



# Application of Protection Motivation Theory to the Study of the Factors Related to Skin Cancer Preventive Behaviors in Students

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## Abstract

**Background:** The identification of the factors related to adoption of skin cancer preventive behaviors in adolescents plays a significant role in the appropriate design and implementation of relevant educational approaches.

**Objectives:** The aim of present study was to investigate the factors associated with skin cancer preventive behaviors in the male high school students of Isfahan, using the protection motivation theory (PMT).

**Methods:** This descriptive cross-sectional study was conducted on 311 male high school students of Isfahan in 2018. A reliable questionnaire was used for data collection, whose validity and reliability had been confirmed before. The data were analyzed, using the SPSS software (version 20), Pearson's correlation coefficient, multiple linear regression, one-way ANOVA, independent *t* test, and Spearman's correlation coefficient.

**Results:** Pearson's correlation coefficient indicated that the score of skin cancer preventive behaviors was inversely associated with response cost score ( $P < 0.001$ ), while it was directly related to perceived susceptibility, perceived severity, self-efficacy, response efficacy, fear, and protection motivation ( $P < 0.001$ ). The multiple linear regression model showed that among the constructs of the PMT, the scores for self-efficacy, response cost, and perceived susceptibility were significant predictors of skin cancer preventive behaviors, respectively, in order of importance.

**Conclusions:** This study showed that the PMT constructs were associated with the skin cancer preventive behaviors, which could be promoted by designing and implementing educational studies based on the constructs.

**Keywords:** Students, Skin, Cancer, Self-Efficacy, Behavior

## 1. Background

Cancer is a non-communicable disease causing various ailments. Like any other chronic diseases, it occurs in any person, age group, and race. The current concern introducing cancer as a global health problem and placing it at the top of the health and treatment agenda is the growing number of people affected by it globally, as well as in our country (1).

One of the most common types of cancers is skin cancer, which is classified into two subunits, namely melanoma (malignant melanoma) and non-melanoma. Non-melanoma skin cancer is one of the most common cancers accounting for approximately 40% of all malignancies (2). Ultra violet overexposure is the most important risk factor for skin cancer, since research shows overexposure is responsible for over 90% of malignant melanomas and other skin cancers (3).

The increased rate of skin cancer has been owing to high-risk behaviors such as sunbathing, inappropriate protective cover/clothing, and failure to use sunscreens (4). With the thinning of the ozone layer, the rate of its filtering function has reduced, resulting in more ultraviolet radiation reaching the surface of Earth. A 10% reduction in ozone levels is estimated to increase the number of non-melanoma and melanoma patients by 300,00 and 4,500, respectively (5).

The adverse effects of ultraviolet radiation would be reduced by wearing suitable clothing, hats, sunscreen, sunglasses, and use of a parasol (6). Studies in Iran also indicate a high incidence of skin cancer with a rate of 16.5% (7). Skin cancer is the most common type of cancer in Iran accounting for between 2.5% and 32.7% of all cancer cases (8).

Although skin cancer has a high prevalence in central Iran, it shows a lower incidence rate than western coun-

tries. In a study examining the geographical distribution of skin cancer in Iran, the provinces of Isfahan, Yazd, Qom, Tehran, and Markazi were found to have the highest incidence rates. The desertish condition of the mentioned regions could be considered one reason (9).

Research shows skin cancer is the most common type of cancer in Isfahan province, where it is the first and second most frequent cancer in men and women, respectively (10).

In Iran, particularly in Isfahan, as a hot and dry city, one should expect a high incidence of skin cancer, since children and adolescents spend many hours a week at school, spending some of the hours exposed to sunlight on school yard activities without using hats, sunscreens, and sunglasses that could reduce the effect of sunlight ultraviolet (5, 11).

High school students are one of the highest risk groups for skin cancer. Some studies demonstrate adolescence as a period, in which an individual has the highest exposure to ultraviolet rays due to summer vacations and school leaves, and has part-time jobs in the summer and often outdoor recreational activities, as well as the tendency to tan the skin (12, 13).

Despite the increased knowledge of the general public, the level of knowledge about the effects of sunlight and the need for using sunscreen is not acceptable. In addition, compared to other health issues, it has not received enough attention. This problem is more prominent among men, as they are more exposed to sunlight for occupational reasons (14, 15).

In Iran, men and boys are more likely to develop skin cancer due to spending more time in outdoor and unroofed places and less use of protective measures, such as sunscreen and clothing, compared to women wearing veils and scarves (16, 17).

