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Original Article

The Effect of an Educational Intervention Based on the Theory of Protection Motivation on the Promotion of Safe Traffic Behaviors in Adolescents

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Abstract

Background: Traffic accidents are one of the biggest public health challenges. Considering the role of safe behaviors in reducing traffic accidents, the present study was conducted to determine the effect of educational intervention based on protection motivation theory on promoting safe traffic behaviors in male students.

Methods: In this study, male students were randomly divided into two control group (n=70) and an intervention group (n=70). After confirming the validity and reliability, a researcher-made questionnaire consisting of 63 questions based on the theory of protection motivation was distributed among the students. The students in the intervention group received training for 90 minutes for four weeks. The data were collected in the form of self-report immediately and six months after the intervention and analyzed by the statistical tests of correlation, Chi-square, multiple regression, repeated measures ANOVA, and *t* tests using SPSS version 19.

Results: The structures of protection motivation theory predicted 21% of the variance of safe behaviors. Immediately after the educational intervention, except for the fear construct, the mean scores of other theoretical constructs and students' safe behaviors were significant between the two groups, but the mean scores were not significant six months after the educational intervention except for perceived self-efficacy, perceived response efficacy, protection motivation of other studied theoretical constructs, and safe behaviors ($P>0.05$).

Conclusion: Considering the influence of several components on the formation of safe traffic behavior, it seems that to promote safe behaviors of students, in addition to designing theory-based training programs, creating supportive infrastructures by policymakers and planners is essential for correct traffic behaviors.

Keywords: Education, Students, Behavior, Motivation, Traffic

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Introduction

Traffic accidents are among the most critical public health challenges, especially in developing societies. These accidents have a devastating impact on all aspects of human health, causing a significant loss of opportunities, productive human resources, and financial resources (1).

Traffic accident injuries result in the death of about 1.3 million people each year and severe disability and injury of 20 and 50 million others. Road traffic injuries cause significant economic damage to individuals and their families, particularly the economy of all nations (2). By 2030, traffic accidents are projected to become the seventh leading cause of death worldwide which will be increasing in developing countries (3). In the world ranking, Iran is the third middle-income country in terms of deaths resulting from traffic accidents (4). In a study conducted in 2014 by Ebrahimi Kebria and Soori, Golestan province, with 89.09 per 100 000 population, was ranked fourth in terms of the rate of pedestrian traffic accidents in Iran (5).

Every year, 10 thousand teenagers in the United States die due to completely preventable reasons such as not observing safe behaviors (6). Studies have demonstrated that most traffic accidents result from people's unsafe behaviors (7) Alizadeh et al reported that the prevalence of high-risk behaviors among Iranian teenagers is high, and it is essential to address the issue of high-risk behaviors

because they induce personal and social problems and deaths from accidents (8). Based on the studies conducted and the statistics of the Forensic Medicine Organization of Iran, about 30% of the pedestrians killed in traffic accidents at school age (less than 18 years old) are trapped. They are at risk and belong to extremely vulnerable groups (9,10); on the other hand, the prevalence of behaviors that endanger health is increasing among adolescents (11).

Proper education of children and adolescents and raising their awareness of proper traffic behaviors can significantly reduce injuries and accidents (12). To adopt preventive behaviors, people must go through the cognitive processes of coping and evaluation (13). Several studies on high-risk behaviors in adolescents have indicated that the constructs of protection motivation theory are strong predictors of using healthy behavior (14,15). One of the theories that focuses on studying motivational factors and behaviors is motivation theory protection (16). According to this theory, a person is likely to perform the recommended safe behaviors if he/she believes he/she is exposed to traffic accidents (perceived vulnerability). The injuries caused by these accidents are severe and dangerous for him/her (perceived severity) and internal and external rewards have fewer existing behaviors that increase unsafe behaviors (perceived reward). This person believes that a consistent response can eliminate the risk of injury (perceived efficiency), and the cost of safe behavior is low (perceived costs) and believes in his/her ability to perform protective behavior successfully (perceived self-efficacy) to lead to safe traffic behaviors ultimately (17).

