Effect of educational intervention on traffic accidents prevention: Theory of planned behavior

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Abstract

Original Article

BACKGROUND: Traffic accidents are a serious challenge for community health. Lack of skills among youth, willingness to risky accidents, and traffic law violations play the main role in accidents. Therefore, this study aimed at the effect of educational intervention on traffic accident prevention in youth using a theory of planned behavior (TPB).

METHODS: This quasi-experimental study was conducted in 2019 in Kurdistan Province, Iran, by participation of 240 young men. They were allocated randomly to the experimental (n = 120) and control (n = 120) groups. The intervention plan consisted of three training sessions and a film demonstration. The instrument was a designed questionnaire based on the TPB which was completed before and two months after the intervention. Data were analyzed by linear regression and t-test.

RESULTS: The mean age of youth was 23.93 ± 3.10 years. Perceived behavioral control was the most predictive structure in behavioral intention. The mean scores of attitude, subjective norms, perceived behavioral control, intention, and preventive traffic accident behavior in the experimental group had different significance compared to the control group after training (P < 0.001).

CONCLUSION: Interventions aimed at promoting attitudes, subjective norms, and perceived behavioral control can increase individuals' intentions to engage in health behaviors and motivate them to implement traffic accident prevention behaviors.

KEYWORDS: Traffic Accident; Youth; Intervention; Planned Behavior Model

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Introduction

A traffic accident is a serious challenge to society's health. About 1.2 million people are killed and 50 million injured annually in traffic accidents throughout the world. Traffic accidents are the main cause of death among 15- to 29-year-old individuals. About 90% of the global deaths take place in low- and middle-income countries, with only half of all registered vehicles.[1] The reports reveal the fact that the number of traffic accidents in most countries has increased in recent decades.[2] Traffic accidents are the main cause of injuries and the second cause of death in Iran. The number of injuries which come about by traffic accidents in Iran is four times higher than the accidents in developed and high-income countries.[3]

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Humans are the main factor in traffic accidents and drivers' behaviors account for 90% of traffic accidents.[4] The theory of the tendency to accident is one of the old theories of the cause of the accident, stating that accidents are related to human personality and specific kinds of driving show, but the probability of an accident in driving conditions is more than drivers' personality.

In other words, accident propensity refers to individuals who have the characteristics of accident-prone among drivers, such as age, driving experience, and driving style in emergencies.[5] Therefore, road traffic violations are more current among young drivers.[6] Bucsuhazy et al. analyzed human factors contributing to road traffic accident occurrence. The result showed that young people mostly had fewer driving skills, but they overestimated their skills. The youth perform less attention to traffic signs, disrespect other drivers, or have aggressive driving styles.[7] Passing the red lights, dangerous overtaking, drinking alcohol, using a cell phone while driving, and speeding are among the risk factors for accidents.[7-9]

The literature review showed that several interventions were carried out in countries to reduce traffic accidents among young people.

The Graduated Driver Licensing (GDL) program was developed and used in some countries, to address these punishes (accidents involving young drivers). The GDL allowed drivers to gain experience in low-risk driving conditions by adding an "intermediate" phase between the learning step and the acquisition of the driving license. This new licensing program required young drivers to advance through several steps where they were subject to a variety of restrictions that reduced their exposure to high-risk driving conditions. Studies showed that the comprehensive GDL programs were associated with a 5%-25% decrease in teen drivers' accident risks.[10,11]

Alvaro et al. assessed the impact of an education program on knowledge of sleepiness and driving behavior in young adult drivers. The result showed that an intensive education program addressing sleep and driving improved circadian rhythm knowledge in young drivers, but did not alter attitude toward risk-taking or other sleep-related knowledge.[12]

Twisk et al. tested road safety educational programs. Results showed that the programs based on road safety education significantly improved self-reported safety behavior.[13]

Considering heavy fines for speeding, improving vehicle safety equipment, and increasing fines by the Iranian traffic police have been relatively effective in reducing the number of traffic accidents. On the other hand, the measures like increasing police budgets, enhancing road safety, using surveillance cameras, enhancing medical care, and enhancing infrastructure (especially on railways) have not led to much effect in reducing the number of accidents.[3]

Although there is still no consensus on the effectiveness of road safety preventive strategies, research showed that advertising based on threats (highlighting dangers such as being injured or killed in an accident) was very effective.[14]

Health education is a process for increasing health information, promoting healthy behavior, and creating motivation and the ability to change lifestyle.[15] Thus, selection of an appropriate health education model for an educational intervention will increase the effectiveness of the program to change unhealthy behaviors.[16]

