Original Article

Evaluation of Sun Protection Behaviors of Secondary School Students Based on Transtheoretical Model

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Abstract

Background: Exposure to ultraviolet, rays has increased due to ozone depletion due to global climate change. The model draws a good road map for evaluating the process by addressing the factors affecting children's sun protection behaviors.
Objective or Aims: This study aimed to evaluate the sun protection behaviors of secondary school students in accordance with the transtheoretical model. The study is cross-sectional and descriptive.
Methodology: The research was conducted in 12 public secondary schools affiliated with Y District Directorate of National Education. 1709 students have been included in the study.
Results: As a result of the study, which aimed to evaluate the sun protection behaviors of the students according to the transtheoretical model, it was found that female students exhibited more sun protection behaviors by scoring higher in all scales and sub-dimensions compared to male students, those with better economic status had higher sunscreen use, and perception of harm, sunscreen, and hat use was higher as the number of sunburns increased, and younger students exhibited more protective behaviors.
Conclusions: The study reveals that boys show sun protection behaviors less than girls. Therefore, it can be stated that male and older students are the priority group in the acquisition of sun protection behaviors.

Keywords: Children, sun protection, transtheoretical model

Introduction

Exposure to ultraviolet (UV) rays has increased due to ozone depletion due to global climate change. This significant change in the atmosphere has increased skin cancer incidence, especially in the fair-skinned population (Miller, Baccam, & Harris, 2022; Sumen & Oncel, 2018). Skin cancer becomes a significant public health problem due to factors such as sun exposure during leisure activities and lying on the beach for a long time to get a tan, especially in regions with steep sun angles. As much as 50% of people living in Australia, where skin cancer is most common, experience this problem at some point in their lives. Over three million people in the United States are diagnosed with skin-related cancer yearly (Henrikson et al., 2018; Parsons et al., 2020). Skin cancer reported to increase by 3% each year in European countries, has become one of the three most common types of cancer. In 2015, the Cancer Registry Center in our country announced the

incidence of non-melanoma skin cancer as 24.8/100,000 people/year in men and 16.9/100,000 people/year in women (Turkyilmaz et al., 2018). Available data show that a history of sunburn in childhood increases the risk of developing skin cancer. Primary school is an important period in which healthy behavioral habits that continue throughout adolescence are acquired and children adopt and develop their health responsibilities and autonomy. The fashion for tanned skin, efforts to look beautiful with the influence of puberty, and family behaviors increase the effects of ultraviolet radiation on children's health (Altunkurek & Kaya, 2020). Children dependent on parental protection are the most at risk for skin cancer. It has been proven that skin burns caused by excessive sun exposure in the first 10 to 15 years of life play a direct role in skin cancer types in children. Furthermore, it is stated that the frequency of sunburn in children is three times higher than in adults (Duarte, et al., 2018; Patel et al., 2019; Thoonen, et al., 2019). Considering these reasons, it can be said that making sun protection behaviors a habit at an early age will be an effective method to prevent skin cancers, and proven theories can be beneficial in creating behavioral change. Theory-based education and practices are known to be effective in health protection and promotion behaviors. One of these theories is the transtheoretical model.

The transtheoretical model (TTM) has been used effectively to change common risky health behaviors such as smoking, unbalanced diet, lack of exercise, and sun exposure. Individuals change their behaviors through a process of stages of change. The model that will motivate the individual to change behavior consists of the stages of non-thinking, thinking, preparation, action, and maintenance. In the non-thinking stage, the individual is unaware of the problem, perceives the pressure of those around him/her as a threat, and is unwilling to change his/her behavior in the next six months. In the thinking stage, the individual continues the risky health behavior but is aware that it harms his/her health. He/she has focused his/her thoughts on changing his/her behavior but is uncertain about taking action. Individuals in the preparation stage have irregular actions to change health habits and need a regular plan. Action is the stage where the individual has changed lifestyle and behavior in the last six months. In the maintenance stage, the individual tries to reinforce the health behavior to prevent a return from where he/she came from (Yusufov et al., 2016). The model draws a good road map for evaluating the process by addressing the factors affecting children's sun protection behaviors.

