

Evaluating Community-Based Programs in Promoting Traffic Behaviors and Safe Road Crossing Behaviors in Youth: An Application on Theory of Planned Behavior

Abstract

Background: Today, one of the most serious causes of mortality and disability among youth is the traffic accidents. Regarding its importance, this paper aimed to investigate the community-based program to promote the safe traffic behaviors among youth. **Methods:** This was a quasi-experimental conducted on 5000 youth in five Iranian cities named Lanjan, Gomishan, Fasa, Tehran, and Zahedan in 2015–2016. The questionnaire was based on the constructs of the theory of planned behavior as well as a questionnaire of pedestrian behavior and driving behavior, which was completed before and after the intervention. The educational intervention was carried out based on the theory of planned behavior. Finally, the obtained data were analyzed using STATA software. **Results:** Six months after the intervention, the mean score of the theory of planned behavior and safe driving behavior in different cities was significantly increased. Here, regarding the safe crossing of the street, the most behavioral changes were observed in Gomishan ($P = 0.000$), Fasa ($P = 0.001$), and Tehran ($P < 0.0001$). The mean score of driving behaviors in Gomishan ($P < 0.000$), Fasa ($P = 0.016$), Lanjan ($P = 0.047$), and Tehran ($P < 0.0001$) scores was significantly higher. **conclusions:** In most of the studied cities, it can be concluded that education based on the theory of planned behavior can improve the safe driving behaviors among youth. Therefore, it is recommended to be implemented this program in other cities using the theory of planned behavior.

Keywords: Accident prevention, drive, health education, youth

Introduction

In 2002, the traffic injuries are known as the tenth leading cause of death in the world, which ranks eighth in the world by 2030. Ninety percent of mortalities from traffic injuries may occur in low and middle-income countries, where they account for more than 80% of the world's population and only 48% of the world's cars.^[1] In this matter, in Iran, as a developing country, the traffic accidents have the highest incidence of illnesses, which are the second leading cause of death after cardiovascular disease. These events accounted for 14.9% of all mortalities and 26.9% of the expected standard years of life lost (SEYLL), whereas the resulting mortality rate was 58 per 100,000, especially among men.^[2]

Up to now, the traffic accidents are often caused by inappropriate and unsafe behaviors by both pedestrians and drivers.^[3] In this regard, the risk behaviors in drivers are mainly influenced by several factors such

as age, emotional states while driving, driving experience, and inappropriate driving behaviors such as eating and drinking, drinking alcohol, talking on a cell phone. Meanwhile, the most important misconduct contains violations of traffic laws, failure to use protective equipment in accidents such as seat belts, failure to pay less attention to the red traffic lights, the speed limits, and accelerated driving.^[4] It should be noted that most inappropriate behaviors, especially those associated with safe crossing of the street, can be violated by traffic laws, adopting unsafe behaviors in dangerous situations, running or moving slowly while crossing the street, ignoring pedestrian traffic lights, not looking at traffic lights. Left and right, distraction, crossing unmarked locations, cell-phone use, text messaging, use of portable music players and headphones noted.^[5-9]

All after, some critical factors such as gender, age, attitude, intention, following others (abstract norms), perceived behavioral controls are important predictors of intention

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to cross the street safely and traffic behavior.^[9-12] More recently, several studies have been conducted on the impact of educational interventions to improve the perceived behavioral control of different populations.^[13-15] An important challenge in the community-based programs is the difficulty of establishing a theoretical and practical structure to investigate these interventions. The interaction between community factors and components forms the results of the program.^[16]

Here, the use of the theory of planned behavior is one of the educational frameworks to effect of street intention and behavior. According to this theory, a person's intention in a particular situation is a prediction of actual behavior, which is often determined by the person's attitude to behavior, subjective norms, and perceived behavioral control.^[11] Note that an attitude is a degree to which a person's behavior is desirable or not. Moreover, the attitude toward the reflective behavior is the outcome of one's positive or negative evaluation of that behavior.^[17] Abstract norms denote the perception of social pressures for whether or not to adopt of behavior and two factors that form it as follows: (a) normative belief and (b) one's motivation to satisfy others' expectations. Perceived behavioral control is the amount of emotion a person feels in controlling or not controlling a perceived behavior. In other words, behaviors are placed in a continuum from control to uncontrolled behavior.^[18] In planning for accident prevention and control, there is an old challenge between applying active intervention strategies (behavioral) and inactive (environmental) intervention strategies. In an active approach, despite the risks to the environment, individuals assume the role of protecting their own and others' health and safety.^[5] The descriptive or interventional studies have indicated that the efficiency of the theory of planned behavior, or the mechanisms of this theory, to enhance the traffic behaviors such as abnormal speed control, or street-crossing behavior.^[19-25] As such, this paper aims to promote the safe traffic behaviors among young people aged 19-29 years in Lanjan, Gomishan, Fasa, Zahedan, and Tehran with the help of an active approach, namely teaching people using the theory of planned behavior.