The implementation of interventions for the health of adolescents is considered one of the fundamental approaches to the health system, and the prevention of risky behaviors significantly impacts adolescents' health in adulthood and old age (18). Due to the importance of the problem, the widespread prevalence of traffic accidents in in Iran and the effective role of safe behaviors in reducing injuries caused by accidents, the present study was conducted to determine the effect of educational intervention based on the theory of protection motivation in male students in Minoodasht.

Materials and Methods

The present study was a quasi-experimental study conducted among male high school students in Minoodasht in 2019. Based on the same study and considering the 95% confidence level and 80% statistical power, the maximum sample size was calculated according to the model structures with 52 people in each group (19). After the approval of the university Ethics Committee with the ethics code of IR.GOUMS.REC.1397.329, obtaining a letter of introduction from the university and presenting it to the officials of the Minoodasht education department, and stating the objectives of the research by the researcher, the consent of the relevant officials was obtained for conducting research in Minoodasht schools.

Using a multi-stage cluster sampling, the researcher randomly selected two schools out of six clusters of secondary schoolboys. Then in each school, only high school students were selected. Students who completed the consent form to participate in the research were selected from the selected high schools. After completing the questionnaire, 70 people in the experimental group and 70 people in the control group were randomly selected. Then, the implementation of the project, the confidentiality of the information, and the purpose of the study were explained to the participants, and the students entered the study voluntarily after receiving informed consent.

Inclusion criteria included studying in the second year of high school and willingness to participate in the study. The exclusion criteria included expressing dissatisfaction with continued cooperation, not attending more than one session in educational sessions, incomplete completion of questionnaires, and students' transfer to another school during the study.

The researcher-made questionnaire had three parts. The first part included demographic characteristics, including age, parents' education, and parents' employment status. The second part of the questionnaire included 41 questions for subscales of protection motivation theory containing perceived vulnerability with six questions and a score range of 6-30 as well as perceived severity and perceived self-efficacy with seven questions, and the score range of these two was between 7-35. Perceived response efficiency, perceived cost, and protection motivation each contained five questions within a score range of 5-25, perceived reward comprised two queries and a score range of 2-10, and fear structure contained four questions within the score range of 4-20. The answers in the studied structures were classified based on the five-point Likert scale ranging from strongly disagree with one point to strongly agree with five points. The third part of the questionnaire contained 22 questions related to unsafe behaviors, and the answers were always considered with a score of four to never with the score within the core range of 0-88.

The validity of the questionnaire's content was assessed both qualitatively and quantitatively. In the qualitative review of the content, experts were asked to check the coordination of the content of the measurement tool and the purpose of the study, and the necessary corrections were made to the questionnaire. Then, to assess the content validity of two indicators in a quantitative form, the content validity ratio and the content validity index were examined by 10 people specializing in health education and health promotion. The content validity index value was higher than 0.79. The modified questionnaire was tested in an experimental study to determine face validity. Further, a modified questionnaire was completed by 30 students to assess the reliability, and after collecting and extracting data, Cronbach's alpha value was 0.8, and the coefficient of internal consistency was 0.79.

In the pre-test stage, educational content was developed after determining the most critical predictors of safe behaviors through multiple regression tests, which

included the constructs of protection motivation theory. The educational content was compiled after studying related books, instructions, and articles based on the constructs of protection motivation theory. Then, the target group was randomly divided into control and experimental groups. In the experimental group, one session was held every week for one month for 90 minutes with health education and health promotion experts and emergency medical experts in schools. Educational topics included providing statistics and information on injuries and deaths related to traffic accidents, the consequences and extensive effects of accidents in their lives, the benefits of using safe behaviors, examining the obstacles teenagers face in using the recommended behavior, and practical training on safe traffic behaviors. The training was done face-to-face by distributing pamphlets and educational tracts, broadcasting educational clips, using group discussions, brainstorming, lectures, questions and answers, and practical demonstrations (Table 1). The experimental group was divided into groups of 20 to 25 people to participate in the training sessions as much as possible. Moreover, during the educational intervention, the control group did not receive educational content.

