

PRESCHOOL AND PRIMARY SCHOOL EDUCATION ON SUN- PROTECTION

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Abstract: *Recent studies have shown that over-exposure to the solar ultraviolet radiation (UVR) has negative effects on human health inducing aging of the skin and formation of skin cancer, eye damage, and suppression of the immune system. Because preschool and primary school children are at higher risk than adults due to their vulnerability; it is essential to promote sun-protection from an early age on. The courses Environmental Health and Natural Sciences for students of the preschool and primary school programme at the Faculty of Education Koper, University of Primorska (Slovenia), emphasize the importance of sun-protection education. The background knowledge of students on sun radiation and sun-protection was evaluated among 102 future preschool and primary school teachers, and it was assessed that their knowledge regarding this particular field was poor and insufficient. For these reasons, it was found essential to introduce additional knowledge and skills with the respect to appropriate sun-protection to sufficiently fulfil their future care of preschool and primary school children.*

Keywords: *preschool education, primary school education, solar UV radiation, over-exposure to sun, self-protection, health effects*

1. Introduction

The sun is a vital source of energy for all life on Earth. It supports life by photosynthesis in plants and by providing warmth and light. Without the sun life as we know it could not be sustained. While certain exposure to the solar UV radiation (UVR) is necessary for the formation of vitamin D, next to that excessive exposure or over-exposure is a major public health concern. Due to a thinner layer of ozone in the stratosphere, an increased amount of the UV-B component (280-315 nm) reaches the Earth surface, having potentially severe consequences for human health. An excessive exposure can cause immediate adverse effects, like sunburn, phototoxic reactions, photo-allergic reactions, polymorphic photo-dermatosis and severe long term consequences such as eye cataract and skin cancers (Gallagher & Lee, 2006; Matsumura & Ananthaswamy, 2004). Over-exposure to solar radiation has also a detrimental effect on immune system function (Katiyar, 2007).

It is worrying that over the next 50 years some thousands of extra skin cancers will be experienced, as today's children grow up over-exposed to the higher level of solar UVR due to ozone depletion (EEA, 2004). It is predicted that the risk of skin cancer will increase by 3-6 % for every 1 % decrease in the ozone layer (Mc Whirter *et al.*, 2000). The incidence rates of skin cancer are increasing worldwide (Harrison *et al.*, 2006) and in Slovenia from the year 2003 on, skin cancer is on the first place among all types of malignancies (CR, 2010).

The increase of incidence is attributed to excessive sun-exposure due to increased travel and recreation. Skin cancers are associated with both intense, sporadic sun-exposure (sunburns) and with chronic sun-exposure (tanning). The individual's sun-exposure history before the age of 20 years appears to be a significant risk factor. Repeated and severe sunburns in childhood have a major role in the development of skin cancer later in life (CDC, 2002). Consequently, preventive behaviour could be a key controlling factor. It has been estimated that 90 % of all skin cancers are preventable (Breitbart *et al.*, 2006).

Reducing the incidence of skin cancer has become a priority for health promotion. The WHO (2003) has identified schools as key players in global effort to reduce the rising incidence of skin cancer. Preschool, primary and secondary school children are an important target group. Several authors reported that continuous education of age-specific target groups resulted in changes in the 'sun-behaviour', leading to a reduced, but sufficiently healthy exposure to solar UVR later in life (Breitbart *et al.*, 2006). In Australia, where public and health education campaign have been implemented since 1980s, the level of knowledge about the means of sun-protection was found higher in primary school children in comparison with five northern European countries (Hughes *et al.*, 1996). Additionally, it is reported that children subjected to sun-safe preschool education programs showed statistically significant improvement in behaviour and knowledge compared to children that did not receive this education (Cruz *et al.*, 2005; McWhirter *et al.*, 2000). However, sun-safety behaviour was reported to change less among preadolescents, adolescents and college students (Eide & Eide, 2005; Reynolds *et al.*, 1996; CDC, 2002). These findings suggest that successful prevention messages should start as early in childhood as possible.