Methods

As mentioned before, this study is conducted as a quasi-experimental study of before and after type that was implemented to improve the driving behaviors as well as the safe crossing of the street in five Iranian cities based on theoretical concepts of the theory of planned behavior. To accomplish this aim, some young people from each of the five cities who participated in the study using the available sampling method. By employing this formula, the prevalence of unsafe behaviors in similar studies was achieved, with a 95%, *d* test confidence interval of 0.015. By replacing the minimum values of the sample number, 939 individuals were calculated, which counted as a final sample for each city, taking into account the likelihood of a fall of 1000. The data collection tool includes two sections: demographic

and background information and a section on measuring the constructs of the theory of planned behavior that was developed by the researcher, in which it was used after confirming its reliability and validity. In this way, the pedestrian traffic behaviors questionnaire was collected from Jalilian *et al.*^[19] at the beginning, 3 months and 6 months after the educational intervention by the researcher and self-reports.

Background and demographic variables included age, height, weight, father's education, mother's education, education level, monthly income, and accident history as the pedestrians. In the meantime, a questionnaire was employed to investigate the constructs of the theory of planning behavior, including 15 questions that were scored using a five-point Likert scale, where a higher score indicates some favorable conditions in the desired structure. Afterward, to assess the attitudes toward safe traffic behaviors, 6 questions of (I strongly from agree to disagree), 4 questions of encouraging subjective norms safe crossing (I strongly from agree to disagree), 2 questions about perceived safe behavioral control (very difficult to very easy), 3 questions of safe conduct behavior intention (very high to very low) was carried out. The adopted questionnaire for safe behaviors related to safe street crossing, contains 23 questions (consistently to never). The reliability coefficient of the designed questionnaire was ranged from 0.72 to 0.84.^[19]

In this paper, the Manchester driving behavior questionnaire (MDBQ) was used to measure the driving behaviors. The questionnaire consists of two parts. The first part is related to the demographic information including age, marital status, driving experience, number of accidents, to be guilt in the accidents. On the contrary, the second part contains five items in four subsections: slips (1 question), mistakes (9 questions), intentional violations (17 questions), and unintentional violations with three questions (unintentional violations). The measurement scale in this questionnaire is a 6-point Likert scale from never to ever.^[20] Arizi *et al.*^[21] have also confirmed both the validity and reliability of the Farsi version of this questionnaire.

The educational intervention was conducted in five educational sessions as follows:

- The first session was allocated to the epidemiology of traffic accidents in the world and in Iran, where the training was cognitive, in which a poster designed by the WHO was helped.
- The second session was discussed driving accidents accompanied by an emphasis on modifying attitudes and skills training. The session featured images, lectures, free discussion, and hands-on training. Hence, the importance of the use of the safety equipment and how to use it was educated.
- In the third session, knowledge of safe driving was educated in the cognitive domain. At this session, pamphlets containing pre-recommendations, necessary vehicle investigations, police tips for a safe driving, and how to use a seatbelt on pregnant women were educated.

- The fourth session was allocated to drive in the special (danger) weather conditions (rain, fog, snow and road frost and night driving).
- In the fifth session, post-accident first aid training was educated, including how to control bleeding, recovery position, driving a motorcycle helmet, and necessary actions during a car fire.

It should be noted that the training tracts 4 and 5 were provided to learners. Finally, a six-part educational book containing educational material was provided to young people.

Here, it is worthwhile to mention that this paper was conducted with the support of the Office of Population Health, Family, Schools, and the Ministry of Health and Medical Education of Iran in collaboration with the Institute for Prevention of Non-Communicable Diseases Research Center, and the Department of Education Development Center of the School of Public Health. After receiving approval for the research project (194088 on 2-8-2015) and receiving official authorization from the Research Vice-Chancellor of Isfahan University of Medical Sciences, this study was conducted. During a meeting in the Ministry, five cities as the representatives and the briefing on how to conduct this intervention were described for them.