The post-test was conducted by redistributing the questionnaire immediately after the intervention to measure the program's long-term effects six months after the educational intervention for both control and intervention groups.

The normality of the data was determined by the Kolmogorov Smirnov test, and the mean (standard deviation) was used to describe quantitative variables according to qualitative variables' conditions and frequency (percentage). The chi-square and Fisher's exact test were used to check the two groups' homogeneous distribution of qualitative variables. Furthermore, independent t-tests were run to determine the mean of the studied constructs in two control and intervention groups, and a correlation test was used to determine the relationships between the studied variables and to examine the change of each variable during the intervention time in each of the repeated measures. Moreover, ANOVA and multiple regression were used to predict the value of the dependent variable based on the independent variables.

Results

As Table 2 indicates, the mean age of the students participating in the study was 16.4± 8.2. In addition, more than 30% of the students' fathers had a university education, and most of them were self-employed. Further, the two groups did not significantly differ in demographic variables before the educational intervention ($P > 0.005$).

According to the multiple linear regression analysis, protection motivation theory constructs predicted a 21% variance in preventing unsafe traffic behaviors. The perceived reward construct was the most vital determinant of behavior with a line slope of -4.227, a standard error of 693, at a significance level of $P < 0.001$.

As evident in Table 3, the correlation test results demonstrate that the perceived self-efficacy construct correlated significantly with response efficiency and protection motivation. The fear structure had a statistically significant relationship with perceived response cost and protection motivation, and there was a significant correlation between protection motivation and fear ($P < 0.05$).

Table 4 depicts the mean scores of protection motivation theory constructs and safe behavior before, immediately, and six months later between the two groups. Although the mean scores of the studied constructs before the educational intervention between the two groups were not statistically significant ($P > 0.05$). Furthermore, the statistical test showed that immediately after the educational intervention, except for the fear construct, the difference in mean between the two groups was statistically significant ($P < 0.05$) in the constructs of perceived vulnerability (-0.95 ± 0.45), perceived severity (2.56 ± 0.73), self-efficacy (-1.64 ± 0.63), response efficiency (-1.06 ± 0.18), cost (0.76 ± -1.48), motivation (-0.91 ± 0.14), perceived reward (0.46 ± -0.02), and safe behaviors (-3.92 ± -0.44). Moreover, the independent t-test revealed that six months after the educational intervention, the mean difference between the two groups was not significant ($P > 0.05$) except for perceived self-efficacy (-0.51 ± 0.73), perceived response efficacy (-1.01 ± 0.96), and protection motivation (-2.64 ± 0.77) of other studied constructs and safe behaviors. The repeated measures analysis of variance also indicated that the mean scores of the studied constructs and safe

Table 1. Organization of Educational Sessions in the Experimental Group

Sessions	Objectives	A Summary of Topics and Activities	Educational Time (min)
First	Increased vulnerability and perceived severity	Through lectures and group discussions, we present statistics about the victims and the resulting problems for the disabled in accidents and traffic accidents in teenagers.	90
Second	Increase response efficiency and reduce response costs	Through questions, answers, and group discussion, the benefits of safe behaviors and barriers to students were extracted. Provide solutions to the raised obstacles.	60
Third	Manage stress and control emotions and reduce perceived internal and external rewards	Using brainstorming, group discussion, speech about internal and external rewards, group discussion about ways to overcome them, role-playing, and meditation training.	90
Fourth	Increased perceived self-efficacy	Practical training of safe traffic behavior and the execution of hypothetical accident maneuvers and first aid station training by the Red Crescent and emergency services	60

Table 2. Frequency Distribution and Percentage of Demographic Variables of Participants in Control and Experimental Groups