Significant progress can be made with the cooperation of school administrators, educators, and health professionals in the field of public health and child health on the issue of sun protection awareness to be developed in children. When the studies conducted in recent years are examined, it has been determined that gender, age, and the region of residence stand out as factors that affect sun protection behaviors in children and that children's sun protection behaviors need to be developed (Mirzaei-Alavijeh, Gharibnavaz, & Jalilian, 2020; Thoonen et al., 2019). School health nurses, who have a crucial role in health promotion programs, can undertake essential tasks in this regard.

Aim of the Study

This study aimed to evaluate the sun protection behaviors of secondary school students in accordance with the transtheoretical model.

Research Questions

- What are the factors affecting the stages of sun protection?
- What are the factors affecting the stages of change in sunscreen use?
- What are the factors affecting sun protection behaviors?
- What are the factors affecting sun protection self-efficacy?
- What are the factors affecting sun protection benefits and harm perceptions?

Methods

Type of Study: The study is cross-sectional and descriptive.

Place and Time of the Study: The research was conducted in 12 public secondary schools affiliated with Y District Directorate of National Education.

Study Population and Sample: Students (n=6252) studying in 12 public secondary

schools affiliated with Y District Directorate of National Education consisted the study population. The population was determined as 724 students through known sampling, and the sample was increased by 100%, resulting in 1709 students being included in the study. The sample group was stratified according to the student weight of the schools, and a balanced distribution was obtained.

Inclusion Criteria for the Study: Students in grades 6-7-8 of the specified schools who agreed to participate in the study and had parental consent were included in the study. Students with any health problems were excluded from the study.

Data Collection Tools: The study data were collected with the Descriptive Information Form, Stages of Change in Sun Protection and Sunscreen Use, Sun Protection Behavior Scale, Sun Protection Decision Balance Scale, and Sun Protection Self-Efficacy Scale.

Descriptive Information Form: The form consists of descriptive information such as age, gender, economic status, parental education level, hair-eye-skin color, and skin type (Patel et al., 2019; Sumen & Oncel, 2018; Yusufov et al., 2016).

Sun Protection Behavior Scale: It is a nine-item, five-point Likert-type scale developed by Maddock et al., (1998)(Maddock et al., 1998) The scale examines how often individuals perform sun protection behavior when exposed to the sun for more than 15 minutes (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always). A higher score on the scale indicates better sun protection behavior. The scale has three subscales: regular sun avoidance (α=.63), sunscreen use (α=.89), and hat use (α=.73). The scale was found to be valid and reliable for use in Turkish children (Aygun & Ergun, 2014).

Stages of Change in Sunscreen Use: Sunscreen use change stages consist of 4 items used to measure continuity in sun protection intentions and behaviors by using sunscreen with a factor of at least 15. The stages of not thinking, thinking, preparation, and action are considered as the stages of change (Prochaska & Velicer, 1997; Rossi, Blais, Redding, & Weinstock, 1995).

Sun Protection Decision Balance Scale: The decision balance scale is a five-point Likert-type scale consisting of 8 items measuring the importance of adolescents' decisions to protect themselves from the sun (1=not important, 2=very little important, 3=important, 4=very important, 5=extremely important) (Maddock et al., 1998). The Turkish validation of the scale, which has two sub-dimensions as benefit (α=0.76) and harm (α=0.71), was conducted by (Aygun & Ergun, 2014).

Sun Protection Self-Efficacy Scale: The self-efficacy scale is a five-point Likert scale developed specifically for American adolescents, consisting of 9 items, including protection from sun exposure, sunscreen use, and hat use, used to measure how confident the participants are in their situations (1=not at all confident, 2=not confident, 3=somewhat confident, 4=confident, 5=very confident). The reliability and validity study of the nine-item structure of the scale was conducted in American adolescents, and Cronbach's Alpha values (sun avoidance α= 0.73, sunscreen use α= 0.88, hat use α= 0.57) were found to be at moderate and high levels (Maddock et al., 1998). The validity and reliability analyses of the Turkish version of the scale were conducted, and the scale was found to be reliable and valid (sun avoidance α=0.65, sunscreen use α=0.84, and hat use α=0.69). The lowest mean score on the scale is nine, and the highest mean score is 45. The lowest mean score of the sun avoidance sub-dimension is three, and the highest mean score is 15. The lowest mean score of the sunscreen use sub-dimension is four, and the highest mean score is 20. The lowest mean score of the hat use sub-dimension is two, and the highest mean score is 10 (Aygun & Ergun, 2014).

