Hormozgan Med J. 2020 June; 24(2):e99984. doi: 10.5812/hmj.99984.

Published online 2020 June 8. **Research Article**

The Effect of Educational Intervention on Safe and High-Risk Driving Behaviors in Taxi Drivers

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Received 2019 December 08; **Revised** 2020 March 09; **Accepted** 2020 March 16.

Abstract

Background: High-risk driving behaviors is one of the leading causes of death and disability.
Objectives: The aim of this study was to determine the effect of educational intervention on promoting safe-driving behaviors and reducing high risk-driving behaviors in taxi drivers based on the health belief model and planned behavior theory.
Methods: A quasi-experimental study of interventional and control drivers (n = 40) selected by a cluster sampling method was conducted. The participants were selected from taxi stations. The intervention group was divided into 4 groups, including 10 people. The contents of the training program were based on driving laws, avoiding high-risk behaviors, and advising on safe driving behaviors. The driving behaviors were measured at baseline and 3-month post-intervention. Constructs of the health belief model and theory of planned behavior were used as an interventional program framework. Independent *t*-test and Paired *t*-test were used to compare the scores between intervention and control drivers and the intervention group before and after the intervention at each of the variables, respectively.
Results: Three months post-intervention, the scores of safe driving behaviors in the intervention group were higher than the control group, and high-risk driving behaviors in the intervention group were less than the control group. After the intervention, a significant difference was observed in the mean scores of perceived barriers, self-efficacy, cues to action, attitude, subjective norms, and perceived behavioral control between two groups ($P < 0.05$).
Conclusions: Educational intervention within the framework of the combined constructs of the health belief model and theory of planned behavior can reduce high-risk driving behaviors and promote safe driving behaviors in taxi drivers.

Keywords: Health Belief Model, High-Risk Driving Behaviors, Safe Driving Behaviors, Taxi Drivers, Theory of Planned Behavior

1. Background

Road traffic accidents (RTAs) are one of the most important health problems that endangers human health. The injuries caused by these accidents are so extensive that they are called road wars (1). Continuous and effective prevention of RTAs requires coordinated and comprehensive efforts (2). Statistics show that a death occurs every 5 seconds due to the road traffic accident (3). By 2020, the number of deaths and injuries caused by RATs is expected to increase by 80% in low/moderate income countries (4). According to the World Health Organization (WHO), 34.1 death-resulting RTAs occur per every 100,000 population, and Iran has the fifth and the first highest RTA-related mortality rate in the world and the Eastern Mediterranean countries, respectively (5). According to the WHO, the issue of RTA is largely behavioral and can be prevented by modifying individual and social behaviors. It is a fact that high-risk driving behavior is one of the important and effective factors in RTAs, and the human factor has been reported as the most common cause of RTA. This factor includes driving behaviors and inadequate driving skills (6). Taxi drivers, as a large group of professional drivers who spend most of their time driving on the road, play an important role in RTAs with their high-risk driving behaviors (7). Considering the growing trend of RTA in Iran, such as: high speed, not wearing seat belts, not driving between lanes, passing red lights, the need to reflect on this problem is important through an educational intervention based on an appropriate model. In this line, several studies have succeeded in improving the high-risk driving behaviors by using theory-based educational programs (8). Since the safe

and high-risk driving behaviors are influenced by individual, social, and environmental factors, the constructs of health belief model and theory of planned behavior were used to increase and promote safe driving behaviors, in this study. Many studies have been using these constructs to successfully train healthy behaviors (9, 10). According to the health belief model, individuals react to health and risk preventing messages when they think they are at a serious risk. Changing high-risk behavior is beneficial for them, and they can overcome barriers. Intervention is effective in such conditions, and self-efficacy, which means one's belief in his ability to stop high-risk behavior, can lead to the adoption of health-promoting behaviors and reduction of high-risk behaviors (9). The theory of planned behavior focuses on social factors and the motivation to follow high profile individuals, so several studies have considered it as an important factor in accepting desired behaviors (11, 12).