Stata software (version 11) was employed for data analysis. To do so, some items such as frequency, percentage, mean, and standard deviation were considered to describe the data. Data were analyzed using a *t* test, analysis of variance (ANOVA), and Chi-square test. Moreover, multivariate analysis (MANCOVA) was then applied to specify the correlations between different constructs of safe

street-crossing behaviors as well as participants' differences in some variables before and after the intervention. Furthermore, covariance analysis (ANCOVA) was employed to control for participants' differences in some variables before and after intervention on driving behavior, where the significance level of 5% was considered in all analyses.

Results

Afterward, 5823 individuals from Gomishan (Golestan province), Fasa (Fars province), Lenjan (Isfahan province), Tehran, and Zahedan preintervention and the same number were entered after the intervention. It can be seen that there was no significant difference between the participants before and after the intervention. Besides, in all considered cities, there was no significant difference ($P > 0.05$) between the participants before and after the intervention in terms of gender and having a motorcycle license ($P > 0.05$). However, in Fasa, there was a significant difference between the participants before and after the intervention only in terms of the history of the accident as a pedestrian. In Lenjan, there was only a significant difference between the participants before and after the intervention in terms of education. In Zahedan, there was a significant difference between the participants before and after the intervention in terms of age, education, third-grade certification, and a history of accidents as a motorcycle racer. Ultimately, in Tehran, there was a significant difference between the participants before and after the intervention in terms of education, third-grade certification, history of pedestrian, driver and motorcycle accident ($P < 0.05$) [Tables 1 and 2].

Table 1: Training strategies and activities in the youth accident prevention training program

Potential Moderator of Behavior Change (Structural Theory)	A theory-based strategy to address the mediators of behavior change	Practical training activities, learning experiences, content or messages
Attitude	Reflection of emotions and emotions	Statement of national and regional statistics
	Information on expectations of the consequences of safe traffic behavior	Expressing attitudes and discussing messages based on feelings and emotions
	Information on the effectiveness and effectiveness of the action	Movie screening, a good photo of the threat created
	Increased concern about unsafe traffic behaviors, threatening or using fear-based communications about unsafe behavior	
Subjective norms	Awareness of subjective norms and expectations	Designing text and video messages about the impact of social environments and normative pressures on traffic behaviors Discuss the impact of other people on safe behaviors such as wearing a seat belt
Perceived behavioral control	Reducing the barriers and complexities of the practice, increasing individual confidence, overcoming the difficulties of the practice	Talk about obstacles and ways to overcome them, facilitators of safe traffic behavior, Introducing the role model
Behavioral intention	Balance in decision making: An analysis of the benefits and disadvantages of behavior	Benefits and Disadvantages of Behavior Analysis, Demonstrating Values for Individual and Group Activities, Group Decision Making, and Commitment
	Revealing Values: Resolving Resistance and Doubts Group decision making and public commitment	

The results showed that there was a significant difference ($P < 0.05$) between the scores of all constructs of safe street-crossing behavior, before and after the intervention ($P < 0.05$). However, there was no significant difference between the attitude scores after the intervention ($P > 0.05$).

After intervention, the attitude score was significantly increased in Gomishan and Tehran. In addition, after intervention, the score of the encouraging subjective norms in each city was significantly higher than, as compared to before intervention, except Zahedan.

After intervention, the behavioral control score in Gomishan, Fasa, and Tehran cities was significantly higher than before intervention. Meanwhile, after intervention, the behavioral intention scores in Fasa and Tehran cities were significantly higher than before intervention. The score of safe street-crossing behavior in Gomishan, Fasa, and Tehran cities after the intervention was significantly higher than before the intervention ($P < 0.05$). On the contrary, in Zahedan, after intervention, the scores of individual constructs except behavioral intention were significantly lower than before intervention by considering the effect of correlation between all constructs of safe crossing behavior as well as the effect of differences between participants before and after intervention, was significantly ($P < 0.05$) reduced in all constructs in terms of age, education, third-grade certification, and history of motorcycle collision.