Variable		Experimental Group No. (%)	Control Group No. (%)	*P*
Father's education	Illiterate	1 (1.4)	7 (10.0)	0.052
	Elementary and middle school	23 (32.9)	21 (30.0)	
	High school	22 (31.5)	18 (25.8)	
	University	24 (34.3)	24 (34.3)	
Mother's education	Illiterate	2 (2.9)	7 (10.0)	0.055
	Elementary and middle school	30 (42.7)	29 (41.4)	
	High school	18 (25.7)	12 (17.2)	
	University	20 (28.7)	22 (31.4)	
Father's job	Worker	7 (10.0)	1 (1.4)	0.571
	Employee	16 (22.9)	16 (22.9)	
	Free	39 (55.7)	53 (75.7)	
	Unemployed	1 (1.4)	0 (0)	
	Retired	2 (2.9)	0 (0)	
Father's job	Worker	1 (1.4)	0 (0)	0.850
	Employee	0 (0)	1 (1.4)	
	Free	2 (2.9)	2 (2.9)	
	Housewife	67 (95.7)	67 (95.7)	

Table 3. Correlation Between the Constructs of the Theory of Protection Motivation and Safe Behaviors of Students

	The Variable Under Consideration	1	2	3	4	5	6	7	8	9
1	Perceived vulnerability	1								
2	Perceived severity	0.338**	1							
3	Self-efficacy	0.068	0.191*	1						
4	Response efficacy	-0.072	-0.105	-0. 230**	1					
5	Response costs	0.087	0.050	0/051	0.050	1				
6	Motivation	0.130	0. 251**	0.300**	0.260**	0.009	1			
7	Perceived rewards	0.120	-0.074	-0.154	0.157	0.137	-0.099	1		
8	Fear	0.263**	0.353**	0.148	-0.177*	0.174*	0.171*	-0.047	1	
9	Behavior	-0.158	0.028	0.025	-0.046	-0.130	0.114	-0.467**	-0.097	1

*$P<0.05$, **$P<0$ .001.

behaviors in the experimental group changed significantly over time ($P<0.05$), but no significant changes were observed in the control group over time ($P>0.05$).

Discussion

The results of this study indicated the effect of the educational intervention two weeks after the intervention on safe behavior and protection motivation theory constructs except for the fear construct. In contrast, six months after the traffic safe behavior training intervention and other constructs of protection motivation theory, there was no statistically significant difference between the two groups except for the constructs of perceived self-efficacy, perceived response efficacy, and protection motivation. In their study on adolescents, Havaei et al reported the lack of significance of protection motivation theory constructs in the use of self-care behaviors between two groups in the second stage of educational intervention follow-up (20). Moreover, a meta-analysis study on adolescents reported that results are different depending on the type of intervention, the place of implementation, and the duration of the educational program (21).

In the present study, the protection motivation theory constructs predicted 21% of students' traffic safety variance. This finding was consistent with Rahimi and Shojaei's study on the use of helmets based on the protection motivation theory (22). Based on the study results, the perceived reward was the most critical predictor of safe traffic behavior for male students, meaning that the fewer rewards students receive for unsafe behavior, the more likely they are to engage in safe traffic behavior. Peeters et al suggested that adolescents who have difficulty controlling their behavior and are sensitive to rewards may be more involved in high-risk behaviors because the motivation to engage in high-risk behaviors may be relatively high (23). Morowatisharifabad et al reported perceived reward as the most critical construct in performing unsafe behaviors in youth and adolescents and reported experiencing more excitement, reaching the destination earlier, and gaining self-confidence as the

Table 4. Evaluation and Comparison of the Effectiveness of the Intervention Program based on the Theory of Protection Motivation Before, Immediately, and Six Months After the Educational Intervention Between the Two Groups