2. Objectives

Therefore, due to the importance of high-risk driving behaviors for taxi drivers, and since no intervention has ever been implemented among taxi drivers of Bandar Abbas based on behavioral models or theories to essentially focus on the impact of individual factors, attitudes and social norms on the behavior, this study was carried out to determine the effect of educational program based on constructs of theory of planned behavior and health belief model on high-risk driving behaviors of taxi drivers in Bandar Abbas.

3. Methods

3.1. Study Population and Sample Size

This study was conducted using a controlled interventional method. The study population comprised of all taxi drivers working in the city of Bandar Abbas in 2017. Inclusion criteria include: working as a taxi driver for at least one year, having the ability to read and write in Persian, being a resident of Bandar Abbas, and willing to participate in the study. Individuals who did not participate in more than one training session were excluded. The sample size, according to the below formula in each group was estimated to be 35 subjects:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 \left(s_1^2 + s_2^2\right)}{\left(\mu_1 - \mu_2\right)^2}$$

However, taking into account the sample drops and to facilitate a normal distribution of samples, 40 individuals were allocated in the intervention group and 40 in the control group. The samples were selected from the taxi stations where they were working in. 24 stations were first identified in different parts of the city, and four stations were selected from them (two stations for the intervention group and two stations for the control group). Sampling was done at each station randomly from the list of taxis employed at that station. The stations were selected in such a way that samples in the control group and intervention group could not contact each other during the implementation of the training program and after the end of the intervention until the data collection was completed in the second phase. The researcher attended the designated stations in the morning and afternoon shifts and conducted the sampling. At each station, the first driver to arrive in the station was asked to enter the study if he had the conditions to enter the study and was willing to participate in the study. Then, the next drivers were selected in the interval of five (first driver to enter the station, six drivers, eleventh driver, etc.). This method continued until the number of samples per station was completed.

3.2. Data Collection Tool

The data collection tool was a researcher-made questionnaire that contained demographic questions about age, education level, driving history, history of working as a taxi driver, the record of fines due to driving violations, as well as the constructs of theory of planned behavior and safe and high-risk driving behaviors. To design the questionnaire, the constructs of the health belief model and the driving behavior-measuring questionnaires from previous studies as well as a pilot study were used. In the pilot study, 12 drivers were invited to participate in a focused group discussion. Their attitudes on the safe driving behaviors, the possibility of an accident while driving, RTA consequences, obstacles to safe driving behaviors, cue to action, self-efficacy in performing safe driving behaviors, benefits and barriers to safe driving behaviors, subjective norms related to the safe driving behaviors, perceived behavioral control regarding safe driving behaviors, and the intention to undertake safe driving behaviors were evaluated, and the questions were developed. Questions related to the constructs of planned behavior theory and the structures of health belief model were designed based on the five-option Likert scale including; I completely agree, I agree, no comment, I disagree, and I completely disagree, which scored from 1 (completely disagree) to 5 (completely agree). The minimum and maximum scores of the health belief model questionnaire: perceived susceptibility, perceived severity, perceived barriers and cues to action were (5 - 25), perceived benefits (6 - 30), and self-efficacy (4 - 20). The minimum and maximum score of the theory of

planned behavior questionnaire: attitude (8 - 40), subjective norms (6 - 30), perceived behavioral control (5 - 25), intention (3 - 15). The minimum and maximum scores of the driving behaviors questionnaire was (0 - 96). To avoid the halo effect, some questions were designed in reverse and behavior-measuring questions (a questionnaire consisting of 32 questions) were designed based on the four-option Likert scale, including, always, most often, sometimes and never.