In Fasa, in terms of pedestrian accident history, after controlling the effect of correlation between all constructs of safe road crossing behavior as well as the difference between participants before and after the intervention, the changes in perceived behavioral control score was not significant ($P > 0.05$). In Lanjan, after controlling the effect of the correlation between all constructs of safe road crossing behavior and also the difference between the participants before and after the intervention in terms of education, an increase in after intervention behavioral intention score was significant ($P < 0.05$), whereas increasing changes in the encouraging subjective norms of behavioral were not significant ($P > 0.05$). After controlling the effect of correlations between all constructs of safe street-crossing behavior in Tehran, as well as the effect of differences between participants before and after the intervention in terms of education, third-grade certification, and a history of accidents as pedestrians, drivers and motorcycle collision; so, there was a significant increase ($P < 0.05$) in all structures after intervention. In Gomishan, after controlling the effect of correlation between all constructs of safe road crossing behavior, there were no significant changes in behavioral control score and behavioral intention after intervention ($P > 0.05$) [Table 3].

The results indicate that the score of all four factors related to safe driving behavior in both phases before

and after intervention was significantly different between cities ($P < 0.05$). Nevertheless, there was no significant difference ($P > 0.05$) in the scores of avoidance of unintentional violations before intervention. The scores for avoiding slips, intentional offenses, inadvertent errors, and offenses, as well as safe driving behavior in the cities of Gomishan and Tehran increased noticeably after intervention, based on which in Tehran, after investigating the effect of differences in participants' educational variables, third-grade certification, a history of accidents as a pedestrian, driver and motorcycle collision were continued. In Fasa, although the increase in the score after the intervention was significant for all four factors, it was not significant for driving behavior, which increased the behavioral score after controlling for the impact of differences between participants before and after intervention in terms of pedestrian accident history. In Lanjan city, no significant changes were observed, but after controlling the effect of differences in participants' education before and after intervention, the score of safe driving behavior was significant ($P > 0.05$). In Zahedan, the scores of all factors and safe driving behavior decreased significantly, in which this trend remaining after controlling the impact of differences between participants before and after intervention in terms of age, education, third-grade certification, and history of motorcycle collision [Table 4].

Discussion

In general, 5823 individuals from the northern, southern, central, and capital cities of the country were entered in this study before and after intervention. Investigating the encouraging subjective norms safe road crossing before intervention confirmed that the considered groups had no significant difference with each other. Nevertheless, the results of six months after the educational intervention revealed a significant increase in the mean score of this construct after the educational intervention in all cities. However, the amount of these changes may vary across cities. Here, some educational strategies such as designing video and messages about the impact of social environments and subjective norms pressures on traffic behaviors, as well as discussing the impact of other people on safe behaviors such as seatbelt closure, could well modify this structure. Several studies showed that individuals in the presence of others are more likely to violate laws and perform the unsafe behaviors, especially when those present also engage in dangerous and unsafe behaviors. As such, they more likely to obey their behavior.^[11,22,26] For instance, Emilio Moyano D a stated that pedestrians were subjected to subjective norms as well as the pressures of pedestrians in violation of traffic laws, which they cannot control them.^[23]

In this research, the attitude scores in Gomishan and Tehran cities increased significantly after the intervention. However, in other cities, this increase was not significant.

Table 2: Characteristics of the study participants by time of intervention and city, separately

