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An Educational Intervention in Primary School Students Regarding Sun Protection: A Pilot Study

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Abstract

Background: Epidemiological data have established a correlation between prolonged sun exposure during childhood and adolescence and occurrence of malign melanoma later in life. The aim of the present study was to investigate knowledge and attitudes of primary school students regarding sun protection measures and sun-related risks before and after an educational intervention.

Methods: It is a descriptive randomized pilot study of two stages with comparison of the results before and after an educational intervention. Sixty students aged 8-12 years from a coastal area participated in this study. Students first completed an anonymous questionnaire and after that took part in an intervention program. After 15 days the same students completed the questionnaire again. Data analysis was performed using the SPSS 17.0 and statistical significance was set to 0.05.

Results: Students' awareness and knowledge level about sun-related risks and sun protection measures before the implementation of the intervention was satisfactory. Regarding sun protection factor, students' knowledge levels also increased and 55% of them answered correctly. The students' attitudes after the intervention showed some improvement, yet without any significant variation. There were no changes regarding the use of sunglasses and wearing appropriate clothing (hat, long-sleeve shirts, etc.). The proportion of children who used a sunscreen with SPF 30+ was significantly higher in students after the intervention ($p<0.001$). Sunburn incidence was found to be high. 35% of the students reported having at least one sunburn in the past summer. Children after the intervention had significantly higher knowledge scores compared to those before the program but the score in attitudes was not so high.

Conclusions: This pilot study showed that a similar intervention in a larger sample could increase and expand the students' knowledge about sun protection.

Keywords: Sun protection; Sun exposure; Sun block; Melanoma; Sunburn

Introduction

Solar light, entering the Earth's atmosphere, is filtered by the ozone layer which is at the stratosphere and absorbs most of the UVR by transforming it to heat. Ozone depletion in the last decades has resulted in a 1-3% annual increase in skin cancer cases worldwide [1,2]. Solar radiation risks are widely known and well-established in the literature. Solar radiation may have direct effects on the kin (redness, sunburn, etc.) that occur within hours or days after exposure, or long-term effects (squamous-cell carcinoma, basal-cell carcinoma, malign melanoma) that occur after prolonged exposure for many years [3].

Epidemiological data have established a correlation between prolonged sun exposure during childhood and adolescence and occurrence of malign melanoma later in life. Sunburn incidence in these age-groups is also a risk factor for skin cancer [4,5]. Children and adolescents are the main target groups of educational interventions in countries with high skin cancer incidence, such as Australia, New Zealand and USA. WHO and CDC have launched in the last decade similar programs that have been used as an example for other countries that wish to implement similar interventions too [6-9].

Relative studies and interventions have highlighted the students' awareness about sun-related risks and sun protection measures as well. They have also investigated the students' attitudes, beliefs and behaviours regarding sun exposure and sun protection. It has been documented that providing systematic and continuous information can change erroneous attitudes and lead to wiser behaviours [8-10].

The aim of the present study was to investigate knowledge and attitudes of primary school students regarding sun protection measures and sun-related risks before and after an educational intervention. It is a pilot study and its findings will be the basis for a full-scale study in the future. The present study will provide some useful insight about methodological problems and difficulties that may arise during planning, implementation, data collection and assessment of the intervention.

Material and Methods

Research planning

The present study is a pilot study that will be used as a guideline for a large-scale epidemiological study. It is a descriptive randomized study of two stages with comparison of the results before and after an educational intervention. One hundred and twenty students aged 8-12 years were our sample. They attended a school in the prefecture

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of Korinthia which was later excluded from the final large-scale study. Response rate was 98% and the study took place from January 2009 until March 2009.

Inclusion/Exclusion criteria -Ethics

In this study, the sample comprised of elementary school students (n=120) aged 8-12 years. Their school was in an urban area and was later excluded from the final large-scale study. The students attended the Fourth, Fifth and Sixth grades. The Greek Pedagogical Institute granted approval. Informed consent was granted by the students' parents and the students themselves. Two non-Greek students had to be excluded due to poor Greek language skills. Strict anonymity was preserved. The school principal also granted permission. No banners or other advertising material was included in the intervention.

Data collection

The students had to complete a questionnaire that was administered to them before and after the intervention. In January 2009 students were administered the questionnaires for the first time. After that, the educational intervention took place, and then, in March, the same questionnaire was re-administered to them, in order to assess any changes in their awareness and attitudes regarding sun protection. Completion of the questionnaires took one school hour during the 'Flexible Zone' hours. The intervention took place after the collection of the questionnaires, and the researchers came back to the school 40 days later and administered the same questionnaires in order to assess the intervention's effectiveness.