Variables		Before Intervention	Difference Mean	Two Weeks After Intervention	Difference Mean	Six Months After Intervention	Difference Mean	*P*
		Mean ± SD		Mean ± SD		Mean ± SD		
Perceived vulnerability	Control	19.32 ± 4.72	0.25 ± 0.88	19.20 ± 4.11	-0.95 ± 0.45	18.87 ± 3.72	-0.91 ± 0.14	<0.001
	Experimental	19.07 ± 3.84		20.15 ± 3.66		19.78 ± 3.86		
P		0.457		0.014		0.739		
Perceived severity	Control	26.88 ± 4.98	-0.5 ± 1.37	26.98 ± 4.98	2.56 ± 0.73	26.88 ± 3.92	0.73 ± 0.47	<0.001
	Experimental	27.38 ± 3.61		24.42 ± 4.25		26.15 ± 3.45		
P		0.498		0.002		0.246		
Self-efficacy	Control	27.95 ± 4.48	-0.26 ± -0.71	28.01 ± 5.52	-1.64 ± 0.63	27.95 ± 5.20	-0.51 ± 0.73	<0.001
	Experimental	28.21 ± 5.19		29.65 ± 4.89		28.45 ± 4.47		
P		0.754		0.030		0.040		
Response efficiency	Control	9.57 ± 3.33	0.11 ± 0.08	9.58 ± 3.21	-1.06 ± 0.18	9.60 ± 3.83	-1.01 ± 0.96	<0.001
	Experimental	9.46 ± 3.25		10.64 ± 3.03		10.61 ± 2.87		
P		0.725		0.001		0.032		
Cost	Control	8.94 ± 3.28	-0.71 ± 1.05	9.04 ± 3.13	0.76 ± -1.48	9.41 ± 3.27	-0.91 ± 0.14	<0.001
	Experimental	9.64 ± 4.33		8.28 ± 4.61		9.18 ± 4.62		
P		0.021		0.023		0.070		
Motivation	Control	18.50 ± 3.83	-0.91 ± 0.14	15.72 ± 3.06	-0.91 ± 0.14	15.74 ± 2.94	-2.64 ± -0.77	<0.001
	Experimental	18.28 ± 2.82		19.05 ± 3.67		18.38 ± 3.71		
P		0.627		<0.001		<0.001		
Perceived Reward	Control	4.00 ± 2.00	-0.64 ± -0.36	4.22 ± 2.17	0.46 ± -0.02	4.17 ± 2.19	-0.17 ± 0.15	<0.001
	Experimental	4.64 ± 2.36		3.76 ± 2.19		4.34 ± 2.04		
P		0.085		0.037		0.634		
Fear	Control	13.40 ± 4.22	-0.54 ± 1.11	13.60 ± 4.08	-0.81 ± -0.14	12.94 ± 4.04	-0.46 ± -0.18	<0.001
	Experimental	13.94 ± 3.11		14.40 ± 4.22		13.40 ± 4.22		
P		0.389		0.067		0.514		
Behavior	Control	63.42 ± 20.29	1.11 ± 0.26	64.05 ± 14.17	-3.92 ± -0.44	64.25 ± 11.69	-1.41 ± 4.62	<0.001
	Experimental	62.31 ± 20.03		67.97 ± 17.61		65.65 ± 16.31		
P		0.744		0.001		0.411		

Note. SD: Standard deviation.

reasons for such behaviors (24). Since adolescence is a developmental period characterized by increased reward-seeking behavior, underestimating adolescents' internal and external rewards during educational programs will significantly impact their safety behaviors.

In the present study, fear was significantly correlated with perceived threat constructs, perceived cost, and protection motivation, so with higher levels of fear, perceived threat, and protection motivation increase in students. Sadeghi et al (25) reported the correlation between fear construct and perceived vulnerability and perceived severity constructs and considered this construct as the most critical predictor of high-risk behavior in adolescents. The results of our study showed a significant correlation between understanding the consequences of not performing safe behavior and students' belief in their abilities and the effectiveness of safe behaviors, and increasing protection motivation. Other studies are consistent with this finding (26). Khazaee-Pool et al stated that preventive behaviors and perceived rewards are not significantly correlated. The reasons for the discrepancy were differences in age groups, data collection method, and type of research (27). The main components of the reward system undergo a significant change during adolescence and in other age periods (28). Educational interventions should be motivated by increasing the perceived sensitivity and intensity of adolescents and, on the one hand, by facilitating the costs of using safe behaviors. It increased the use of recommended behavior.