The theory of planned behavior (TPB) is used widely to modify and enhance health behaviors. This theory assumes that behavioral intention directly determines behavior, and the three factors - attitude toward a behavior, subjective norms, and perceived behavioral control - affect an individual's intention.[17]

According to structures of this theory (Figure 1),[18] when a person intends to show

behavior, first, she/he evaluates the result and then intends to do it. Subjective norms show that a person is affected by others in a society in doing healthy behavior, such as partners, parents, religious leaders, relatives, and health officials. People build their intentions on the desires of others. If a person does not believe in any resources to do a special behavior, he/she is not likely to have a serious intention to do that; even he/she may have a positive attitude toward it or believe that other important people confirm it.[19]
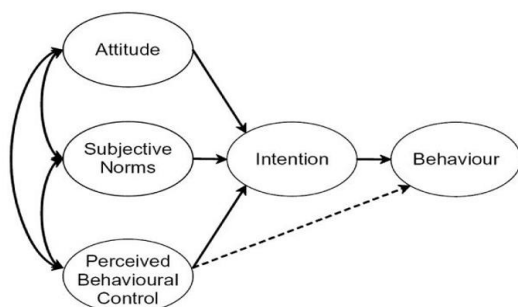
Figure 1. Theory of planned behavior

There are major differences between the groups intending to carry out behavior and those that do not. Analyzing these differences is useful in formulating intervention goals to change behavior.[20] Accordingly, this study was carried out to specify the effect of education according to the TPB on the prevention of traffic accidents among the male youth in Kurdistan, Iran.

Methods

The present quasi-experimental study has an educational intervention design. In city selection for intervention, the allocation was not random. According to the province priorities and the implementation of a pilot country traffic plan, Qorveh in Kurdistan was considered the experimental population. The neighboring city (Dehgolan) as the control group was given similarity of geographical,

cultural, and economic context. Inclusion criteria were young men aged 19-29 years with no mental disorder (according to the electronic health record). Participants with more than one absence from the training course, or more than 10% of the questionnaire being incomplete, and those without informed written consent were excluded from the study. The sample size was considered 240 people in two groups of 120 people. Taking into account the 95% power, the error of the first type of 0.05, and the information from Feenstra's study,[26] we needed 105 people (210 people in total) to do the intervention in the groups. By calculating the 20% attrition, the final sample size was 240.

$$n = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 (\delta_1^2 + \delta_2^2)}{(\mu_1 - \mu_2)^2}$$

The eligible men were selected by examining the electronic file available in the comprehensive health service centers. The researchers contacted them and explained the aim of the study, performing the plan, and keeping the information confidential. Participants signed a written consent and entered the study. This study was conducted with approval from the Institutional Review Board and Ethical Committee of Kurdistan University of Medical Sciences, Sanandaj, Iran (No. IR.MUK.REC.1398.243). Pretests were completed one week before the intervention. Post-tests were completed 2 months after the end of the intervention.

The researcher-made questionnaire consisted of two parts. The first part referred to demographic characteristics (age, level of education, marital status, job, traffic accidents history, and having a driver's license), and the second part referred to the structures of TPB. The main questions were ranked on a five-point scale, except for the behavior construct, which was ranked on a three-point scale (high, medium, low).

The attitude about accident prevention behavior was evaluated with 6 questions (e.g., I think using a cell phone in driving increases the risk of traffic accidents), subjective norms with 6 questions (e.g., my friends believe that considering the speed limit is essential), and the intention with 6 questions (e.g., I have decided to fasten the seatbelt in any situation). Perceived behavioral control was evaluated with 6 questions (e.g., I can avoid eating and drinking during driving). Additionally, the behavior was evaluated with 6 three-choice questions over the past month (e.g., I did not use my cell phone while driving last month).

Content validity index (CVI) and content validity ratio (CVR) were used to assess content and face validity. Moreover, the opinions of ten health education and development specialists and one expert psychologist were examined in line with this end. Experts were asked to rate each question using a three-part scale that implied essential items, useful but unnecessary items, and non-essential items to determine the CVR. The content index was assessed based on the relevance, clarity, and simplicity of questions. All structures rendered acceptable content ratios and indices (CVI = 0.86, CVR = 0.81). The internal consistency method was applied to estimate the reliability of the questionnaire. The pilot questionnaire was developed with the participation of 30 young men within a two-week interval. These persons have not been included in the target population. Cronbach's alpha coefficient was 0.84 for attitude structure, 0.91 for subjective norms, 0.89 for intention, 0.90 for perceived behavioral control, and 0.83 for behavior.