Data Collection: The researchers administered the questionnaires to the students in the classroom environment under the teacher's supervision.

Data Analysis: The SPSS 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) program was used for data analysis. Number, percentage, mean, and standard deviation were used to evaluate socio-demographic data. Since the skewness kurtosis values were evaluated as ±1.5, it was determined that the normal distribution of the data was not appropriate. Therefore, the Mann-Whitney U test was used for binary variables, and the Kruskall Wallis H test was used for more than two variables. The

Bonferroni test was used for further analysis of the data.

Ethical Aspects of the Research: For the implementation of the study, permission was obtained from X University Social and Human Sciences Ethics Committee (Protocol number: 34 - Decision number: 34) and X Provincial Directorate of National Education. Verbal consent was obtained from the students, and written consent was obtained from their parents to administer the questionnaires.

Results

The students who participated in the study were equally distributed in gender and age. The income of 42% of the participants was equal to their expenses. 39.4% of the students were fair-skinned, 27% were auburn-light brown, 26.9% were brunette, and 31.9% had type I and type II skin types. It was determined that 54.6% of the participants had experienced sunburn in the last year. It was determined that 36.1% of the students were in the stages of sun protection, and 66.4% were in the stages of not-thinking-thinking-preparing to use sunscreen.

A statistically significant difference was found between the economic status of the participants and the sun protection behavior scale sunscreen sub-dimension and the sun protection decision balance scale harm perception sub-dimension (p<.01). Based on further analysis, the sun protection behavior scale sunscreen sub-dimension score of the students whose income was higher (8.14±3.63) than their expenses were higher and significant (p<.01) compared to those with low income (7.50±3.15).

It was determined that between the sunburn status of the participants and the sun protection behavior scale, the sun protection cream change stages of the students who had sunburn were at an advanced level, and this result was statistically significant (never (p<.001), one time (p=.001), two times (p<.012).

The sunscreen and hat use behavior of those with three or more sunburns were higher and more significant (p=.020) than those who had never sunburned (p=.007). Those who had two or more sunburns had higher and more significant (p<.05) self-efficacy for sunscreen use compared to those who had never sunburned (Table 1).

The sun protection behavior scale and its sub-dimensions were found to be statistically significant concerning the gender of the participants. Statistically significant differences were observed between genders in the sun protection self-efficacy scale and its sub-dimensions (p=.110 except hat). There was a statistically significant difference between the ages of the participants and the total score of the sun protection behavior scale, sunscreen, and hat sub-dimensions of younger students compared to older students (p<.001). In the total score of the sun avoidance self-efficacy scale, a statistically significant difference was found in the sun avoidance, sunscreen, and hat sub-dimensions of younger students compared to older students (p<.001). A statistically significant difference was determined between the benefit and harm sub-dimensions of the sun protection decision balance scale between 12-year-old students compared to 14 and 15-year-old students (p<.001).

Table 1. Comparison of Participants' Sunburn and Scale Scores

	Sunburn	N	Mean	Std. Deviation	F	p	Bonferroni
Sun Protection Change Stages	None	776	3.51	1.69	.60 7.83	.610	
	1 Time	385	3.56	1.61			
	2 Time	255	3.67	1.47			
	3 and above	293	3.55	1.54			
Sun Protection Cream Change Stages	None	776	2.42	1.65	1.71	.000	3 and above > None-1-2 times
	1 Time	385	2.45	1.62			
	2 Time	255	2.51	1.57			