Our study showed that despite the lack of significant difference between the studied constructs and safe behaviors before the educational intervention, immediately after the intervention, the mean of safe behaviors and all theoretical constructs except the fear construct in the experimental group changed significantly compared to the control group. Indeed, students became sensitive to the injuries and damages caused by non-observance of safe behaviors by being provided with statistics and showing them films. On the other hand, they learned the skills of performing safe behaviors step by step and

believed in their effectiveness in preventing accidents and in reducing the pleasure of risk-taking and such rewards for themselves, that safe behaviors will increase in them. Regarding the insignificance of the fear structure, it can be argued that excitement is associated with an increase in risky behaviors (27). Additionally, due to the unique characteristics of adolescence, complex emotions such as fear of rejection, desire to look smart, danger, excitement, or anxiety, the level of fear in this age group is less aroused than in other people; on the other hand, curiosity and peer pressure were the main reasons that teens engaged in high-risk behaviors (29).

According to the present study results, six months after the intervention, except for self-efficacy structures, response efficiency, protection motivation of other theoretical structures, and safe behaviors of students did not change significantly in the experimental group compared to the control group. There was no significant difference in the intervention of preventive behaviors in the experimental group compared to the control group (30). Consistent with this finding, Heidarnia et al also reported the lack of significance of high-risk behavior in the two groups after the educational intervention (31). Individual, family, and social factors in the level of students' unsafe behaviors were considered influential factors in high-risk behaviors in youth and adolescents (32). In a strategic study by Mafi et al, colleagues suggested the need to accelerate the reform of the road structure in Minoodasht (33). It seems that the non-continuity of safe traffic behaviors of students is affected by the poor traffic engineering of cities in terms of the capacity of roads, public transportation, parking lots, signs, and traffic lights. In the present study, although the students believed in their ability to use safe and efficient behaviors and were motivated to follow them in the intervention group, it did not affect their behavior. Given that safe traffic behaviors require the creation of safe infrastructures at the community level, the existence of coherence and support of the organizations along with the educational program can be effective.

One of the limitations of the present study was completing the questionnaire by self-report method, conducting the study only on male students, and examining a high school level of education. Therefore, it is suggested that future studies consider both age groups, other levels of high school education, and other factors affecting behavior. Such components of the urban environment are examined in the intervention process. However, conducting a theory-based educational intervention on male students as one of the most vulnerable groups to traffic accidents is considered one of the strengths of the present study. In the present study, it was found that the self-efficacy, motivation of teenagers, and understanding of the effectiveness of the recommended behaviors increased after the intervention, which seems necessary to provide the infrastructure of the physical environment to achieve safe traffic behaviors.

Conclusion

Despite the influential role of education on the constructs of protection motivation theory and safe behaviors immediately after the educational intervention, for the continuation of safe traffic behaviors in adolescents, participatory preventive interventions with an educational approach, empowerment, and emphasis on preventive behaviors in accidents traffic is an essential step in promoting the health of adolescents, and achieving this will not be possible except with the participation of other departments and devices to create a safe road infrastructure.

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Authors' Contribution

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Competing Interests

The authors declare that there is no conflict of interests.

Ethical Approval

This study was conducted after obtaining the code of ethics number IR.GOUMS.REC.1397.329 from the Vice Chancellor for Research at Golestan University of Medical Sciences.