Variables	Tehran (1120)			Zahedan (1278)			Lanjan (1203)			Fasa (1111)			Lost (n=1111)		
	*P	After intervention	Before intervention	*P	After intervention	Before intervention	*P	After intervention	Before intervention	*P	After intervention	Before intervention	*P	After intervention	Before intervention
Average age (standard deviation)	0.941	23.76 (3.36)	23.75 (3.50)	<0.0001	22.49 (3.23)	23.42 (3.29)	0.77	24.18 (3.81)	24.23 (3.65)	0.65	25.01 (3.91)	25.10 (4.36)	0.44	24.26 (3.52)	24.15 (3.33)
Gender (number (%))															
Female	1.00	560 (50.00)	560 (50.00)	0.779	528 (45.32)	572 (44.76)	0.234	582 (48.38)	571 (50.85)	0.852	411 (47.51)	518 (47.09)	0.966	555 (49.95)	554 (49.86)
Male		560 (50.00)	560 (50.00)		637 (54.68)	706 (55.24)		621 (51.62)	552 (49.15)		454 (52.49)	582 (52.91)		556 (50.05)	557 (50.14)
Education (number (%))															
illiterate	<0.0001	5 (0.45)	3 (0.27)	<0.0001	35 (3.03)	32 (2.51)	<0.0001	2 (0.17)	2 (0.18)	0.267	4 (0.47)	3 (0.27)	0.185	12 (1.08)	23 (2.07)
High school		118 (10.55)	91 (8.13)		295 (25.50)	463 (36.31)		107 (9.20)	71 (6.44)		116 (13.55)	180 (16.50)		506 (45.67)	498 (44.91)
Diploma		389 (34.79)	292 (26.07)		179 (15.47)	252 (19.76)		541 (46.52)	398 (36.12)		333 (38.90)	399 (36.57)		388 (35.02)	405 (36.52)
Academic		606 (54.20)	734 (65.54)		648 (56.01)	528 (41.41)		513 (44.11)	631 (57.26)		403 (47.08)	509 (46.65)		202 (18.23)	183 (16.50)
Third degree certificate [number (percent)]	0.001	750 (67.20)	822 (73.46)	0.001	364 (31.54)	317 (25.18)	0.172	622 (52.14)	607 (54.98)	0.676	399 (46.83)	501 (45.88)	0.742	201 (18.14)	207 (18.68)
Motorcycle Certificate [Number (Percent)]	0.158	77 (6.89)	95 (8.48)	0.050	82 (7.12)	117 (9.32)	0.713	156 (13.15)	139 (12.64)	0.290	150 (17.71)	173 (15.90)	0.119	70 (6.32)	89 (8.03)
Accident history (number (%))															
pedestrian	0.008	103 (9.22)	147 (13.13)	0.438	140 (12.13)	140 (11.12)	0.606	85 (7.20)	73 (6.65)	0.001	93 (12.58)	76 (7.79)	0.086	66 (5.95)	48 (4.34)
Driver	<0.0001	197 (17.65)	323 (28.84)	0.434	127 (11.05)	126 (10.07)	0.629	177 (15.04)	173 (15.77)	0.458	193 (22.87)	233 (21.45)	0.541	71 (6.40)	64 (5.78)
Motorcyclist	0.013	84 (7.54)	118 (10.55)	0.003	64 (5.57)	109 (8.73)	0.395	141 (11.98)	122 (11.19)	0.578	190 (22.62)	226 (21.00)	0.578	87 (7.84)	94 (8.49)

*Use of Chi-square test to compare qualitative variables; use of independent sample t-test for age variable

Table 3: Comparison of the overall score of different constructs of safe crossing behavior (attitude, encouraging behavioral subjective norms, perceived behavioral control, behavioral intention, behavior) before and after intervention for each city

Structure	Tehran	Zahedan	Lanja	Fasa	Gomishan	P (ANOVA)
Attitude						
Mean attitude score before intervention	4.23 (0.68)	4.22 (0.76)	4.30 (0.66)	3.32 (0.60)	4.17 (0.64)	<0.0001
Mean attitude score after intervention	4.32 (0.69)	3.97 (0.79)	4.29 (0.65)	4.30 (0.75)	4.26 (0.67)	0.081
<i>P</i> (<i>t</i> -test)	0.001	<0.0001	0.496	0.505	0.002	-
* <i>P</i> (MANCOVA)	<0.0001	<0.0001	0.060	0.115	0.003	-
Behavioral abstract norms of behavior						
Mean (standard deviation) score of persuasive abstract norms before intervention	3.72 (0.90)	3.76 (1.02)	3.73 (0.94)	3.68 (0.96)	3.73 (0.88)	<0.0001
Mean (standard deviation) score of persuasive abstract norms after intervention	3.87 (0.92)	3.44 (0.85)	3.86 (0.91)	3.83 (0.94)	3.88 (0.95)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	<0.0001	0.001	0.001	0.0003	-
* <i>P</i> (MANCOVA)	<0.0001	<0.0001	0.061	0.008	<0.0001	-
Perceived behavioral control						
Mean (standard deviation) perceived behavioral control score before intervention	3.90 (0.85)	3.80 (0.97)	4.15 (0.79)	4.01 (0.81)	3.90 (0.85)	<0.0001
Mean (SD) score of perceived behavioral control after the intervention	4.04 (0.86)	3.69 (0.92)	4.16 (0.87)	4.12 (0.82)	3.97 (0.85)	<0.0001
<i>P</i> (<i>t</i> -test)	0.0001	0.004	0.587	0.004	0.049	-
* <i>P</i> (MANCOVA)	<0.0001	<0.0001	0.595	0.237	0.095	-
Behavioral intention						
Mean (SD) score of behavioral intention before intervention	3.94 (0.87)	3.64 (1.02)	3.91 (0.92)	3.83 (0.91)	3.78 (0.95)	0.035
Mean (SD) score of behavioral intention after intervention	4.10 (0.86)	3.66 (0.94)	3.90 (0.89)	3.97 (0.89)	3.74 (0.96)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	0.543	0.882	0.001	0.427	-
* <i>P</i> (MANCOVA)	<0.0001	0.005	<0.0001	0.004	0.318	-
The behavior of crossing the street safely						
Mean (SD) score of safe street crossing behavior before intervention	4.04 (0.76)	4.08 (0.81)	4.32 (0.69)	4.15 (0.69)	4.28 (0.67)	<0.0001
Mean (SD) score of safe street crossing behavior after intervention	4.30 (0.72)	2.25 (0.80)	4.31 (0.70)	4.27 (0.69)	4.38 (0.59)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	<0.0001	0.852	0.001	0.001	-
* <i>P</i> (MANCOVA)	<0.0001	<0.0001	0.491	<0.0001	0.001	-