3.3. Reliability and Validity

To determine the content validity, the questionnaire was given to 10 health promotion and health education trainers and experts of safe behaviors and traffic, as well as their comments and points were applied (13). To determine the face validity, the questionnaire was given to 15 drivers who were similar to the target population, and they were asked to comment on the clarity, simplicity and relevance of the questions with the study objectives. No item was removed from the original questionnaire, and only a few items were corrected. The reliability of the questionnaire was calculated by Cronbach's alpha coefficient, which was higher than 0.7 in all constructs. Cronbach's alpha for each construct is as follows: perceived susceptibility (0.81), Perceived severity (0.79), Perceived Barriers (0.78), cues to action (0.79), Perceived benefits (0.82), self-efficacy (0.89), Attitude (0.84), Subjective norms (0.9), Perceived behavioral control (0.84), intention (0.87) and driving behaviors (0.76).

3.4. Implementation of Educational Intervention

At first, a pilot study was carried out in the intervention and control groups. Next, the intervention group was divided into 4 groups containing 10 samples. After that, 4 educational sessions were held for each group separately over a month. Each training session lasted for at least one hour. The trainings were delivered in the form of a lecture and a question and answer. At the end, three pamphlets containing the training program were given to the drivers. The contents of the training program were based on driving laws, avoiding high-risk behaviors, and advising on safe driving behaviors. Two months after the intervention, a post-test was carried out in both intervention and control groups. Since, there was a possibility that, the intervention group might have forgotten some educational materials during these two months, they were contacted monthly and reminded of the contents. The training sessions were flexible to best fit the taxi drivers' education level, learning strength, and availability.

3.5. Data Analysis

Data were analyzed by SPSS software version 22. At first, the score of each construct of planned behavior theory and the health belief model was calculated. The higher score indicated the stronger attitude, more subjective norms, higher perceived behavioral control, greater behavioral intention in doing safe driving behaviors, greater perceived sensitivity, greater perceived severity, more perceived benefits, more perceived barriers, higher self-efficacy, and more cue to action. To compare the constructs of planned behavior theory and health belief model in both intervention and control groups before and after the intervention, Independent *t*-test and Paired *t*-test were used.

3.6. Ethical Considerations

The study was approved by the Ethics Committee of Hormozgan University of Medical Sciences: HUMS.REC.1396.38. Before the data collection, the aims of the study were explained to the participants, and they participated in the study willingly. All participants were also assured about the confidentiality of their information. They were also told that they are free to withdraw from the study at any time for any reason.

4. Results

The average age of the participants in the intervention and control group was 45.5 years and 46.4 years, respectively. The mean driving experience in the intervention group was 18.5 years, and in the control group was 21.6 years, and there was no significant difference between them according to the result of the *t*-test. In terms of education level in the intervention and control groups, most participants were at the diploma level. Moreover, 58.3% of the samples in the intervention group and 41.7% in the control group had the history of driving fine, which according to the result of the chi-square test, there was no significant difference between them. Other background information related to the participants is shown in Table 1. The status and variations of the mean scores of constructs of the health belief model and planned behavior theory and performance (safe and high-risk driving behaviors) before and after the intervention are presented in Table 2. As outlined in the results, there was a significant difference between the mean scores of all constructs in the intervention group before and after the educational intervention. However, in the control group, a significant difference was only observed in the contrast of perceived severity before and after the intervention and this difference was not observed in other constructs. In comparison of the mean scores of constructs between planned behavior theory and health

Table 1. Comparison of the Underlying Variables of Participants in Both Intervention and Control Groups[a]

Demographic Variables	Intervention	Control	Significant Level
Age	40 (45.5)	41 (46.4)	0.74
Driving history	40 (18.8)	41 (21.6)	0.283
Taxi driving history	40 (10.07)	41 (13.07)	0.113
Fining history	14 (53)	10 (24.4)	0.337
Level of education			0.221
Illiterate	2 (5)	0	
Primary school	7 (17.5)	8 (19.5)	
Secondary school	8 (20)	12 (29.3)	
High school	8 (20)	3 (7.3)	
Diploma	12 (30)	17 (41.5)	
University	3 (7.5)	1 (2.4)	

[a]Values are expressed as number (mean).