By building a framework for effective interventions to change behavior, theories help us to understand how people decide on their own health and identify the social and environmental factors affecting those decisions (18).

The protection motivation theory (PMT) is one of the major theories in health education that is used to understand and predict health-related intents and behaviors protecting an individual against harmful events (19, 20).

The theory is composed of the following constructs: perceived susceptibility, perceived severity, reward, fear, self-efficacy, response costs, response efficacy, protection motivation, and behavior.

## 2. Objectives

Widely accepted as a framework for prediction and intervention in health-related behaviors, the theory has been

used in many studies, and its constructs have been used to predict and accept protective behaviors; therefore, the aim of this research was to investigate the factors related to skin cancer preventive behaviors in the male high school students of Isfahan.

## 3. Methods

This cross sectional descriptive-analytical study was conducted in 2018 among 311 male high school students in Isfahan, Iran.

Applying a multistage incidental sampling, 10 schools were randomly chosen from 47 junior high schools of district 3 in Isfahan. Out of the students of these schools, 311 students were systematically and randomly selected and entered the study (31 students from 9 schools, and 32 students from 1 school were chosen).

Inclusion criteria were studying in the junior high school, being male, students' tendency to enter the study, and lack of a skin disease.

Exclusion criteria were being absent for more than one educating session and being transferred to other schools.

According to the Equation 1

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 (1 - r^2)}{2} + 2 \quad (1)$$

the significance level  $\alpha = 0.05$ , and the test power  $\beta = 0.80$ , the sample size was obtained at least 299. In this relation,  $r$  is an estimate of the correlation coefficient between the score of the skin cancer preventive behaviors and the score of the PMT constructs, which was found to be at least 0.16 in previous studies (18, 19).

A reliable questionnaire, whose validity and reliability had already been confirmed, was used to collect data. The content validity index (CVI) of the questionnaire was higher than 0.79, the content validity ratio (CVR) of the questionnaire was higher than 0.75, and the internal consistency of the questionnaire was calculated 0.78, using Cornbrash's alpha (7).

The questionnaire consisted of 3 parts: (1) Demographic and general information (including age, educational status, parents' education, father's occupation, mother's occupation, family income per month, and sunburn history), (2) questions related to the PMT in 8 divisions (perceived susceptibility, perceived severity, perceived reward, fear, self-efficacy, response efficacy, response cost, and protection motivation), and (3) skin cancer preventive behaviors.

The section related to the PMT constructs consisted of 34 questions, which were based on a 5-point Likert scale. In the 5-point spectrum, the score of each statement was

1 (totally disagree) to 5 (totally agree) as follows: 4 questions for the perceived susceptibility with its scores ranging from 4 to 20, 3 questions for perceived severity with scores ranging from 3 to 15, 5 questions for self-efficacy with scores ranging from 5 to 25, 5 questions for response cost with scores ranging from 5 to 25, 5 questions for perceived reward with scores ranging from 5 to 25, 5 questions for response efficacy with scores ranging from 5 to 25, 4 questions for the fear construct with scores ranging from 4 to 20, and 5 questions for the protection motivation with scores ranging from 5 to 25.

A total of 8 questions were devoted to skin cancer preventive behaviors, designed into “yes, no, and 4 options” format, where higher scores indicated a more desirable status.

The method was such that selected schools were referred to, and questionnaires were administered to the students. During completion of the questionnaires, the researcher was present and answered the students’ questions, if any. Written consent was obtained from the students’ parents for participation in the study, and the students and their parents were assured of the provided information confidentiality.

The data were analyzed, using the SPSS software (version 20). Pearson’s correlation was used to assess the relationship between skin cancer preventive behaviors’ scores and Protection Motivation Model constructs’ scores. To appoint the significance of predictors of the Protection Motivation Model constructs, multiple linear regression models were applied. Independent *t* test was also used to analyze the mean score of skin cancer preventive behaviors in students based on their parents’ jobs.

Approval to conduct the study was obtained from the Research Ethics Committee of Isfahan University of Medical Sciences (ID- number: IR.MUI.REC.1397.081). Written informed consent was obtained from the participants. Furthermore, the students were assured of the study confidentiality.

#### 4. Results

Of the 311 students studied, 177 (56.9%) had a history of sunburn. The education levels of most fathers (95.5%) and mothers (96.5%) were high school diploma or higher. Most fathers (53.6%) had private business, and most mothers (59.5%) were housewives (Table 1). The average score of the skin cancer preventive behaviors in the students was 39.04 with a standard deviation of 11.12 out of 100.