In Slovenia, the Sun-safety program has been developed in the cooperation between the Institute of Public health and the Cancer Association (IPH, 2007). The program consists of a poster, a toy and a workbook for children, a brochure for parents and educational and didactic material for teachers. In the first (pilot) phase, ten groups of children were involved, *i.e.* 240 children between age 4 to 6 years and their teachers (n=23) from a selected region. In four weeks (May and June 2007), children were subjected to the daily learning activities about the sun-safety. During this phase, didactic and education materials were evaluated and further needs assessed. The trialled program was then extended in the second phase in spring 2008 involving 14.685 children from 109 kindergartens throughout Slovenia. Similar activities like the year before were performed, followed by an additional evaluation, interviewing the head teachers and preschool teachers from each kindergarten. Parents of the participating children were also involved to provide their opinions regarding the project and the sun-safety activities. As a result, a standardized sun-protection educational program for kindergartens was adopted by the Ministry of Health as a regular task of the National policy on the public health. In 2009 the project was rewarded by the Slovenian Cancer Prevention Union.

Schools are an excellent place to teach healthy behaviours, so teachers play an important role in influencing children’s knowledge, attitudes and behaviours regarding sun-protection (WHO, 2003). Teachers, who are well aware of the adverse effects of the solar UVR, often can be the only effective educators of children. Assuming this, it is extremely important firstly to educate the teachers who may not be aware adequately about the sun-protection measures, and secondly to assure that well-skilled teachers will then transfer a proper knowledge and promote self-protective behaviour.

The present study aims to (1) assess the knowledge, habits and attitudes of future teachers, students of Faculty of Education Koper (University of Primorska, Slovenia) and to (2) propose an effective teaching strategy to improve their knowledge about the consequences of over-exposure to the solar UVR.

2. Methods

102 students age 19 to 26 years participated in the survey (13.7 % male and 86.3 % female). They attended the courses of *Natural Sciences* and *Environmental Health* of the preschool and primary school program at the Faculty of Education Koper, University of Primorska, Slovenia.

A brief questionnaire was developed for this purpose. Ten questions were divided in two groups; the first group consisted of four questions to assess the students’ general habits and attitudes regarding the over-exposure to solar UVR. The second group consisted of six questions to evaluate their knowledge regarding self-protection and adverse effects of over-exposure to solar UVR (Table 1).

Table 1

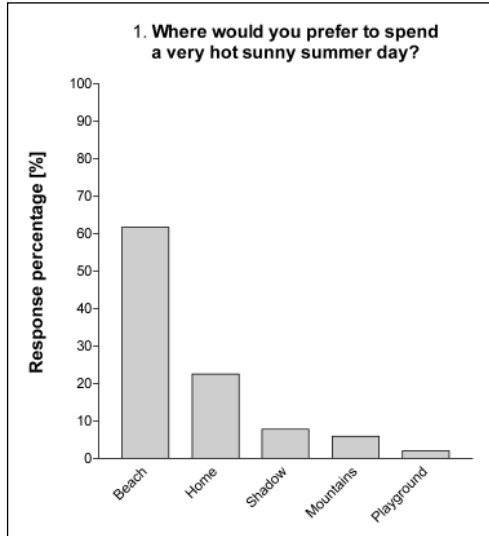
Questions:	
1.	Where would you prefer to spend a very hot sunny summer day?
2.	Do you use any sunscreen?
3.	Which type of sunscreen do you use?
4.	Did you get any sunburn last summer?
5.	Explain the „shadow rule“!
6.	State three of the more relevant health benefits of the sun.
7.	State three of the more severe health risks of overexposure to the sun.
8.	What does the UV-index stand for?
9.	What does the SPF (Sun Protection Factor) stand for?
10.	What are the main causes for elevated solar UV radiation?

3. Results

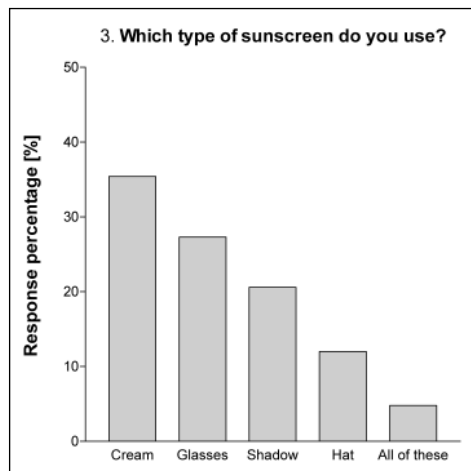
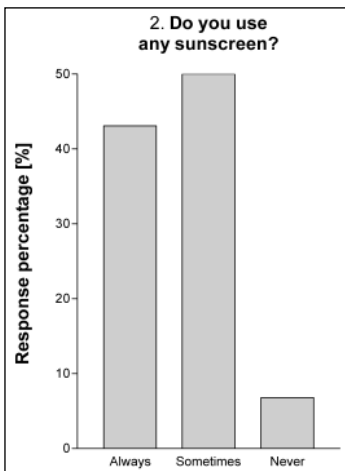
3.1. HABITS AND ATTITUDES OF STUDENTS