Table 2. Comparison of the Mean Scores of Constructs of the Health Belief Model and Theory of Planned Behavior in the Intervention and Control Group Before and After the Intervention[a]

Variables	Intervention Group	Control Group	*t*-Test
Perceived sensitivity			
Before	23.9 (1.7)	23.5 (3.2)	0.59
After	24.8 (0.57)	24.5 (1.2)	0.11
Paired *t*-test	0.001	0.09	
Perceived severity			
Before	20.9 (3.2)	21.3 (2.5)	0.59
After	23.1 (4.6)	23.8 (2.5)	0.46
Paired *t*-test	0.02	0.001	
Perceived benefits			
Before	27.5 (3.8)	28.6 (2.7)	0.17
After	29.9 (0.47)	29.7 (0.7)	0.15
Paired *t*-test	0.001	0.08	
Perceived barriers			
Before	17.7 (5.5)	19.6 (4.7)	0.09
After	13.4 (4.5)	19.4 (6.5)	0.001
Paired *t*-test	0.001	0.92	
Cue to action			
Before	17.5 (5.3)	5.8 (18.8)	0.28
After	21.3 (5.4)	18.7 (5.7)	0.04
Paired *t*-test	0.005	0.89	
Self-efficacy			
Before	14.9 (2.2)	15.3 (2.3)	0.53
After	17.6 (1.3)	15.3 (2.5)	0.011
Paired *t*-test	0.001	0.9	
Attitude			
Before	27.2 (4.9)	28.8 (3.7)	0.09
After	32.2 (2.8)	28.7 (3.4)	0.001
Paired *t*-test	0.001	0.92	
Subjective norms			
Before	22.9 (1.5)	21.8 (3.4)	0.06
After	28.1 (1.4)	22.7 (3.5)	0.001
Paired *t*-test	0.001	0.21	
Perceived behavioral control			
Before	13.6 (3.7)	14.1 (4.7)	0.58
After	19.4 (3.3)	15.1 (3.60	0.001
Paired *t*-test	0.001	0.28	
Behavioral intention			
Before	13.3 (2.4)	13.5 (2.4)	0.66
After	14.9 (0.35)	14.5 (1.5)	0.14
Paired *t*-test	0.001	0.05	

[a]Values are expressed as mean (SD).

belief model in the control and intervention groups before the intervention, there was not statistically significant differences. However, a significant difference was observed in the mean scores of constructs of perceived barriers, self-efficacy, attitude, subjective norms and perceived behavioral control after the intervention ($P < 0.05$). In comparison of high-risk driving behaviors and safe driving behaviors before and after the educational intervention in the intervention and control groups showed a significant difference, in a way that, safe driving behaviors in the intervention group were higher than the control group while the high-risk driving behaviors in the intervention group were less than the control group ($P < 0.05$, Figure 1)

5. Discussion

This quasi-experimental study was conducted to determine the effect of educational intervention based on the constructs of both planned behavior theory and health belief model on driving behaviors of taxi drivers in the city of Bandar Abbas, Iran. The results of this study showed that the scores of safe driving behaviors such as keeping a proper distance from the front cars and driving at a legal speed increased from 73.8 to 86.3, and the scores of high-risk driving behaviors, such as crossing a red traffic light, having more passenger in the care than the care capacity and opening the car's door regardless of surrounding decreased from 22.1 to 9.6 among taxi drivers in the intervention group. Al-Hemoud and Al-Asfoor in a study showed that educational intervention led to the promotion of safe behaviors, such as crossing the street, in the intervention group (14). Iversean et al. also found similar results in his study that intended to modify behavior through a traffic safety campaign (15). Lack of significant difference between the two groups before the intervention in terms of