Pearson’s correlation coefficient indicated that skin cancer preventive behaviors’ score was reversely related to the response cost score ( $r = -0.21$ ;  $P < 0.001$ ), but it was directly related to perceived susceptibility, perceived sever-

**Table 1.** Frequency Distribution of Demographic Characteristics in the Participants

	No. (%)
<b>Father’s educations</b>	
Elementary	4 (1.3)
Junior high	10 (3.2)
High school diploma and higher	297 (95.5)
<b>Mother’s educations</b>	
Elementary	2 (0.6)
Junior high	9 (2.9)
High school diploma and higher	300 (96.5)
<b>Father’s occupation</b>	
Employee	115 (37)
Self-employed/private business	167 (53.6)
Worker	7 (2.3)
Unemployed	1 (0.3)
Retired	21 (6.8)
<b>Mother’s occupation</b>	
Housewife	185 (59.5)
Employed	126 (40.5)
<b>Family’s monthly income, Rials</b>	
< 10,000,000	4 (1.3)
1,200,000	26 (8.4)
≥ 20,000,000	175 (56.2)
Unknown	106 (34.1)
<b>Sunburn history</b>	
Yes	177 (56.9)
No	134 (43.1)

ity, self-efficacy, response efficacy, fear, and protection motivation ( $P < 0.001$ ). Moreover, there was no significant correlation between the skin cancer preventive behaviors’ score and the reward’s score ( $P = 0.15$ ;  $r = 0.08$ ) (Table 2).

Multiple linear regression models demonstrated that among the PMT constructs, the scores of self-efficacy, response cost, and perceived susceptibility were significant predictors of the skin cancer prevention behaviors’ score, respectively, in order of importance. Additionally, in the presence of those 3 variables, the scores of other constructs in the PMT were not significant predictors of the skin cancer preventive behaviors’ score (Table 3).

#### 5. Discussion

The aim of this study was to investigate the application of the PMT to study the factors related to skin cancer pre-

**Table 2.** Pearson's Correlation Coefficients Between the Score of Skin Cancer Preventive Behaviors and Those of the Protection Motivation Theory Constructs

Protection Motivation Theory Constructs	Score of Skin Cancer Preventive Behaviors	
	r	P Value <sup>a</sup>
Perceived susceptibility	0.212	< 0.001
Perceived severity	0.283	< 0.001
Self-efficacy	0.439	< 0.001
Response cost	-0.212	< 0.001
Response efficacy	0.338	< 0.001
Reward	0.081	0.15
Fear	0.303	< 0.001
Protection motivation	0.427	< 0.001

<sup>a</sup>Significant at 0.05 level.

**Table 3.** Multiple Linear Regression Analysis to Predict the Score of Skin Cancer Preventive Behaviors Based on the Scores of the Protection Motivation Theory Constructs

Score	Raw Coefficients	Standard Coefficients	t	P Value <sup>a</sup>
Perceived susceptibility	0.752	0.138	2.03	0.04
Perceived severity	-0.050	-0.007	0.10	0.92
Self-efficacy	1.514	0.303	5.20	< 0.001
Response cost	-1.114	-0.191	3.72	< 0.001
Response efficacy	0.267	0.048	0.78	0.43
Reward	0.971	0.081	1.27	0.12
Fear	0.485	0.105	1.72	0.09
Protection motivation	0.672	0.137	1.93	0.06

<sup>a</sup>Significant at 0.05 level.

ventive behaviors in the male high school students of Isfahan. The results indicated that 56.9% of the students had a history of sunburn. In a study conducted by Rahmatiasl which was conducted in the schools of Ahwaz, 31.2% of students had a history of sunburn (18). Another study by Nyiri conducted in the schools of Singapore found that the incidence of sunburn among students was more than the expected rate (21). In a study carried out on female students in Yazd, Baghianimoghaddam et al. showed that 47.7% of the students had a history of sunburn (22).

The results of this study show that there is, unexpectedly, a high rate of sunburn in the students of Isfahan. According to a study performed by Hall et al. (23), individuals who had a history of sunburn used protective behaviors, like wearing protective clothes, more than others. These results reveal that individuals show more protective behaviors when they are aware of the harms of sunlight.