Instruments

Questionnaire: The literature review did not provide us with a questionnaire specifically designed for this particular age-group (8-12 years old students). Consequently, the researchers had to develop a special questionnaire drawing from the Intersun programme, developed by the WHO [8]. The relevant Australian programme (Sun Smart) also played a role in the development of our instrument [7].

The questions, apart from the demographics, aimed at assessing the students' knowledge about sun-related risks and sun protection measures. The questionnaire included 21 items. Demographics included age, gender, nationality, place of residence and distance from the beach. Personal data that are important for someone's attitude towards sun protection, such as complexion, eye colour, freckles and moles on the skin were also included. The students' knowledge about sun-related risks and sun protection measures were also investigated. The biggest part of the questionnaire (items 10-21) was about daily sun-protection, especially in the summer. The questionnaire had also been pilot-tested on 50 same-age students and all necessary amendments had been made. Internal cohesion reliability was assessed by Cronbach's alpha which was 0.79. Alpha reliability of the attitude-related items was rs= 0.78. Face validity was deemed satisfactory by four specialists (one statistician, two university professors and one PhD candidate in Health Education).

Educational intervention: The intervention programme was designed along the lines of the Australian SunSmart [7] programme, which is tailored for this particular age group. It included a presentation about positive and negative effects of sun radiation on humans and extensive information about ozone and its protective role against UVR. After that, students were informed in detail about sun protection measures. The intervention focused on the correct sun protection factor a sunscreen for children should have, and on applying correctly the sunscreen.

Statistical analysis

Means and standard deviations were used for the description of quantitative variables. Absolute (N) and relative (%) frequencies were used for the qualitative variables. In order to compare quantitative variables among two groups, Student's t-test was used, whereas for comparison among three or more groups parametric analysis (ANOVA) was used. Significance levels were bilateral and statistical significance was set to 0.05. The SPSS 17.0 software was used for the analysis.

Results

Demographics

The average age of the sample (n =120) was 9.9 years (±1.1), while 58% (n=75) were females and 42% (n=50) were males. Moreover, 80% (n=24) of the students were Greek, while 20% (n=24) were of non-Greek nationality. 26% (n=32) of the participants belonged to the high-risk group. More specifically, the high-risk group included children who had four out of five high-risk characteristics (fair complexion, light-coloured eyes or hair, freckles and moles) (Table 1).

Awareness and knowledge

Students' awareness and knowledge level about sun-related risks and sun protection measures before the implementation of the intervention was satisfactory. After the intervention, there was an overall increase in knowledge levels. More specifically, before the intervention, 82% of the participants knew that the sun's heat is at its peak between 10.00 a.m. and 16.00 p.m., 92% were aware that sunscreen can help prevent sunburns and 75% knew that excessive sun exposure may cause skin and eye damage. Yet only 25% of them knew that sunscreens for children should have a sun protection factor of 50. After the implementation of the programme, there was a positive shift in the students' knowledge levels. More specifically, 91% of the students knew when the sun's heat is at its peak, 95% had learned that sunscreen can prevent sunburns and 85% knew that excessive sun exposure may lead to skin and eye damage. Regarding sun protection factor, students' knowledge levels also increased and 55% of them answered correctly.

There was also a significant difference regarding knowledge levels among children of different age. More specifically, after Bonferroni Correction was applied, students aged 10 years outscored both students aged less than 9 years ($p<0.001$), and students aged 9-10 years ($p<0.001$), as well.

Also there was no statistically significant difference regarding knowledge levels between females and males. The males' percentage of

		N	%
High-risk group	No	88	74
	Yes	32	26
Your complexion is	Fair, prone to sunburns	30	25
	Darker, sunburns are rare	90	75
Your eye-colour is	light	24	20
	dark	96	80
Your hair-colour is	light	28	23
	dark	92	77
Do you have freckles on your face/body?	No	88	80.6
	Yes	32	19.4
Do you have any moles on your face/body?	No	88	74
	Yes	32	26

Table 1: Individual characteristics.

overall right answers increased significantly (2.8 ± 0.9 vs 3.2 ± 0.9), and so did the females' right answers (2.9 ± 0.8 vs 3.4 ± 0.8).

Attitudes

The students' attitudes after the intervention showed some improvement, yet without any significant variation (Table 2). It seems that there was a significant difference regarding applying sun protection measures before and after the intervention (Table 3). More specifically, children after the intervention said they applied sun protection measures more often than before the programme.