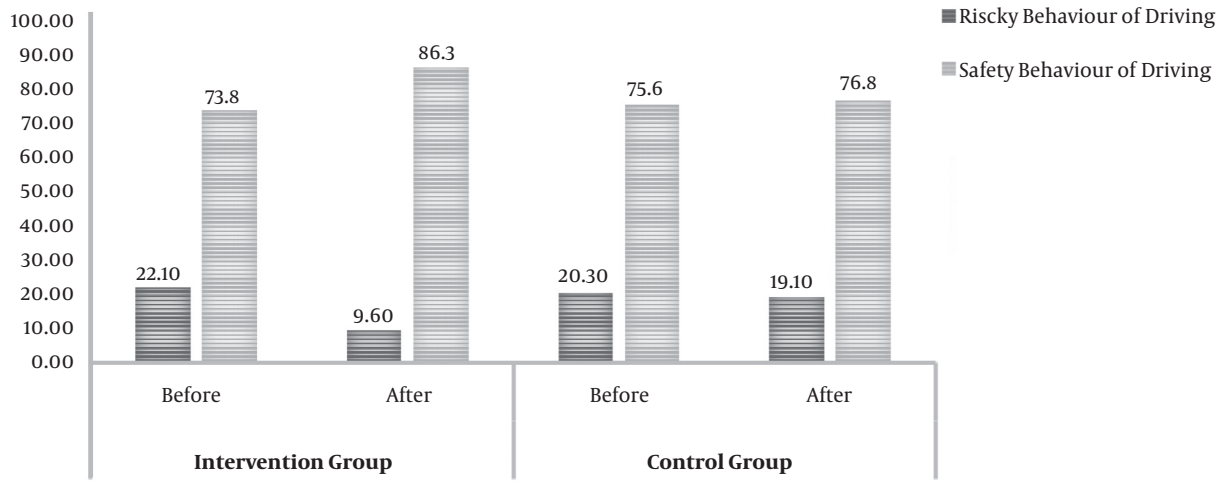

Figure 1. Comparison of the amount of performing high-risk and safe driving behaviors before and after the intervention in the intervention and control groups

the variables of behaviors and structures of the two models indicated the homogeneity of the two groups. In the control group, a significant difference was found in the construct of perceived severity before and after the intervention, which could be due to the effect of short educational videos that are broadcasted in between TV programs, or videos downloaded through social networks that show people are being severely injured in a car crash, which the researchers had no control over. On the other hand, since the police, the family, and the Taxi Union have a role to play in cue to action, their guidance and warnings on how to behave safely and also on the severity of injuries following a high-risk driving behavior could have increased the score of perceived severity in the control group. Educational intervention resulted in significant changes in the constructs of the health belief model in the intervention group. In the constructs of perceived barriers, cues to action, and self-efficacy, changes were significant compared to the pre-intervention period, but in the constructs of perceived sensitivity and perceived severity, the changes were not statistically significant. In this respect, these results are not in line with the Shafei et al.'s study (16), but they are consistent with the findings of Hanewinkel and Asshauer's study (17). One of the probable reasons could be the level of risk-taking due to the low level of education as well as social class. To be sensitive towards the high-risk behaviors and subsequently exposed to related injuries, will encourage a person to behave safely to avoid harm, and this pattern will enhance perceived sensitivity and severity. In this study, attention to the high cost of injury, limb amputation and its consequent disability (included in the educational content) could be the reason for the increase in these two constructs after the intervention. A significant decrease in the construct of perceived barriers in the intervention group indicated the impact of educational schedule on removing the perceived barriers to undertake safe driving behaviors, and to stop high-risk driving behaviors. This could be due to the reduction in driver's concern in being ridiculed and judged by colleagues while adhering to traffic laws and performing safe driving behaviors resulting from an increase in self-efficacy during the intervention. Furthermore, in the educational sessions, driving ethics were discussed with the drivers. The effect of training on the perceived barriers to undertaking safe driving behaviors has been confirmed in several studies (16, 18). However, this result is not consistent with the findings of Zhang et al.'s study (19). This discrepancy may be due to differences in the design and implementation of the educational program and training method. An increase in the cues to action could be due to the increased attention and respect to traffic police and laws. The safety of passengers and the supervision of the Taxi Union can also be a reason for the increase in cues to action compared to the pre-intervention period. The impact of the intervention on increasing the cues to action is consistent with the study of Thorsen et al. (20). The significant increase in the score of self-efficacy after the intervention in this study is consistent with the studies of Boroumandfar et al. and Rezaeian et al. (21, 22). In the present study, we attempted to reinforce the drivers' belief in their ability to prevent high-risk driving behaviors, such as lack of physical presence of police or closed-circuit television camera (CCTV) cameras and being in a hurry to reach the destination. An increase in the score of perceived benefits after the intervention in

