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Promotion of sun protective behaviors in high school students in Ahwaz: a theory-based intervention

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Abstract

The most important environmental factor affecting human health is the long exposure to solar ultraviolet radiation. This study aimed to determine the effect of an educational intervention based on the protection motivation theory in promoting sun-protective behaviors. In this quasi-experimental prepost test study, a sample of 215 high school students in Ahwaz. Using a reliable and valid questionnaire, and based on the theory of protection motivation, the data were collected before and four months after the intervention. In the posttest, there was a significant difference in mean score of the protection motivation theory components between the experimental and control groups. the comparison of the mean score of the components of protection motivation theory in the experimental and control groups before and after the intervention showed a significant difference in all the components except for the response cost, while in the control group the mean score difference not significant. The results of this study showed that the intervention may lead to the sun exposure preventive behaviors, which reflects the effectiveness of the educational intervention based on the protection motivation theory.

Keywords: Behavior, Intervention, Protection, Motivation, Student

Introduction

Ultraviolet radiation (UV) is the most important environmental factor influencing human health [1,2]. Exposure to sunlight can lead to the acute and chronic complications in skin, eyes, and immune system. Acute effects of UV radiation include sunburn and tanning; in addition, long-term exposure to this radiation can lead to loss of elasticity, wrinkles, dryness, roughness, and aging of skin [3,4].

Based on studies, excessive ultraviolet radiation is the cause of more than 90% malignant melanoma and other skin cancers [1,5]. Skin cancer is the most common cancer in the world. This cancer comprised 12.3% of all cancers reported in Iran, and 11.5% in Khuzestan province in 2009 [6,7]. Exposure to UV radiation in childhood and adolescence and history of sunburn are the risk factors for skin cancer, especially for potentially fatal disease of malignant melanoma [8-12]. According to a meta-analysis, sunburn in childhood increases the risk of melanoma in adulthood by 2 fold [13].

The UV ray can cause eye diseases such

as cataract, retinopathy, photokeratitis, and photoconjunctivitis as well as, gradually causes pterygium and by affecting the photoconjunctivitis [14,15] and by repressing and weakening the immune system, increases the viral, bacterial, fungal, or parasitic infections. In addition, high levels of UV radiation may reduce the effectiveness of vaccines [4,16].

In 2000, according to the World Health Organization, the burden of diseases attributed to UV radiation exposure was estimated around 1.6 million Disability-Adjusted Life Years (DALYs) [17]. The report has estimated the annual loss of 29026 DALYs due to ultraviolet radiation exposure in Iran [18].

Given that 80% of individual exposure to ultraviolet radiation occurs before age 20 [19] and the exposure to UV during childhood and adolescence is a risk factor for skin cancer in rest of life [20]; moreover, considering that schools are important places to convey the messages about sun protection [4] and developing the good habits in childhood leads to the good behavior and reduced exposure to sunlight later in life [20,21].

In this context, the use of educational theories can be useful. By creating a framework for effective intervention to change behavior, the theory leads to the stronger and more effective intervention [22]. In 1975, Rogers developed the Protection Motivation Theory (PMT) that is originally a health behavior change model based on the expectancy-value model to account for the effects of fear on the attitudes and healthy behaviors [23,24]. Since that, the theory has been used as a framework for prediction of and intervention in health-related behaviors [25]. In this theory, it is assumed that the adoption of protective behavior (healthy behavior), which is recommended against a health risk behavior, is due to the motivation of persons in order to protect themselves [23].

In the PMT, two cognitive-mediator processes, i.e. threat appraisal and coping appraisal, are combined and as confounding variables, act on the protection motivation [26]. Threat appraisal includes maladaptive response and perceived threat (severity and vulnerability) and by assessing maladaptive behavior, reduces protection motivation and therefore reduces the likelihood of behavior. Reward increases the possibility of maladaptive response and perceived threat decreases this possibility [23].

When the perceived threat increases, the person will experience more fear [27].