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References

1. Gopalakrishnan S. A public health perspective of road traffic accidents. J Family Med Prim Care. 2012;1(2):144-50. doi: 10.4103/2249-4863.104987.
2. Road traffic injuries [Internet]. Available from: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries. Accessed January 22, 2021.
3. Road traffic mortality [Internet]. Available from: https://www.who.int/data/gho/data/themes/topics/sdg-target-3_6-road-traffic-injuries. Accessed May 23, 2022.
4. Shams M, Mohebi F, Gohari K, Masinaei M, Mohajer B, Rezaei N, et al. The level and trend of road traffic injuries attributable mortality rate in Iran, 1990-2015: a story of successful regulations and a roadmap to design future policies. BMC Public Health. 2021;21(1):1722. doi: 10.1186/s12889-021-11721-9.
5. Ebrahimi Kebria S, Soori H. Study of epidemiological pattern of pedestrian's road traffic injuries in 2014 and determination of related risk factors on severity of injury. Payesh. 2017;16(3):293-302. [Persian].
6. Heron M. National Vital Statistics Report Volume 66, Number 5 November 27, 2017 [Internet]. Vol. 66, National Vital Statistics Reports. 2015. Available from: https://www.cdc.

Accessed August 4, 2022.
7. Setoodehzadeh F, Ansari-Moghaddam A, Okati-Aliabad H, Khammarnia M, Mohammadi M. Self-reported motorcycle riding behavior in southeast of Iran. Health Scope. 2021;10(3):e116025. doi: 10.5812/jhealthscope.116025.
8. Alizadeh S, Raheb G, Mirzaee Z, Hosseinzadeh S. Effect of social competence training on tendency towards high-risk behaviors in male adolescents living in welfare boarding centers. Arch Rehabil. 2020;21(1):54-73. doi: 10.32598/rj.21.1.2874.1. [Persian].
9. Mansourkiyayi A, Mahmoodabadi A, MirHosseini S. The evaluation of the effectiveness of training programs to change the behavior of children and adolescents in the face of traffic threats. Sharif Civ Eng J. 2010;27(3):93-7. [Persian].
10. Zoghi L. Formulation and evaluation of the effectiveness of traffic behavior educational package in terms of learning safe traffic behaviors in elementary (four stage) children. Rahvar. 2019;8(29):221-78. [Persian].
11. Ebrahimtabar Gerdroodbari E, Emadian SO, Mirzaeian B. The effectiveness of family education classes on parental bonding and high-risk behaviors among adolescents. Ebnesina. 2021;23(3):43-51. doi: 10.22034/23.3.43. [Persian].
12. Omidi S, Farmanbar R, Mokhtarpour S. The effect of educational intervention based on PRECEDE-PROCEED model on promoting traffic safety behaviors in primary schools students of Tabriz in 2014. J Educ Community Health. 2016;2(4):48-56. doi: 10.21859/jech-02047. [Persian].
13. Kim JK, Crimmins EM. Age differences in the relationship between threatening and coping mechanisms and preventive behaviors in the time of COVID-19 in the United States: protection motivation theory. Res Psychother. 2020;23(3):485. doi: 10.4081/ripppo.2020.485.
14. Xu Y, Chen X. Protection motivation theory and cigarette smoking among vocational high school students in China: a cusp catastrophe modeling analysis. Glob Health Res Policy. 2016;1:3. doi: 10.1186/s41256-016-0004-9.
15. Lin H, Chang C. Factors associated with the quitting intention among Chinese adults: application of protection motivation theory. Curr Psychol. 2021. doi: 10.1007/s12144-021-01500-5.
16. Bashirian S, Barati M, Mohammadi Y, Moaddabshoar L, Dogonchi M. An application of the protection motivation theory to predict breast self-examination behavior among female healthcare workers. Eur J Breast Health. 2019;15(2):90-7. doi: 10.5152/ejbh.2019.4537.