From the 102 students, 63 (61.7 %) preferred to spend a very hot sunny summer day on the beach, while 23 of them (22.5 %) preferred to stay at the air conditioned

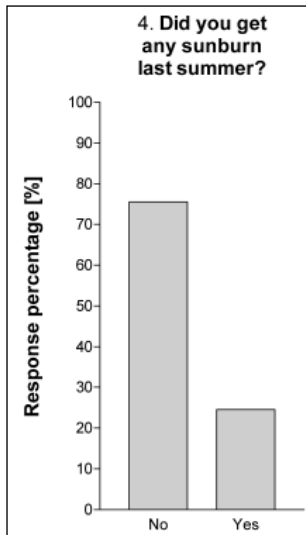
home. Some students rather spend such a summer's day outside in the shadow (8, 7.8 %), or went hiking in the mountains (6, 5.9 %) and only 2 spend their time on the playground (2.0 %) (Figure 1).



The questions about using the sunscreen protection revealed that when exposed to the sun only 43.1 % of students used a sunscreen. 6.8 % of students did not use a sunscreen protection, while 50.0 % used it only occasionally. Of the 95 students who (occasionally) used sunscreen, most of them used sunscreen cream (35.4 %), 27.3 % used sunglasses and 12.0 % used a hat, 20.6 % of students stayed in the shadow and 4.8 % used all of before mentioned protections (Figure 1).



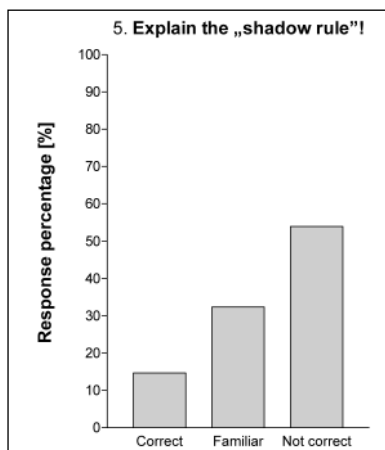
Regarding the experiences of sunburns in last summer 24.5 % of students confirmed sunburns (Figure 1) although most of these (22.5 %) used sunscreen protection.



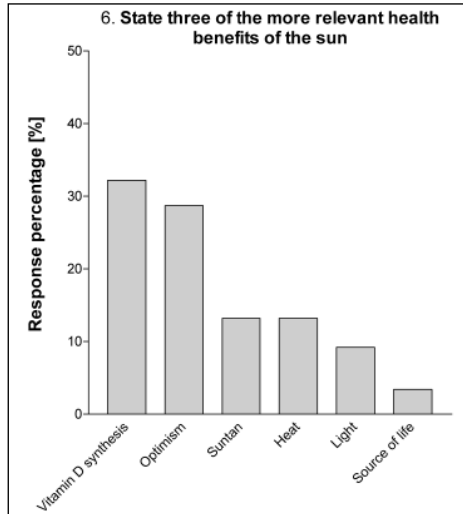
3.2. THE KNOWLEDGE OF STUDENTS ON SUN-PROTECTION AND OVER-EXPOSURE

The question “What is the Shadow rule?” was designed to examine students’ awareness of the severe adverse effects of the solar UVR between the day time period from 10 am to 4 pm. An easy way to describe this crucial time period to children is to explain them the “shadow rule”. The “shadow rule” consists out of a simple method to determine the sun’s altitudes by observing the length of a person’s shadow during the time course of the day. If the length of the shadow is bigger than the person’s height, sunscreen is not necessary.

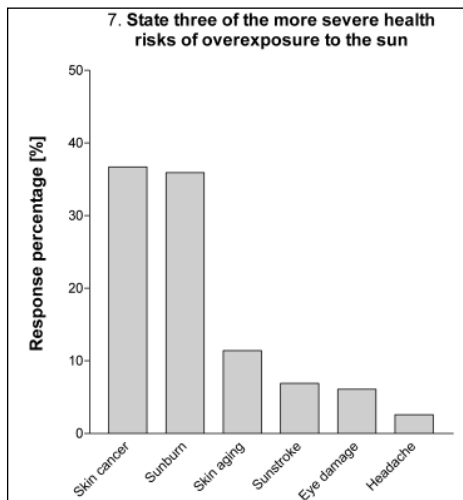
Only 14.7 % of the students knew and understood the “shadow rule”, 32.4 % of students did not understand exactly the rule, however they were aware of the unsafe sun-exposure period and 53.9 % of the students were not aware of the “shadow rule” or the day period with the highest sun-exposure (Figure 2).