*Multivariate analysis considering the correlation between the 5 constructs of safe street crossing behavior and differences between participants before and after the intervention (Zahedan: age, education, third grade certification, crash history as a Engine Rocket; Lanjan: Education; Tehran: Education, Third grade Certificate, Pedestrian Accident, Driver and Engine Rocket accidents; FSA: Pedestrian Accident History; None: None)

On the contrary, after intervention, the behavioral intention scores in Fasa and Tehran cities were significantly higher than before intervention, whereas in other studies, they have shown that perceived attitudes and behavioral control constitute the intention of safe behavior.^[26] On the contrary, a conducted study from different countries with different cultural levels and different levels of development has also shown that attitudes and intentions towards safe behaviors are different among these people.^[24] In other words, in different ethnic cultures, one might expect different results to be justified. On the contrary, the mean safe behaviors in Lanjan city were higher than other cities at the beginning of the study and, of course, its partial improvement after study did not show a significant change.

After the educational intervention, a significant increase in the mean score of perceived behavioral control was

observed in different cities such as Gomishan, Fasa, and Tehran. Thus, it seems that utilizing the role patterns can generate more interactions with these groups and other groups; holding an educational meeting has reinforced critical thinking in the learner and can lead to greater behavior change and behavioral control. The results of other studies were consistent with our study, so that the speed control media campaign had a declining effect on drivers' perceived behavioral control.^[25]

The results of this study indicated that the mean score of driving behaviors in Gomishan, Fasa, Lanjan, and Tehran cities has increased significantly and many of the behaviors related to slips, intentional offenses, and unintentional offenses have decreased. The driving slips such as disregarding the speedometer, missing the way also reduce deliberate offenses such as escape from a hazard lamp,

Table 4: Comparison of overall score of driving behavior and its four factors (slips, intentional offenses, errors, unintentional offenses) before and after intervention for each city