	3 and above	293	2.95	1.65			
Sun Protection Behavior Scale- Sun Avoidance	None	776	9.17	2.74	4.06	.162	
	1 Time	385	9.21	2.29			
	2 Time	255	9.43	2.36			
	3 and above	293	8.94	2.42			
Sun Protection Behavior Scale- Sunscreen Use	None	776	7.62	3.38	4.21 2.68	.007	3 and above > None
	1 Time	385	7.69	3.11			
	2 Time	255	8.04	3.27			
	3 and above	293	8.35	3.28			
Sun Protection Behavior Scale – Hat Use	None	776	5.04	2.22	1.52	.006	2-3 times and above > None
	1 Time	385	5.18	2.15			
	2 Time	255	5.46	2.14			
	3 and above	293	5.48	2.12			
Sun Protection Behavior Scale	None	776	21.84	6.93	1.29	.045	
	1 Time	385	22.09	5.97			
	2 Time	255	22.94	6.17			
	3 and above	293	22.78	6.38			
Sun Protection - Benefit	None	776	12.26	4.63	1.08 4.34	.205	
	1 Time	385	12.60	3.95			
	2 Time	255	12.85	4.00			
	3 and above	293	12.65	4.36			
Sun Protection - Harm	None	776	9.41	4.08	.93	.273	
	1 Time	385	9.17	3.67			
	2 Time	255	9.28	3.81			
	3 and above	293	9.76	4.23			
Sun Protection Self-Efficacy Scale- Sun Avoidance	None	776	9.04	3.47	2.38	.355	
	1 Time	385	8.94	3.15			
	2 Time	255	9.37	3.38			
	3 and above	293	8.90	3.37			
Sun Protection Self-Efficacy Scale- Sunscreen Use	None	776	11.05	4.94		.005	2-3 times and above > None
	1 Time	385	11.25	4.61			
	2 Time	255	12.05	4.88			
	3 and above	293	11.94	4.52			
Sun Protection Self-Efficacy Scale- Hat	None	776	6.03	2.63		.422	
	1 Time	385	6.10	2.49			
	2 Time	255	6.34	2.53			
	3 and above	293	6.14	2.53			
Sun Protection Self-Efficacy Scale	None	776	26.13	9.56		.068	
	1 Time	385	26.30	8.53			
	2 Time	255	27.77	9.18			
	3 and above	293	26.99	8.66			

Table 2. Comparison of Participants' Genders and Scale Scores

	Gender	N	Mean	Std. Deviation	t	p
Sun Protection Change Stages	Female	862	3.77	1.50	5.69	<.001
	Male	847	3.33	1.69		
Sun Protection Cream Change Stages	Female	862	2.73	1.64	5.14	<.001
	Male	847	2.33	1.62		
Sun Protection Behavior Scale- Sun Avoidance	Female	862	9.38	2.37	3.30	=.001
	Male	847	8.97	2.69		
Sun Protection Behavior Scale- Sunscreen Use	Female	862	8.41	3.28	7.51	<.001
	Male	847	7.23	3.20		
Sun Protection Behavior Scale – Hat Use	Female	862	5.38	2.22	3.39	=.001
	Male	847	5.03	2.13		
Sun Protection Behavior Scale	Female	862	23.19	6.32	6.21	<.001
	Male	847	21.24	6.59		
Sun Protection - Benefit	Female	862	13.02	4.11	5.12	<.001
	Male	847	11.95	4.51		
Sun Protection - Harm	Female	862	9.14	3.86	2.66	=.008
	Male	847	9.66	4.08		
Sun Protection Self-Efficacy Scale- Sun Avoidance	Female	862	9.31	3.27	3.29	=.001
	Male	847	8.77	3.46		
Sun Protection Self-Efficacy Scale- Sunscreen Use	Female	862	12.22	4.77	7.26	<.001
	Male	847	10.55	4.70		
Sun Protection Self-Efficacy Scale- Hat	Female	862	6.21	2.59	1.60	=.110
	Male	847	6.01	2.55		
Sun Protection Self-Efficacy Scale	Female	862	27.75	8.82	5.47	<.001
	Male	847	25.35	9.31		

Table 3. Comparison of the Participants' Ages with The Scores Obtained from the Scale