The process of coping appraisal includes the efficacy variables (response efficacy and self-efficacy) and the response cost and assesses the ability to cope and avert the threat. Enhancement of coping appraisal leads to the increased intention and the possibility of performing an adaptive behavior. Response efficacy and self-efficacy increase the probability of adaptive behavior selection and response cost decreases this possibility [23].

Due to the geographical location, Khuzestan Province is closer to the equator compared with the other provinces in Iran, and the fact that the sun is more intense in the summer months [28] and the lack of study in this regard in Ahwaz, and a few studies that have examined only the female behavior, this study aimed to determine the effect of an educational intervention based on PMT on improving sun-protective behaviors in male and female high school students.

Method

This quasi-experimental study was conducted on the first-grade high school girls and boys in Education District 4 of Ahwaz city, the westsouth of Iran. Inclusion criteria included the students in the first grade of secondary schools that were tended to participate and they were excluded from the study if they did not want to continue the study, or they were absence in more than one training session or they were transferred to another school. In this study, a multi-stage random sampling method was used. At first, among the all the education Districts of Ahwaz city, District 4 randomly was selected and then, among the secondary schools in the area, 4 schools (two schools for girls and two schools for boys)

were selected. Among them, two schools for intervention and two schools for control were designated.

The questionnaire was administered in two stages of pre and post test. The data obtained in the pretest was used to design a proper educational program for students in the intervention group. Given that spring is the best session to do training [20], the intervention was carried out in June. In this study, to promote sun protective behaviors in the intervention group, four half-hour sessions for a week were performed. Girls' schools included one 18-student class and two 17-student classes and boy schools included one 18-student class and two 19-student classes. The educational intervention was designed and implemented using the methods of lecture, question and answer, and demonstration on the following topics: ultraviolet radiation and health effects of exposure to ultraviolet radiation, the factors affecting the exposure to UV light, the importance of sun protection in childhood and adolescence, how to protect from the sunlight, benefits of using protective devices against the sunlight and correct ways to use sunscreen. In addition, to fix the students' information, a pamphlet containing educational content of the program was distributed ion them. Finally, after four months, the questionnaire was administered in the posttest on both experimental and control groups to determine the effect of the intervention.

Data were collected using a researcher-made questionnaire designed based on PMT for sun protective behaviors. Both quantitative and qualitative methods were used to investigate the formal validity. The results of measurement of formal validity in an eight-member expert panel showed that the five statements need to be corrected or deleted. The results of quantification of the formal validity showed that all the questions had a score equal to or greater than 1.5; therefore they were remained in the final edition of questionnaire.

To check the content validity, the questionnaire was checked by six health education specialists and two dermatologists for modifying the questions according to the experts' opinion. The values of the ratio and the content validity index were over 0.75 and 0.87, respectively.

To determine the internal consistency of components, Cronbach's alpha was used. In this regard, the questionnaire was distributed on 30 students, who were later excluded from the study; the Cronbach's alpha value of theoretical components was confirmed in range of 0.63 to 0.82 and in the total questionnaire it was confirmed at 0.78.

The questionnaire had three parts:

A) Demographic variables included seven questions: gender, household size, parents' education, parents' occupation, and the amount of household income per month.

B) questions related to the components of PMT included 34 questions which were measured based on a five-degree Likert scale (totally disagree, disagree, indifferent, agree, and totally agree).

The range of components' scores of PMT was as follows: perceived vulnerability, 4 to 20; perceived severity, 3 to 15; self-efficacy, 5 to 25; response costs, 5 to 25; response efficacy, 5 to 25; reward, 3 to 15; fear, 4 to 20; and protection motivation, 5 to 25. In addition, threat appraisal (attainable score in range of − 4 to −20) was obtained from subtracting the scores of reward and perceived threat, and the coping appraisal (attainable score of 5 to 25) was obtained from the subtraction of response cost from the sum of response efficacy and self-efficacy.

C) protective behaviors against the sunlight included 10 questions, which the score of each person ranged from zero to 14.