Intervention program: The educational intervention was developed and implemented based on constructs of the TPB and the two groups' pre-test findings during the three sessions within 3 weeks. Participants in the experimental group received the educational program. Each session lasting 45 minutes was performed for groups of 8 to 10 youth. The participants were educated based on active learning methods including lectures, group discussions, questions-answers, and pamphlets during the sessions. After each session, a booklet was given to the participants. The content of the sessions included basic information regarding traffic accidents facts (e.g., epidemiology and risk factors), the attitude toward behavior preventing (speed limit, wearing a seat belt, not using a cell phone while driving, not eating and drinking while driving, and refraining from driving while intoxicated), obstacles to complying with traffic laws, beliefs and motivation to comply, consequences of non-compliance with preventive behavior, and strategies to prevent traffic accidents. "Perceived behavioral control" was discussed through a sense of empowerment and control over compliance with traffic laws, and strategies were proposed to improve it. During the educational intervention, the control group did not receive any training, but after the intervention, to maintain the ethical principles of research, the control group also received the relevant training in one session.

Data analysis was done using descriptive tests [mean, standard deviation (SD), and frequencies] and analytical tests [analysis of covariance (ANCOVA) and linear regression] by using SPSS software (version 22, IBM Corporation, Armonk, NY, USA). Significance level for all statistical tests was 0.05.

Results

The mean age of participants was 23.93 ± 3.10 years. Most of the participants had a diploma-level education. Twenty-three percent of participants (test and control groups) were drivers. Both groups did not have a statistically significant difference in demographic variables (P > 0.05). Demographic variables are listed in table 1.

Table 1. Demographic variables of the participants in the study

Variable	Experimental group [n (%)]	Control group [n (%)]	P
Education level			
Elementary	23 (19.16)	22 (18.33)	0.58
Secondary	29 (24.16)	30 (25.00)	
Diploma	43 (35.83)	45 (37.50)	
Academic	25 (20.83)	23 (19.16)	
Marital status			
Single	64 (53.30)	63 (52.50)	0.86
Married	56 (46.70)	57 (47.50)	
Employment status	29 (55.76)	30 (57.68)	
Unemployed	43 (35.83)	40 (33.30)	0.79
Employee	55 (45.90)	56 (46.70)	
Driver	22 (18.33)	24 (20.00)	
History of accident			
Yes	94 (78.30)	99 (82.50)	0.63
No	26 (31.20)	21 (17.50)	
Driver license			
Yes	103 (85.80)	110 (91.70)	0.66
No	17 (14.20)	10 (8.30)	
Driving frequency			
Never	10 (8.30)	8 (6.66)	0.71
Rarely	17 (14.20)	21 (17.50)	
Sometimes	55 (45.90)	57 (47.50)	
Almost everyday	38 (31.66)	37 (30.83)	

The results of linear regression in table 2 reveal that among the predictor variables, only the perceived behavioral control variable had a significant effect on changes in "behavioral intention" and the model explained 37.2% of the changes in the response variable (behavioral intention) in the presence of the considered variables (R^2 = 0.372, P < 0.001). Behavioral intention explained just 8% of the changes in the observance of traffic rules behavior (R^2 = 0.08, P = 0.018).

Ultimately, table 3 shows the mean scores of the variables in the experimental and control groups in the two periods before and after the intervention. Before the intervention, the two groups had no statistically significant differences in the variables. There was a significant difference between the two groups after the intervention in the model constructs and behavioral consequences (P < 0.001).

Discussion

This study was intended to determine the effectiveness of educational intervention in promoting traffic accident prevention behaviors among the youth using a TPB. The TPB has been widely used to explain young drivers' risky and illegal driving in studies on traffic safety.[21-23]

In previous studies, "perceived behavioral control" had a significant influence on young drivers' intention to engage in risky or illegal behavior.[21,22] In this regard, Hu et al. showed that young people overestimated their driving skills given their age, had unrealistic self-confidence, and showed aggressive driving behaviors.[5] In contrast, Walsh et al. showed that perceived behavioral control did not influence intentions to use a mobile phone while driving.[24]

Similar to our findings, Mehri et al. showed that TPB was a predictor of seat belt use.[25] According to the TPB, the intention of protective behaviors arises from the positive evaluation of the positive and negative aspects of that behavior (attitude) and the approval of peers when performing this behavior (or the way peers do).