Therefore, individuals' experiences suffering from the harms of sunlight could be used to increase the perceived sensitivity of other individuals in educative interventions.

Some studies also demonstrated that there was a sig-

nificant relationship between the history of sunburn in individuals and the mean score of perceived susceptibility, self-efficacy, and perceived response. It proves that individuals who once had sunburn show more suitable preventive behaviors in the consequent sun exposure situations (24, 25).

The results of Pearson's correlation between protective behaviors and the PMT constructs showed that there was a significant positive relationship between behavior and perceived sensitivity. The results of the study by Tazval et al. showed that there was a significant correlation between the PMT constructs and protective behaviors. In addition, their results showed that protective behaviors were significantly and directly correlated with perceived susceptibility, perceived severity, response efficacy, and protection motivation, while outer and inner rewards were significantly and inversely correlated with response costs (26). These results show that the more the people perceive themselves to be exposed to the skin cancer risk, the more they will be likely to adopt protective behaviors. Consistent with the findings of this study, behavior is directly and sig-

nificantly correlated with perceived susceptibility in the study conducted by Mohammadi et al. (27) and Baghi-animoghaddam et al. (22). Furthermore, the findings of the present study demonstrated that protective behaviors were significantly and positively correlated with perceived severity, while the results of Schuz and Eid's study showed that self-efficacy was positively correlated with sun protection behaviors (28). The results of Xiao et al.'s study, on the other hand, showed a positive correlation between protective behaviors and perceived severity, perceived susceptibility, and self-efficacy, and a negative correlation between reward and response cost (29). These results indicate that the more aware the individuals are of the consequences and costs of the disease for their own and their families, the more the likelihood of their protective behaviors will be.

Additionally, the present study showed a positive correlation between protection motivation and behavior, indicating that the greater a person's intent to have a protective behavior, the more the probability of showing a protective behavior, which is consistent with the results obtained by Xiao et al. (29), Sharifirad et al. (30), and Morowatisharifabad et al. (31).

The results of a study conducted by Suppa et al. conducted in a school in Italy showed that students' knowledge of skin cancer affected their protective behaviors (32). According to Hall et al., those with a history of sunburn had a higher rate of adopting protective behaviors, suggesting that when people become aware of the dangers of sunlight, they are more likely to adopt protective behaviors (23).

The findings of this study showed no significant correlation between the skin cancer preventive behaviors' score and the rewards' score. In a study carried out by Tazval et al. there was a significant negative correlation between the inner and outer rewards and protective behaviors that is consistent with the results of similar studies (26). The existence of a significant and negative correlation between rewards and protective behaviors means that the greater the inner and outer rewards are for incompatible behaviors, the less the probability of adopting protective behaviors will be.

The results of the multiple linear regression model in this study indicated that among the PMT constructs, the scores of self-efficacy, response cost, and perceived severity were significant predictors of the skin-preventing behaviors' score, respectively.

In the current study, self-efficacy was the strongest predictor of the PMT ( $\beta = 0.303$ ). In other words, the more students are confident of their own efficiency and ability in showing preventive behaviors, the more they show them. Thus, it can be concluded that to reach a high level of skin

cancer preventive behavior in students, and consequently to improve the level of health status, at first, students' self-efficacy should be increased.

In the studies conducted by Plotnikoff et al. (33), Wurtele et al. (34), and Melamed et al. (35), using the PMT, self-efficacy was the most significant preventive factor of behavioral intention, being consistent with the results of the present study. These results show that self-efficacy should be prioritized in educative interventions to increase individuals' motivation.

### 5.1. Conclusions

Since the results of the present study showed that among the PMT constructs, respectively, the scores of self-efficacy, cost response, and perceived severity were significant predictors of skin cancer preventive behaviors in students, it is better to consider these constructs in educative interventions to teach skin cancer preventive behaviors in this age group, and use this theory to design and implement intervention programs to improve self-protective behaviors.

The survey of preventive behaviors in skin cancer using an appropriate theory can be considered the strength point of the current study.

### 5.2. Limitations

1- The use of only male students in this study is one of its most important shortcomings.

2- In this study, only junior high-schools of Isfahan were analyzed, and there was no sample of other cities of Isfahan.

### 5.3. Suggestions

It is suggested that, in the future studies of this field, sampling be carried out from students living in desert areas and from both male and female genders in order to be able to compare them.

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## Footnotes

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Hossein Shahnazi and Afsaneh Maleki. Statistical analysis: Akbar Hasanzadeh.

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