There were no changes regarding the use of sunglasses and wearing appropriate clothing (hat, long-sleeve shirts, etc.). The proportion of children who used a sunscreen with Sun Protection Factor (SPF) 30+ was significantly higher in students after the intervention (p<0.001). On the other hand, sunscreen use was higher among students when asked before the intervention (78.2% vs 65.5%). The percentage of children who re-applied sunscreen after getting out of the sea was much higher after the intervention, while when asked if they continue to apply sunscreen even after getting a tan the percentage was significantly lower among children when asked after the intervention (29.7% vs 54.8%).

In what regards the children's activities and protection measures before and after the intervention, when asked after the programme, they said they took more protection measures compared to before the programme. More specifically, before the intervention children said that they used to take more protection measures compared to their answers after the intervention, mainly when they play at the park (22.5% vs 20.1%), during Physical Exercise (P.E.) class (17% vs 15.6%) and when they go hiking to the mountain (15.2% vs 1.6%). Even when they go the beach/pool, it seems that more children used to take protection measures (67.5% vs 66.2%) before the intervention, although this does not seem to be statistically significant (p=0.092).

	Measurements				P Student's t-test
	Before		After		
	mean	SD	mean	SD	
Attitude score	21.6	3.45	23.71	3.48	<0.001

Table 2: Overall attitude before and after intervention.

		Percentage		P Pearson's x^2 test
		Before	After	
		%	%	
Do you wear a hat when under the sun?	Always	33.1	42.3	<0.001
Do you wear long trousers and long-sleeve shirts when under the sun?	Always	18.7	7.9	<0.001
Do you usually stay in the shade when at the beach?	Always	45.2	49.0	0.049
Do you wear sun-glasses?	Always	38.5	33.9	0.009
Do you use sunscreen?	Always	64.0	75.3	<0.001
What is the SPF of your sunscreen?	I never used one/ Lower than 15	8.8	9.0	<0.001
	15	15.3	14.5	
	30	29.7	54.8	
	I do not know	46.2	21.6	
Do you re-apply sunscreen at the beach?	Every 2 hours	30.5	32.5	0.037
When tan, do you use keep using sunscreen?	Always	59	52.6	<0.001
Do you like to get a tan?	No	57.4	34.2	<0.001
	Yes	26.5	39.5	
	I don't care	16.1	26.3	

Table 3: Attitude before and after intervention.

Sunburn incidence was found to be high. 35% of the students reported having at least one sunburn in the past summer. This answer was not assessed after the intervention, since it wasn't summer yet and because this was a pilot-study in order for the intervention to be standardized.

Correlations

There was a significant difference in knowledge levels in accordance with a child's place of residence and its distance from the beach. After Bonferroni Correction was applied, it was found that students who lived 15-20km away from the beach had lower scores compared to those who lived 0-5 km, 10-15 km, 20 and over km away from the beach (p<0.001, p=0.005 and p=0.015 respectively). Moreover, students living in urban areas outscored those who lived in semi-urban areas (2.9 ± 0.9 VS 2.7 ± 0.8. P=0.001, Pearson's x^2 test).

The correlation between attitude and gender showed that both males and females had slightly worse attitudes towards protection measures after the intervention. Specifically, males and females do not usually wear a hat and appropriate clothes (p<0.001).On the other hand, use of sunscreen with SPF 30+ showed an important (p<0.001) increase (males: 33.2% vs 47.2%; females: 26.2% vs 62.9%). Re-application of sunscreen was also higher. In this case, males reported they re-applied sunscreen every two hours, after the intervention, (30.7% vs 33.8%, p=0.030), but females did not show any significant change (30.2% vs 31.2%, p=0.337).

Correlation between knowledge and age showed that younger students had gained much more knowledge after the intervention. It was also found that children less than 9 years of age took protection measures when playing at the park (15.1% vs 23.4%) and when they used to go to the mountain (8.4% vs 14%), compared to children 10 years and older. Males took significantly (p<0.001) less protection measures than females when they used to go to the beach (65.3% vs 73.5%) and during P.E. class (13.8% vs 21.7%).

Correlation between attitudes and nationality showed that Greek students had had better sun-related attitude than students of non-Greek nationality. Also, students that did not belong to a high-risk group had had better attitude regarding protection measures.

Finally, it was found that children after the intervention had significantly higher knowledge scores compared to those before the programme, regardless of whether they belonged to a high-risk group or not.