	Age	N	Mean	Std. Deviation	F	p	Bonferroni
Sun Protection Change Stages	11	68	4.20	1.31	8.13	<.001	11=12>13.14.15.16
	12	361	3.86	1.41			
	13	528	3.51	1.64			
	14	500	3.47	1.66			
	15	215	3.25	1.71			
	16	37	2.91	1.55			
Sun Protection Cream Change Stages	11	68	3.17	1.68	8.33	<.001	11=12>13.14.15.16
	12	361	2.87	1.66			
	13	528	2.53	1.65			
	14	500	2.37	1.59			
	15	215	2.18	1.54			
	16	37	2.35	1.58			
Sun Protection Behavior Scale- Sun Avoidance	11	68	9.42	2.56	4.11	.001	12>14
	12	361	9.51	2.48			
	13	528	9.32	2.57			
	14	500	8.89	2.59			

	15	215	9.04	2.38			
	16	37	8.24	2.08			
Sun Protection Behavior Scale- Sunscreen Use	11	68	8.70	3.40	9.27	<.001	11=12>14.15.16 13>14.15
	12	361	8.47	3.29			
	13	528	8.05	3.31			
	14	500	7.42	3.24			
	15	215	7.03	3.08			
	16	37	6.72	3.09			
Sun Protection Behavior Scale – Hat Use	11	68	6.05	2.27	9.53	<.001	11=12>14.15.16 13>>15.16
	12	361	5.61	2.15			
	13	528	5.28	2.17			
	14	500	5.02	2.12			
	15	215	4.73	2.21			
	16	37	4.10	1.88			
Sun Protection Behavior Scale	11	68	24.19	6.68	10.77	<.001	11=12=13>14.15.16
	12	361	23.60	6.51			
	13	528	22.66	6.56			
	14	500	21.34	6.38			
	15	215	20.81	6.16			
	16	37	19.08	5.67			
Sun Protection - Benefit	11	68	13.45	3.97	4.991	<.001	12>14.15
	12	361	13.24	4.32			
	13	528	12.59	4.29			
	14	500	12.02	4.33			
	15	215	11.94	4.52			
	16	37	11.75	4.12			
Sun Protection - Harm	11	68	10.51	3.75	5.184	<.001	14.15<12
	12	361	10.11	4.22			
	13	528	9.37	3.99			
	14	500	9.01	3.82			
	15	215	8.94	3.81			
	16	37	8.67	3.74			
Sun Protection Self-Efficacy Scale- Sun Avoidance	11	68	10.02	3.29	4.901	<.001	11=12>14
	12	361	9.51	3.34			
	13	528	9.13	3.35			
	14	500	8.60	3.34			
	15	215	8.92	3.42			
	16	37	8.21	3.52			
Sun Protection Self-Efficacy Scale- Sunscreen Use	11	68	12.19	4.58	7.375	<.001	12>13. 14.15
	12	361	12.54	4.50			
	13	528	11.44	4.91			
	14	500	10.80	4.73			
	15	215	10.69	4.90			
	16	37	10.35	4.94			
Sun Protection Self-Efficacy Scale- Hat	11	68	6.83	2.44	6.057	<.001	11>14. 16 12>14. 15. 16
	12	361	6.52	2.44			
	13	528	6.22	2.60			
	14	500	5.80	2.54			
	15	215	5.84	2.65			
	16	37	5.18	2.56			
Sun Protection Self-Efficacy Scale	11	68	29.05	8.96	8.255	<.001	11=12>14.15.16
	12	361	28.57	8.75			
	13	528	26.79	9.08			
	14	500	25.20	8.96			
	15	215	25.46	9.61			
	16	37	23.75	9.32			

Discussion

As a result of the study, which aimed to evaluate the sun protection behaviors of the students according to the transtheoretical model, it was found that female students exhibited more sun protection behaviors by scoring higher in all scales and sub-dimensions (except perception of harm) compared to male students, those with better economic status had higher sunscreen use, and perception of harm, sunscreen, and hat use was higher as the number of sunburns increased, and younger students exhibited more protective behaviors.