The sample size was calculated according to "McClendon BT, Prentice-Dunn S" [29], the estimated sample size was 93 for each group. Considering the likelihood of 20% drop out, therefore, 224 participants involved in the study. All the participants were selected according to the inclusion and exclusion criteria and were divided randomly into the intervention and control groups (112 participants in each group).

It should be noted that the normality of

data distribution was examined using the Kolmogorov-Smirnov test. After 4-month follow-up, the data were analyzed in SPSS version 21 using,the parametric tests, independent t-test, Mann-Whitney test, Paired t-test, were used for the normal distributed data and non-parametric tests chi-square test, Kruskal Wallis test,Wilcoxon test, and Spearman correlation coefficient for non-parametric distribution.

In order to comply the ethical considerations, authorization was received from the Department of Education, the written consent were obtained from student parents for participating their children in this study, and the female and male interviewers were employed to interview with female and male students, respectively. In order to give the opportunity for the participants to decide freely, before research beginning, the researcher explained the objectives and stages of the study and they were informed about the voluntary nature of participation in the research and also they were told that they are free to relinquish the study in any stage. Finally, according to ethical principles, a training session was held for the control group in the context of the research subject and the prepared pamphlet was also distributed on them. The study was approved ethically by research council and the research ethics committee of Ahvaz Jundishapur university of medical sciences.

Results

In this study, the participants consisted of 112 boys (52.1%) and 103 girls (47.9%). The highest frequency of education level in students' parents was related to the primary level as 39.1% and 60.5% for father and mother education, respectively. 97.7% of students' mothers were housewife and also 14.9%, 43.7%, 14.9%, 18.1%, and 8.4% of students' fathers were employee, self-employed, worker, unemployed, and retired, respectively. The monthly income of 14.9% of the student families was less than 5000000 Rials. 67 students (31.2%) stated that they have a history of sunburn.

The results of chi square test showed that there was no significant difference between the experimental and control groups in terms of demographic characteristics including gender ($p=0.526$), father's education ($p=0.84$), mother's education ($p=0.411$), father's occupation ($p=0.537$), mother's occupation ($p=0.182$), monthly family income ($p=0.734$), and a history of sunburn ($p=0.176$) , which indicates a good matching between the two groups ($p>0.05$).

In the examination of correlation between the components of PMT and sun-protective behaviors before the intervention, the Spearman correlation test was used. The results showed that sun-protective behaviors had a positive correlation with the components of perceived severity, self-efficacy, response efficacy, protection motivation, fear, and coping appraisal; and a negative correlation with threat appraisal at the level of 0.01. In addition, there was a positive correlation between the protection motivation and perceived vulnerability, the perceived severity, self-efficacy, response efficacy, fear, and coping appraisal. Also, there was a negative correlation between the protection motivation and rewards, threats, and the response costs (Table 1). Among the components of PMT, only protection motivation component ($\beta=0.235$) was able to predict behavior (Table 2).

Based on Independent t-test and Mann-Whitney U, the mean scores of PMT components did not show significant differences between the intervention and control groups before the intervention. After the intervention, the score difference of PMT components was significant between two groups of intervention and control. Furthermore, a comparison between the mean score of PMT components before and four months after the intervention shows that in the intervention group there is a significant difference between the scores obtained in all the components, except for the response cost, while in the control group the difference between the mean scores of components was not significant (Table 3).

Table1 *The spearman correlation coefficient matrix between structures of the PMT*

Structures	Perceived vulnerability	Perceived severity	Reward	Threat appraisal	Fear	Self-efficacy	Response efficacy	Response costs	Coping appraisal	Protection-motivation	Behavior
Perceived vulnerability	1										
Perceived severity	0.554**	1									
Reward	-0.057	-0.073	1								
Threat appraisal	-0.804**	-0.763**	0.471**	1							
Fear	0.301**	0.424**	-0.202**	-0.430**	1						
Self-efficacy	0.389**	0.498**	-0.177**	-0.484**	.421**	1					
Response efficacy	0.480**	0.427**	-0.153*	-0.527**	.368**	0.387**	1				
Response costs	-0.283**	-0.320**	0.331**	0.418**	-.277**	-0.083	-0.223**	1			
Coping appraisal	0.541**	0.582**	-0.294**	-0.675**	.499**	0.701**	0.760**	-0.590**	1		
Protection-motivation	0.398**	0.509**	-0.147*	-0.488**	.602**	0.594**	0.514**	-0.252**	0.646**	1	
Behavior	0.068	0.183**	-0.095	-0.147*	.241**	0.302**	0.167*	-0.021	0.241**	0.324**	1

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed).