Regarding the high-risk group, there was a difference in using protection measures among students before and after the intervention. More specifically, when asked after the intervention, high-risk children said that they used to wear less often long trousers (19.1% vs 2.7%), sunglasses (38.4% vs 31.4%) and apply sunscreen (77.5% vs 65.9%) compared to their answers before the intervention. On the other hand, after the intervention, high-risk students said that they would

use sunscreen with SPF 30+ much more than before the intervention (27.2% vs 60.6%). Similarly, after the intervention the percentage of high-risk students who would re-apply sunscreen every two hours was much higher than before (28.3% vs 43.2%). Also, after the intervention the percentage of high-risk students who wanted to be tan, was again higher (25.4% vs 51%).

Discussion

The present study investigated the changes in knowledge and attitudes of students after an educational intervention. Also, it examined whether the questionnaire was easily understood by the students, in order to be administered to a larger sample without any significant methodological problems.

The implementation of prevention and educational programmes within primary education is an important part of Health Education in many countries. In Greece, some health promotion programmes have taken place during the last years, although it seems that sun protection is not a top priority for the Ministry of Health yet. Nevertheless, sun protection is a priority for many other countries, and also for the WHO and the CDC, and multiple prevention programmess have been launched and taken place in schools [6-9].

The international literature has established that systematic and well-coordinated programmes that focus on large population groups can have better results than sporadic, isolated interventions. The 8-12 age-group seems to be the best option for educational interventions aiming at knowledge improvement and healthier behaviours through attitude change [11-13].

Our demographic results showed that the number of males and females was almost the same. Almost 20% of the participants were of non-Greek nationality, something that shows that Greece has become essentially multicultural. In the larger study, it is expected that knowledge and attitudes will vary according to nationality, as well. This hypothesis is based on the assumption that other characteristics (e.g. phototype) and different clothing in other cultures may have an effect on the foreigners' attitude towards sun exposure and sun protection measures [14-16].

The students' knowledge level was high even before the intervention, but it got significantly higher after the intervention, something that confirms that this programme could be useful for a larger student sample. Our findings are in agreement with those of other studies that have reported high knowledge scores regarding sun protection measures [15-20]. Also, although before the intervention the students' knowledge about sun protection factors was low (25%), after the intervention it increased to 55%, since the programme was specifically aiming at enhancing knowledge about SPF. Similar studies from Spain, the US, New Zealand and Turkey have found lower knowledge levels regarding SPF [21-24]. Several international studies have shown an improvement regarding choosing the appropriate sunscreen, similarly to the present study. Finally, older age students seem to have higher knowledge levels, as expected, since knowledge accumulates over time [10-15].

The students' attitude showed some improvement after the intervention, although not a very significant one. Nevertheless, this was an encouraging sign for the present study. This finding could be attributed to the fact that new and healthier behavioral patterns cannot be adopted by children just on account of more knowledge, since family, peer and school influence play an important role in adopting wiser behaviors, as other studies have also shown [15,18,25].

Sunburn incidence is a well-known risk factor for sun-related damages, according to the literature. In the present study, a significant percentage of the participants (35%) reported having at least one sunburn in the past summer. Other studies have also found similar percentages [20,26-30]. In the present study, it wasn't feasible to assess whether the intervention had reduced sunburn incidence, because it took place before the summer. The forthcoming full-scale study will include a full assessment. Similar interventions worldwide have been shown to reduce sunburn incidence among young person's [26,28,31-33].

Distance between place of residence and the beach was also found to be a significant factor affecting knowledge and attitudes. Students who lived relatively away from the beach in semi-urban areas had, in general, low knowledge levels and did not take sun protection measures, compared to students who lived closer to the beach and had more frequent exposure to the sun. On the other hand, children from rural areas have prolonged exposure to the sun because they may help their parents at the farm or play outdoors [34,35].

This pilot study showed that educational interventions yield better results when implemented at a young age, a finding confirmed by other international studies. Interventions should be aimed at previously documented knowledge gaps and deficiencies and try to accomplish specific targets. The main target of the present study was to enhance the students' knowledge about sun protection factors (SPF), appropriate use of sunscreens and sun-related risks. The long-term target was to make students adopt healthier attitudes and behavior towards sun exposure. The present pilot study used a small sample and was followed by a full-scale study with a sample of 5000 students.

Conclusion

This pilot study showed that a similar intervention in a larger sample could increase and expand the students' knowledge about sun protection. The study was also used as a means of assessing the questionnaire and, in this respect, no methodological problems arose during all the stages of the study.

It is noteworthy that such interventions should be systematic and continuous, since a simple one-time presentation cannot expand the students' knowledge. Systematic up-to-date information is required, and developing interventions specifically designed for each age-group is also essential. In order for such interventions to be successful, social, school and family environment should be included and should actively participate. Parents and teachers should also be informed, since students are by and large influenced by family and school environment.

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