The mean scores of female students in all scales and sub-dimensions, except the mean scores of hat use, were higher and more significant than those of male students. In a study conducted in community clinics in California, Colorado, and Hawaii, similar to our study, the use of sunscreen, umbrellas, and glasses by girls was significantly higher than that of boys ($p<0.001$). However, the use of protective clothing and hats was higher and more significant in boys (Patel et al., 2019). In other studies, conducted in our country, it was determined that the mean scores of female students on sun protection and self-efficacy were higher and statistically significant than male students. These studies stated that the mean scores of female students using sunscreen cream were significantly higher (Altunkurek & Kaya, 2020; Aygun & Ergun, 2016; Ayvaz, Acar, Ercan, & Cetin, 2021). However, differently, in the perception of harm, while the averages of male students were lower and statistically significant compared to female students (Aygun & Ergun, 2016), on the contrary, this study reveals that female students' perception of harm is lower. In other research, female students were twice as likely to use sunscreen than male students (Lee, Garbutcheon-Singh, Dixit, Brown, & Smith, 2015; Thoonen et al., 2019). The inclusion of sunscreens, especially in cosmetic products, and the diversity of hats and glasses in terms of models make them more accessible for female students.

Current public health recommendations for safe sunbathing include regularly using sunscreens with a sun protector factor of 15 or higher, minimizing sunburn, and deliberately avoiding sunbathing (Merten, et al., 2014). In our study, sunscreen and hat use were higher and more significant in younger students ($p<.001$). In a previous study, similar to our study, sunscreen ($p<.001$) and hat ($p=0.02$) use was found to be more common in younger students (Patel et al., 2019). In the perception of benefit from sun protection ($p=0.003$), in the sun protection self-efficacy scale's sun avoidance ($p=0.008$) and wearing a hat sub-dimension ($p=0.001$), younger students' mean scores were found to be higher and statistically significant (Aygun & Ergun, 2016). In a study conducted in Northern Cyprus, it was determined that 38% of the children preferred to play in the shade, 36.5% stayed indoors, and 23.5% tried to protect themselves from the sun with clothing methods such as hats. It has been reported that 57.4% of children use sunscreen cream voluntarily, and 37.4% use it according to family recommendations (Kaptanoglu, Dalkan, & Hincal, 2012). In addition, the rate of correct sunscreen use decreases as age increases. As children get older, they tend to refuse to exhibit protective behavior and may prefer to maintain increasing independence (Lee et al., 2015; Thoonen et al., 2019).

The sunscreen use of students whose income was higher than their expenditures was found to be higher and more significant compared to low-income students ($p<.01$). The harm perception of high-income students was higher and more significant than those whose income was equal to their expenses ($p<.01$). Unlike our study, in another study, no statistically significant difference was found between the economic level of students and the sub-dimensions of harm perception and sunscreen use ($p>0.05$) (Aygun & Ergun, 2016). It is thought that those with better economic status have more sun exposure. It is predicted that having more regular vacation opportunities may be related to this situation.

The mean scores of fair-skinned individuals in the sun avoidance sub-dimension are significantly higher than dark-skinned individuals ($p<.001$) and exhibit more sun-protective behaviors, supporting the literature in this respect. A study conducted with adolescent athletes showed that light-skinned children who trained outdoors had higher sun protection behavior scores (Ayvaz et al., 2021). This is thought to be due to the idea that light-skinned individuals are more prone

to sunburn (Eastabrook, Chang, & Taylor, 2018). Individuals with fewer sunburns are expected to have higher sun protection behaviors. However, in our study, the number of sunburns was directly proportional to protection behaviors and self-efficacy. This is due to the incorrect or incomplete use of sunscreen cream by individuals who stay under the sun more.

Conclusion: This study describes the sun protection behaviors of middle school children. The study reveals that boys show sun protection behaviors less than girls. Therefore, it can be stated that male and older students are the priority group in the acquisition of sun protection behaviors. The finding that students with higher incomes use sunscreen more frequently raises questions about the affordability of sunscreen products. On the other hand, it was observed that students with fair skin or who had more skin burns performed sun protection behaviors more frequently. In the interventions made to children and adolescents regarding sun protection behaviors, it should be stated that light skin and people with dark skin are more likely to be exposed to sun rays, which increases the risk of skin cancer.

Acknowledgement: The authors acknowledge the cooperation of the Turkish Ministry of Education, as well as the many principals, teachers, parents and students who participated in this study.

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