this study is consistent with the results of Abood et al.'s study. However, this increase was not statistically significant in our study, but it was significant in Abood et al.'s study, which showed that the health belief model could significantly increase the perceived benefits of samples in the intervention group (23). The effectiveness of planned behavior theory in predicting high-risk driving behaviors and in designing educational programs has been shown in numerous studies (24, 25). The results of the present study showed a significant difference between the mean scores of all contrasts of the planned behavior theory in the intervention group before and after the intervention, which is consistent with the results of Martin et al.'s study (26). The educational method is effective in forming a positive attitude toward a subject. To better words, the art of educational interventions is to create an atmosphere in which a person has the power to logically evaluate and compare the outcomes of current behavior and the positive outcomes of recommended behavior. Once a person who has strong and positive beliefs about the outcomes of a behavior can develop a positive attitude towards the behavior, and the intention to adopt it will be formed. As the results of the present study showed, the educational intervention, by using group discussion and question & answer method, was able to significantly change the attitude as one of the predictors of behavioral intention, and this is consistent with the findings of Mohammadi Zeidi and Pakpour's study (27). After the educational intervention, the construct of social norms in the intervention group increased. In this study, social norms were investigated in four domains of family, friends, colleagues, and Taxi Union. The role of social norms, especially friends and family, in modifying behavior has been confirmed in various studies (10). One of the constructs in the theory of planned behavior is the construct of perceived behavioral control, which is influenced by two factors of perceived empowerment and control beliefs. In fact, the constructs of perceived empowerment and control beliefs were significantly increased in the intervention group after the intervention, in the present study. The participants in this study appeared to have developed an upright understanding of the barriers and facilitators of safe driving after the intervention, including the ability to respect the priority right, not performing unauthorized overtaking in two-way roads, and not stopping in prohibited areas (28, 29). The intention to behave includes motivational factors that affect the behavior, and indicates what extent people seek to behave and try to do it (30) which increased significantly after the intervention in the present study (31). In addition to positive points, this study had some limitations: First, the result assessment time was only 3 months after the intervention which can be prolonged in future research in order to better evaluation of the outcomes related to the implemented training. Secondly, the behavioral evaluation was based on self-reporting method. Therefore, further studies can employ the combined methods of self-reporting and direct observation.

5.1. Conclusions

Based on the our findings, the application of Health Belief Model and Theory of Planned Behavior is useful in designing interventions to promote safe driving behaviors and reduce high-risk driving behaviors.

Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Acknowledgments

The authors would like to thank all the participants in the study.

Footnotes

Authors' Contribution: Asghar Razmara collected the data. Teamur Aghamolaei and Abdolhossein Madani developed the study design. Shahram Zare analyzed the data. Asghar Razmara did the educational intervention. Asghar Razmara, Teamur Aghamolaei, and Zahra Hosseini interpreted the results and prepared the manuscript. All authors read and approved the final version of the manuscript.

Conflict of Interests: The authors declare that they have no competing interests.

Ethical Approval: This study was approved by the ethics committee of Hormozgan University of Medical Sciences (code: HUMS.REC.1396.38).

Funding/Support: The collection of data was funded by the Deputy of Research and Technology of Hormozgan University of Medical Sciences.

Patient Consent: Before the data collection, the purpose of the study was explained to the participants and informed consent was obtained verbally.

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