17. Rogers RW. A protection motivation theory of fear appeals and attitude change1. J Psychol. 1975;91(1):93-114. doi: 10.1080/00223980.1975.9915803.
18. Arazi S, Alaei Karahroudi F, Rouhani C, Puorhoseingholi A, Vasli P. The effect of health promoting education plan on adolescents' lifestyle in patients with thalassemia major. J Nurs Educ. 2017;6(1):16-22. [Persian].
19. Andi SJS, Moghadam MHB. Design and Evaluation on Effect of an Educational Intervention on the High Risks Behaviors for the Prevention of Gastric Cancer According to PMT in Babol City [thesis]. Yazd: Shahid Sadoughi University; 2015. [Persian].
20. Havaei M, Salehi L, Akbari-Kamrani M, Rahimzadeh M, Esmaelzadeh-Saeieh S. Effect of education based on protection motivation theory on adolescents' reproductive health self-care: a randomized controlled trial. Int J Adolesc Med Health. 2019;33(4). doi: 10.1515/ijamh-2018-0195.
21. Manlove J, Fish H, Moore KA. Programs to improve adolescent sexual and reproductive health in the US: a review of the evidence. Adolesc Health Med Ther. 2015;6:47-79. doi: 10.2147/ahmt.s48054.
22. Rahimi T, Shojaei S. Determinants of helmet use by motorcycle riders in Qom, Iran, using the protection motivation theory. J Police Med. 2019;8(1):27-32. doi: 10.30505/8.1.27. [Persian].
23. Peeters M, Oldehinkel T, Vollebergh W. Behavioral control and reward sensitivity in adolescents' risk taking behavior: a longitudinal TRAILS study. Front Psychol. 2017;8:231. doi: 10.3389/fpsyg.2017.00231.
24. Morowatisharifabad MA, Momeni Sarvestani M, Barkhordari Firoozabadi A, Fallahzadeh H. Predictors of unsafe driving in Yazd city, based on protection motivation theory in 2010. Intern Med Today. 2012;17(4):49-59. [Persian].
25. Sadeghi R, Mazloomy Mahmoodabad SS, Fallahzadeh H, Rezaeian M, Bidaki R, Khanjani N. Predictive factors for preventing hookah smoking and health promotion among young people based on the protection motivation theory. J Educ Health Promot. 2019;8:169. doi: 10.4103/jehp.jehp_78_19.
26. Hassan S. Application of protection motivation theory to diabetic foot care behaviours in Egypt. J Diabetes Metab Disord. 2020;19(2):869-73. doi: 10.1007/s40200-020-00573-6.
27. Khazaee-Pool M, Naghibi M, Pashaei T, Chaleshgar Kordasiabi M. Use of protection motivation theory to assess preventive behaviors of COVID-19. J Mazandaran Univ Med Sci. 2021;31(195):19-29. [Persian].
28. Yee DM, Adams S, Beck A, Braver TS. Age-related differences in motivational integration and cognitive control. Cogn Affect Behav Neurosci. 2019;19(3):692-714. doi: 10.3758/s13415-019-00713-3.
29. Ajisuksmo CR. Why some adolescents engage in risk-taking behavior. Int J Educ Psychol. 2021;10(2):143-71.
30. Hoseini ZS, Tavakoli Ghouchani H, Mohaddes Hakak H, Lashkardoost H, Khankolabi M, Mehri A, et al. Effect of awareness and perceived self-efficacy on breast cancer preventive behaviors in women; a case study of Neyshabur city. J Educ Community Health. 2019;6(1):33-9. doi: 10.29252/jech.6.1.33. [Persian].
31. Heidarnia A, Barati M, Niknami S, Allahverdipour H, Bashirian S. Effect of a web-based educational program on prevention of tobacco smoking among male adolescents: an application of prototype willingness model. J Educ Community Health. 2016;3(1):1-11. doi: 10.21859/jech-03011. [Persian].
32. Moshrefi AH, Hosseini SM, Amani R, Razavimehr SV, Aghajanikhah MH, Mahmoodi P. Investigation of aids epidemiology in Mazandaran province during 1986-2014. J Rafsanjan Univ Med Sci. 2016;15(6):575-82. [Persian].
33. Mafi E, Ghanbari M, Hosseinzadeh A. The effect of implementation of the new law traffic on human hazards of accident in roads of North Khorasan province. Strategic Research on Social Problems in Iran. 2016;4(3):51-68. [Persian].