Factor	Tehran	Zahedan	Lenjan	Fasa	Gomishan	P (ANOVA)
Avoid slips						
Mean score of non-slip pre-intervention	4.19 (0.61)	3.96 (0.84)	4.44 (0.59)	4.26 (0.55)	4.18 (0.74)	<0.0001
Mean score of non-slip after intervention	4.51 (0.56)	2.41 (0.89)	4.47 (0.56)	4.35 (0.56)	4.35 (0.59)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	<0.0001	0.452	0.016	0.001	-
* <i>P</i> (ACNOVA)	<0.0001	<0.0001	0.595	0.120	0.001	-
Avoid deliberate violations						
Mean (standard deviation) score of intentionally avoiding violations before intervention	4.19 (0.67)	3.96 (0.88)	4.43 (0.89)	4.29 (0.56)	4.08 (0.96)	<0.0001
Mean (SD) score of intentionally avoiding violations after intervention	4.54 (0.59)	2.43 (0.91)	4.49 (0.91)	4.36 (0.61)	4.35 (0.66)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	<0.0001	0.061	0.037	<0.0001	-
* <i>P</i> (ACNOVA)	<0.0001	<0.0001	0.093	0.049	<0.0001	-
Avoid mistakes						
Mean (SD) score of avoidance of errors before intervention	4.28 (0.65)	3.97 (0.88)	4.52 (0.67)	4.39 (0.58)	4.20 (0.87)	<0.0001
Mean (SD) score of avoidance of errors after intervention	4.57 (0.61)	2.45 (0.93)	4.54 (0.61)	4.47 (0.58)	4.41 (0.66)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	<0.0001	0.603	0.031	0.0001	-
* <i>P</i> (ACNOVA)	<0.0001	<0.0001	0.588	0.118	0.0001	-
Avoid unintentional offenses						
Mean (standard deviation) score of avoiding unintentional violations before intervention	4.00 (0.81)	3.88 (0.94)	4.18 (0.80)	3.90 (0.80)	4.01 (0.81)	0.577
Mean (standard deviation) score of inadvertent violations after intervention	4.38 (0.76)	2.51 (0.99)	4.23 (0.73)	4.09 (0.79)	4.13 (0.76)	<0.0001
<i>P</i> (<i>t</i> -test)	<0.0001	<0.0001	0.156	<0.0001	0.029	-
* <i>P</i> (ACNOVA)	<0.0001	<0.0001	0.267	0.002	0.029	-
Safe driving behaviors						
Mean (SD) score of safe driving behavior before intervention	4.20 (0.61)	3.99 (0.86)	4.47 (0.60)	4.30 (0.53)	4.16 (0.81)	<0.0001
Factor	4.54 (0.55)	2.41 (0.90)	4.51 (0.53)	4.39 (0.54)	4.37 (0.61)	0.001
Avoid slips	<0.0001	<0.0001	0.249	0.082	0.0001	-
Mean score of non-slip pre-intervention	0.0001	<0.0001	<0.0001	0.044	0.0001	-

*Analysis of covariance considering differences between participants before and after the intervention (Zahedan: age, education, having a third degree certificate, motor accident history; Lanjan: education; Tehran: education, third-grade certificate, accident history a a pedestrian, driver, and Engine Rocket; Fasa: Accident history as a pedestrian; Lost: None)

overtaking the front car in a hazardous situation, crossing a red light and ignoring legal speed, late at night or day. The behavioral causes and social stresses and perceived behavioral control model based on object modeling as well as some solutions to causes accidents, such as productive behaviors to prevent aggressive driving, drowsiness while driving, tips for a better field of view, and tips on motor safety. All of these points reduce slips in driving such as not paying attention to speedometer, missing the way, and the ignored legal speeding at late night or day.

In Zahedan, the score of all factors and safe driving behavior were significantly reduced. It appears that the lack of impact of education to enhance the safe traffic behaviors was due to the heterogeneity of the study population in terms of demographic characteristics, education, third-grade certification, track recorded of pedestrian, driver and engine rocket accidents. In addition, in this city, the score of attitudes, perceived behavioral control, and subjective norms did not increase. This may indicate as all model constructs have not increased, it is not possible to expect

safe behaviors to improve. Therefore, a special attention should be paid more attention to the cultural and social factors of the region concerning interventions in areas with a particular indigenous and ethnic context.

The results of our study, which were conducted by educating a relatively large number of people in different cities of Iran with the help of the theory of planned behavior, although it could not be effective on all model constructs, our resulted can lead to improve the performance of safe behaviors, and the cause of improvement in other psychological factors including social identity,^[26-28] which was not evaluated in this study. Consistent with our study, several studies have reported the usefulness of the theory of planned behavior to investigate and explain pedestrian behaviors in the traffic environments.^[29-32]

Conclusions

The educational intervention designed in this study was provided to young people in five cities in the form of

the theory of planned behavior, based on applying some appropriate educational strategies. The results of the study indicate the effectiveness and success of the designed intervention. Thus, most of the theoretical constructs were significantly increased in the intervention groups after the educational intervention.

Strength points

To the best of our knowledge, this research is the first educational intervention designed based on the theory of planned behavior in the prevention of traffic accidents and pedestrian safety for the community of youth and different cities. However, the disadvantage of this study is the self-reporting method to answer the questionnaire questions. The study also assessed the high-risk behaviors and their structures in car drivers or motorcycle riders. It is also recommended to evaluate the effectiveness of these studies to improve pedestrian safety. On the contrary, the role of the environment as one of the most important determinants and influencing factors in safety has not been considered in this study.

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Conflicts of interest

There are no conflicts of interest.

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