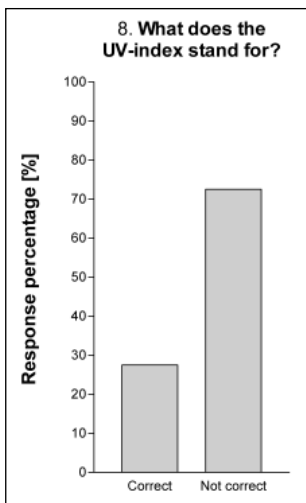
On the question “State three of the more relevant health benefits of the sun” each student could state three answers. About half of the students were aware about the health benefits of the sun (Figure 2) and among them, 32.2 % mentioned the connection of the sun-exposure with the synthesis of vitamin D and 28.7 % of students connected the sun-exposure with optimism and happiness. However, 13.2 % of students considered suntan a benefit of UV exposure.



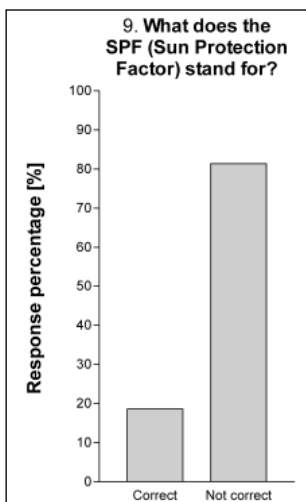
Similarly, the question “State three of the more severe health risks of over-exposure to the sun” revealed various answers (Figure 2). 36.7 % of the students considered skin cancer the most severe long-term consequence of UV over-exposure. 35.9 % of students believed that sunburns are a consequence of over-exposure to the sun. In addition, students were aware of other adverse effects of UVR, like enhanced aging of the skin (11.4 %), sunstroke (6.9 %), eye damage (6.1 %) and headaches (2.6 %).



With the question “What does the UV index stand for?” it was expected that the students would know that UV index is the number, linearly related to the intensity of UVR reaching the surface of the Earth at a given point and time, with higher values representing higher risk level of skin damage due to UV exposure. The question was answered adequately by 27.5 % of students (Figure 2).

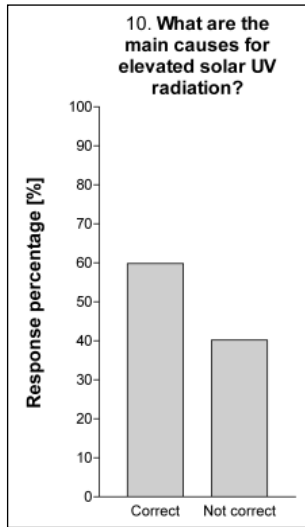


The meaning of Sun Protection Factor (SPF), which is a number for rating the degree of protection provided by sunscreens, was adequately understood by only 18.6 % of the students (Figure 2). Interesting to notice is that 9.8 % of the students did not distinguish the terms UV-index and Sun Protection Factor.



Regarding the last question, to describe the main causes for elevated solar UVR, the majority of students (59.8 %) sufficiently described the main cause for elevated solar

UVR. A fully correct answer would state: the depletion of the stratospheric ozone layer which absorbs the solar UVR, due to the emission of the ozone depletion substances into the atmosphere. 40.2 % of students did not know the correct answer to this question (Figure 2).



LEGENDS TO TABLES AND FIGURES:

Table 1. Questions from the sun-safety questionnaire.

Figure 1. Responses of students to the questions evaluating their habits and attitudes regarding sun-protection: (1) “Where would you prefer to spend a very hot sunny summer day?”, (2) “Do you use any sunscreen?”, (3) “Which type of sunscreen do you use?” and (4) “Did you get any sunburn last summer?”. The columns represent the numbers of answers. For every question the responses of 102 students were evaluated. On question 3 three answers could be stated.

