposure between 12:00 and 18:00 h and the risk of acute intermittent exposure, as well as knowing their phototype. Similar findings have been obtained in many successful campaigns.[23,26,37,53]
- Before the program the pupils thought that skin cancer was a remote possibility that only affects older people, and after the program they still thought the same; ie, although they were aware of the danger from the sun at all ages they considered skin cancer to be something that only affects older people. Thus, teenagers may not be convinced by warnings of this nature when their whole life is ahead of them and physical attractiveness and interest in external appearances are a sufficiently strong motivation to get a tan, while warnings relating to skin cancer are ignored as being a remote possibility.[18,24,68]

Therefore, a better strategy could be to place less emphasis on the risk of cancer and highlight the harmful effects of sunlight exposure on physical appearance. Some studies have achieved a certain level of success with this approach.[67,69]

As in other studies,[16,23] the first survey showed that many of the students (43%) did not know that cloudy days are dangerous and were unaware of the risks. However, we found that after taking the course the students were aware of the risks of UV radiation on cloudy days and also claimed to put this knowledge into practice.

In our study, the students who took the program demonstrated better use of protection measures, which has also been reported in other studies.[17,23,25,26,30,57,58,60,70] After the intervention there was a reduction in the incidence of sunburn in the total sample, although this was much more evident in the group taking the program. This observation is similar to the outcome following some American,[14,26] Australian,[71] and Spanish campaigns.[52]

No differences were found that could be attributed to types of school, as was also the case in other studies,[23] although there were differences depending on where vacations were taken, finding that people going to places other than the beach are not aware of excessive sun exposure and tend to use protection measures less often. This trend has been found in other studies.[17,42]

Perhaps a fresh evaluation of the students taking our program would complete our work and lay the definitive groundwork for preparing new projects. Our study is not free from limitations; it was assessed very shortly after it was completed, although a new assessment of the students is planned among our future projects. The intervention model used was applied without the direct involvement of the teachers, and perhaps is not the most suitable for year-to-year continuity, especially in large populations; however, among our aims we tried to confirm the effectiveness of the school intervention and lay the groundwork for larger studies. We think that the implementation of sunlight exposure prevention programs is essential as the first step in the prevention of skin cancer. Although these programs are of great importance for teenagers, we should also bring to mind other particularly susceptible groups in need of primary prevention, including parents, sports monitors, and teachers.[72] Campaigns should be designed, administered, and monitored by a multidisciplinary team, where the dermatologist plays a key role.

Conclusions

1. The level of knowledge and behavior in the target population needs to be determined before planning a campaign.
2. Skin cancer primary prevention programs should aim at consolidating knowledge and changing behavior, and should place particular emphasis on the risks of intermittent sunlight exposure and how to use different sun protection methods.
3. Intervention in schools is effective. Students who take the program improve their behavior.

4. The study group taking the program suffered less sunburn the following summer, thus representing a first step in controlling the incidence of skin cancer.

Conflicts of Interest
The authors declare no conflicts of interest.

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