Table 2. Linear regression analysis of variables determining the intention and behaviors to prevent traffic accidents in the experimental group

Variable	Predictor variables	R2	R	β	P
Intention	Attitude	0.63	0.372	0.218	0.074
	Subjective norms			0.027	0.061
	Perceived behavioral control			0.426	< 0.001
Behavior	Intention	0.26	0.081	0.261	0.016

Table 3. Theory of planned behavior (TPB) component scores at baseline and follow-up among experimental and control groups

TPB structure	Experimental group		Control group		Within-group comparison (P) t-value		Between-groups comparison (P) t-value		ANCOVA test
	Before intervention	After intervention	Before intervention	After intervention	Experimental group	Control group	Before intervention	After intervention	F-value (P)
Attitude	21.81 ± 2.46	21.40 ± 3.45	18.30 ± 4.70	20.70 ± 4.55	(< 0.001) 4.36	(0.095) 1.71	(0.814) 0.24	(0.033) 2.17	6.47 (0.013)
Subjective norms	15.46 ± 4.84	17.23 ± 2.58	15.15 ± 6.75	18.45 ± 2.06	(< 0.001) 4.77	(0.057) 1.93	(0.699) 0.39	(0.028) 1.85	6.62 (0.010)
Perceived behavioral control	20.27 ± 3.73	21.67 ± 3.96	19.84 ± 3.18	20.44 ± 3.08	(< 0.001) 4.96	(0.199) 1.30	(0.548) 0.60	(0.004) 2.89	10.14 (0.002)
Intention	18.52 ± 4.31	19.26 ± 5.07	19.16 ± 4.78	18.46 ± 5.64	(< 0.001) 3.75	(0.807) 0.24	(> 0.999) 0.00	(0.020) 2.36	7.19 (0.009)
Behavior	8.06 ± 1.51	2.30 ± 0.48	3.99 ± 0.90	2.75 ± 0.80	(< 0.001) 4.21	(0.199) 1.30	(0.548) 0.60	(0.024) 1.32	6.11 (0.007)

ANCOVA: Analysis of covariance; SD: Standard deviation; TPB: Theory of planned behavior

This means that the behavior is affected by norms/social influences in similar situations and a positive evaluation of the effectiveness or desired results of that behavior is created along with the control expected over performance.[26]

Markl showed no significant effect of the intervention program based on TPB components regarding driving under influence of alcohol or riding with an intoxicated driver. These results may be due to the fact that all participants already show extremely high attitudes toward drink-driving in the basic measuring; it is reported as a very safe attitude regarding driving under the influence (DUI).[27]

Youth awareness and attitude can be effective in behavior change.[28] Besides, an attitude refers to the inner beliefs of the individual that affect behavior change and the social norms were effective in attempting a behavior and establishing it in this study. Additional to a group norm, there is a subjective norm that shows the social pressure of all people important to individuals.[20] In some studies, peer comparisons are used to show this effect. The hypothesis of these studies is that people make decisions that other people make in a particular situation. This approach has proven more effective in individual behavior than the other factors such as biological, personality, family, religious, and cultural effects.[29]

In training to enhance the skills, self-efficacy and perceived behavioral control have to be focused on as the behavior will not change without them.[30] Moreover, the decision and intention to carry out behavior can increase performance and change a person's behavior and the intention is usually a strong predictor of the occurrence of a behavior.[28]

Similar to many health behaviors, traffic accident prevention behaviors can have various causes not merely affecting education in changing and maintaining the proper behavior. These interventions are like a multi-stage driver's license system, improving driver's license system for those with behavioral problems, periodic re-driving tests, enforcing the law, public education through mass media, enhancing transportation infrastructure, and technical control of vehicles.[31] Moreover, to increase the effect of the intervention over time on many health behaviors, it is essential to be continued as the behavior continues. Enforcing traffic laws is one of the basic measures to move towards a safe society, which is undeniable for every human being and is one of the purposes of the World Health Organization (WHO).[32] Besides enforcing the new road driving rules, it is essential to pay attention to vehicle safety promotion, community education, driver safety behavior promotion, road safety promotion, and a comprehensive systematic approach to the involvement of all stakeholders to reduce traffic accidents.[33] Ultimately, it is critical to obtain reliable information on the results of interventions and implement programs to promote preventive behaviors from traffic accidents and reduce the number of these accidents. Information like that can assist the authorities to adopt effective policies to reduce traffic accidents.

The study was associated with some limitations. Like many quasi-experimental studies, the results obtained have to be interpreted with care and the generalization to the population has to be done carefully given the small size of the study sample and the impossibility of observing all the principles of randomization. Another limitation of the study was the gender monopoly and limiting the target group to men, and the other limitation was the lack of a follow-up period to specify the persistence of behavior which is very important in health education. Hence, focusing on these cases in future studies is suggested to get better generalizable findings.

Conclusion

Interventions aimed at changing attitudes,

mental norms, and perceived behavioral control can increase individuals' intentions to engage in health behaviors and motivate them to engage in traffic accident-preventive behaviors. It is recommended to study the use of this model in different groups and strata of society.

Conflict of Interests

Authors have no conflict of interests.

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