Figure 2. Responses of the students to the questions evaluating their knowledge on sun- protection and over-exposure: (5) “Explain the “Shadow rule”?”, (6) “State three of the more relevant health benefits of the sun.”, (7) “State three of the more severe risks of over-exposure to the sun.”, (8) “What does the UV-index stand for?”, (9) “ What does the SPF (Sun Protection Factor) stand for?” and (10) “What are the main causes for elevated solar UV radiation?”. The columns represent the numbers of answers. For every question the answers of 102 students were evaluated. On the questions 6 and 7 three answers could be stated.

4. Discussion

After the evaluation of the questionnaires, it was concluded that the knowledge of these students - future preschool and primary school teachers- regarding sun-protection was poor and insufficient.

We assumed that students, who used sunscreen protection, are sufficiently aware

of self-protection measures. However, one would expect a higher number of students who do use sunscreen protection among well-aware future preschool and primary school teachers. The reason for high percentage of sunburns among students may be an inappropriate or insufficient use of sunscreen protection. Moreover, a quite worrying fact for future teachers is that 13.2 % of students considered suntan a benefit of UV exposure. Besides, around 10 % did not distinguish the terms UV-index and Sun Protection Factor (SPF). Almost half of the students could not explain the main cause for elevated solar UVR, which was very surprising, since this can be considered general knowledge of university attending students. In addition, the subject is expected to be well recognized among the general population, due to discussion in media on daily basis.

Based on results and evaluation of our questionnaires, an educational plan has been proposed in collaboration with the Institute of Public Health, to improve their knowledge, especially on negative effects of sun radiation and on appropriate self protection measures.

The plan was to perform a project work, as alternative to the traditional teaching method, where the roles of professors and students in a teaching class are to be exchanged. This will demand an active attitude to the subjects of all the participants of the project work. In this way, topics of interest can be discussed from different perspectives due to extensive team work. Additionally, a higher work motivation and consequently also a higher success of learning is maintained throughout the course (Novak *et al.*, 2009). Moreover, external experts could be involved in the project work, like health professionals, local or national agencies, and policy makers.

The project work should be focused on the following tasks:

- (1) Understand the positive and negative health effects of sunlight radiation;
- (2) Application of different sunlight protection strategies;
- (3) Understand and discriminate the terms UV index and SPF factor;
- (4) Understand what UVR is and that the UVR on Earth varies around the globe;
- (5) Achieving responsible behaviour concerning personal health and sunlight radiation;
- (6) Successful application of their knowledge to educate children.

5. Conclusions

This paper suggests that sun-safety educational curricula need to be offered to future teachers and therefore need to be implemented in the Faculties of Education. Standardization of national curricula of Education Programs is thus recommended. This will improve the students' own protective behaviour and furthermore, potentially it will lead to a more responsible and skilled sun protection management in the future for us and our children.

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VZDĚLÁVÁNÍ MATEŘSKÝCH A ZÁKLADNÍCH ŠKOL V OBLASTI OCHRANY PŘED SLUNEČNÍM ZÁŘENÍM

Abstrakt: Nedávné studie ukázaly, že nadměrné vystavování slunečnímu ultrafialovému záření (UVR), má negativní účinky na lidské zdraví, navozuje stárnutí kůže a přispívá ke vzniku rakoviny kůže, poškození očí a potlačení imunitního systému. Jelikož děti v mateřských a základních školách jsou vystaveny vyššímu riziku než dospělí vzhledem k jejich zranitelnosti, je nezbytné podporovat ochranu před slunečním zářením již od útlého věku. Kurzy s názvem *Zdravé životní prostředí a přírodní vědy* pro studenty programu předškolního a základního vzdělávání na Pedagogické fakultě v Koperu, Univerzita Primorska (Slovinsko), zdůrazňují význam výchovy k ochraně před slunečním zářením. Znalosti studentů související se slunečním zářením a ochranou před ním zhodnotil průzkum mezi 102 budoucími učiteli mateřských a základních škol a ukázalo se, že jejich znalosti týkající se této konkrétní oblasti jsou chabé a nedostatečné. Z těchto důvodů se ukazuje jako nezbytné zajistit další znalosti a dovednosti směřované k vhodné ochraně před slunečním zářením, které by dostatečně zajistily budoucí péči o děti předškolního a mladšího školního věku.

Klíčová slova: předškolní vzdělávání, základní vzdělávání, sluneční UV záření, nadměrné vystavení slunečním paprskům, ochrana před slunečním zářením, dopady na zdraví