Table 2 *Regression analysis of structures of PMT in the prediction of behavior*

Predictor	Standard β coefficients	t	p	R2	Dependent variable
Protection -motivation	0.235	2.435	0.016	0.149	Behavior

Table 3 *Comparison of mean and standard deviation of structures of PMT in the experimental and control groups before and after intervention*

Structures	Group	Before the intervention M±SD	4 Months after intervention M±SD	p
Perceived vulnerability	Experimental	12.09±3.41	15.49±3.21	0.000***
	Control	11.50±3.62	11.53±3.52	0.946***
	p	0.222*	0.000*	
Perceived severity	Experimental	10.43±2.73	11.89±2.58	0.000****
	Control	9.90±2.83	9.93±2.86	0.919****
	p	0.180**	0.000**	
Reward	Experimental	8.22±2.59	7.10±2.76	0.001****
	Control	8.64±3.22	9.23±3.01	0.172****
	p	0.408**	0.000**	
Threat appraisal	Experimental	-14.30±6.13	-20.28±5.95	0.000***
	Control	-12.77±5.92	-12.23±6.31	0.454***
	p	0.064*	0.000*	
Fear	Experimental	13.08±4.10	14.79±3.80	0.001****
	Control	13.05±4.40	12.96±4.50	0.921****
	p	0.950*	0.004**	
Self- efficacy	Experimental	17.34±3.47	19.18±3.76	0.000****
	Control	16.11±4.61	16.36±5.15	0.425****
	p	0.063**	0.000**	
Response efficacy	Experimental	15.42±3.31	17.05±4.02	0.001***
	Control	15.61±3.51	14.71±3.87	0.061***
	p	0.683*	0.000*	
Response costs	Experimental	15.43±3.52	14.56±4.15	0.086***
	Control	15.31±3.79	15.77±4.20	0.385***
	p	0.814*	0.035*	
Coping appraisal	Experimental	17.33±6.64	21.67±8.02	0.000***
	Control	16.41±6.38	15.31±8.85	0.271***
	p	0.301*	0.000*	
Protection-motivation	Experimental	16.62±4.32	18.33±3.83	0.000****
	Control	16.70±4.68	16.89±4.78	0.720****
	p	0.896*	0.035**	
Behavior	Experimental	3.73±2.09	6.44±2.12	0.000****
	Control	4.43±2.41	4.28±2.72	0.699****
	p	0.075**	0.000**	

*Independent t-test
**Mann-Whitney U
***Paired t test
**** Wilcoxon

Discussion

This study aimed to determine the effect of educational intervention based on protection motivation theory on promoting the sunlight exposure-protective behaviors among female and male students in Ahwaz secondary schools.

In the present study, sunlight exposure-protective behaviors had a positive correlation

with the components of perceived severity, self-efficacy, response efficacy, protection motivation, fear, and coping appraisal and a negative correlation with the threat appraisal. The results of a study conducted by Schüz [30] showed a positive correlation between sunlight protective behavior and the intention of avoiding overexposure to the sunlight, self-efficacy, and the appearance motivation [30]. In the study conducted by Sharifirad et al [31], there was a positive correlation between the influenza type A-protective behaviors and perceived vulnerability, perceived severity, response efficacy, self-efficacy, fear, and coping appraisal and protection motivation as well as a negative correlation between the protective behaviors and reward and threat appraisal [31]. The negative correlation between protection-motivation and the perceived response costs indicates that if the perceived barriers to do protective behavior are more, a person's motivation for the protective behavior is less. The positive correlation between motivation and perceived self-efficacy shows that if a person's belief in the ability to do protective behavior is more the person's intention to conduct a protective behavior gets more [32]. In addition, while fear and threats conceptually are distinct (earlier is emotional and latter is cognitive), they are mutually interrelated; when the perceived threat increases, the person experiences more fear [27]. But sparked fear cannot directly change the attitude or behavior [33] and a way must be found that the attitude and subsequently the behavior be changed by stimulating a fear. In fact, in addition to motivating fear, recommendations and behavioral awareness to reduce the threat should be given to increase the possibility of recommended practices and sustainable behavior in the future [25].

In this study, the protection-motivation was the most powerful predictor of protective behaviors against sunlight. The results indicated that if the person is going to do more protective behaviors the possibility of doing protective behaviors gets more. The results of the study conducted by Plotnikoff [34] in predicting aerobic physical activity in Canadian adults with type 2 diabetes showed that the self-efficacy and the response efficacy had the ability to predict aerobic physical exercise intention and the self-efficacy was a stronger predictor [34]. Also, in the study conducted by Morowati Sharifabad, components of protection motivation theory were the predictors of unsafe driving behaviors, and the role of perceived reward was more important [35]. Driving behavior in the study of Morowati Sharifabad [35], the intention of physical activities in the study of Plotnikoff [34], and the protective behaviors against sunlight in our study, has been investigated; so, the reason for different structures of importance for predicting the adoption of behavior can be the fact that different behaviors have been studied.

In the present study before the intervention, no significant difference was found between the intervention and control groups in terms of PMT structures. However after the intervention, the mean score difference of PMT structures between the two groups was statistically significant. After the educational intervention, in the experimental group the average score of all the PMT components, except for response costs, significantly increased in comparison to before the educational intervention; however, in the control group before and after the educational intervention, no significant difference was observed in the mean scores of PMT components. These results showed the effectiveness of educational interventions.

The results of the study conducted by Ghahremani show that two months after an intervention based on PMT, the scores of components of perceived vulnerability, perceived severity, response cost, self-efficacy, response efficacy, and malaria preventive behaviors increased significantly in the intervention group [36]. In the study conducted by Dehdari et al [37], no significant difference was found between the components of the theory in both groups before the intervention. After the intervention, however,

the mean score of self-efficacy, perceived vulnerability, and request for Pap smear test in the intervention group was significantly higher than the control group [37].

The findings of the current study show that no significant difference existed between the mean scores of sunlight-protective behaviors in two groups before the intervention, but the mean score of protective behaviors against sunlight in the intervention group significantly increased; however, in the control group, no significant difference was observed in the mean scores of sunlight-protective behaviors before and after the intervention. These findings indicate the theory's effectiveness in increasing the protection against the sunlight in the intervention group. The results obtained by Gaston and Prapavessis' suggest that interventions based on PMT can change the exercise behavior among pregnant women [38]. they are also consistent with the results of the study conducted by Hawkes et al., which indicated that school-based interventions are effective in promoting sunlight-protective behaviors [39] and with the results of a randomized clinical trial in children younger than 12 years conducted by Gritz et al ., that showed the intervention has led to the increased use of sunscreen and wide brim hat [8].

One limitation of this study was the failure to consider the intervention to investigate the role of parents in the adoption of protective behaviors against sunlight. Given that parents play an important role in protecting children from sunlight, interventions are recommended to determine the effects of educational interventions based on PMT on promoting the sunlight-protective behaviors.

Conclusion

The findings of the present study indicate that the intervention led to a significant increase in the mean score of PMT components in the experimental group compared to the control group hence, the intervention promoted the sunlight-protective behaviors and it can be concluded that educational interventions can be designed based on this theory. Furthermore, given that schools are the best place to provide health education programs and the student as a health officer in the family plays an important role in providing and maintaining public health, the education of sun protective behaviors in schools must be considered as a top priority.

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Contribution

Study design: HR, MA
Data collection and analysis: HR, KAA ,MA
Manuscript preparation: HR, MA

Conflict of Interest

"The authors declare that they have no competing interests."

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