

Safe Traffic Behaviors in High School Students: a Predictive Cross-sectional Study Based on the Theory of Planned Behavior

Vahid Ranaei

Hormozgan University of Medical Sciences

Laleh Hassani (✉ 7hassani1969@gmail.com)

Hormozgan University of Medical Sciences <https://orcid.org/0000-0001-8446-0992>

Alireza Shahab Jahanlou

Hormozgan University of Medical Sciences

Ghodratollah Roshanaei

Hamadan University of Medical Sciences

Forouzan Rezapur-Shahkolai

Hamadan University of Medical Sciences

Research

Keywords: School health, Safe behavior, Health promotion, Theory of planned behavior, Adolescent, Injury, Road traffic

Posted Date: March 10th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-281581/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Abstract

Background: Road traffic injuries are known as one of the leading causes of death of young people in the world. Therefore, the present study was conducted to investigating the effective factors on safe traffic behavior of high school students in Hamadan using the theory of planned behavior.

Methods: The present study is a cross-sectional-analytical study. The population of this study was all high school male students in Hamadan in the academic year 2020, of which 414 were selected by stratified random sampling method. The data collection tool was a researcher-made questionnaire that was conducted and were confirmed its validity and reliability.

Results: Findings from Spearman correlation analysis and multiple regression showed that there is a significant positive relationship between knowledge ($p < 0.001$), attitudes towards behavior ($p < 0.001$), subjective norms ($p < 0.001$) and perceived behavioral control ($p < 0.001$) with students' behavioral intention. Also, was significant the effect of perceived behavioral control ($P < 0.001$) and behavioral intention ($P < 0.001$) on traffic safety behavior.

Conclusion: Based on the findings, it can be concluded that the theory of planned behavior can be useful in predicting safe traffic behaviors.

Background

Despite being predictable and preventable, road traffic injuries (RTI) are considered as one of the most important public health challenges that place heavy economic and social pressures on any community, especially the developing ones (1). In fact, RTI are the most important cause of death in developing countries (2). In this regard, studies indicate that the annual RTI rate in Iran is 34 cases per 100 thousand people, while worldwide, this rate is 18 cases per 100 thousand people (3, 4).

In addition, RTI are known as one of the leading causes of death of young people in the world (5). According to studies, RTI account for approximately 35 to 40% of adolescent deaths in Western countries, and high-risk road behaviors among the most important predictors (6). Therefore, according to studies, children and adolescents are the most vulnerable group in the road traffic system and RTI are one of the deadliest and most common types of injuries for them (7).

Now, considering the importance of people's behavior in the occurrence of RTI, special attention to the people's behavior, perceptions, attitudes and beliefs about safe traffic behaviors is important, and in the meantime, the theory of planned behavior (TPB) (8) has been used with a wide range of evidence to predict a variety of behaviors, including safe traffic behaviors. The framework of TPB components' relationships according to (8) is shown in Fig. 1.

According to the TPB, people's attitudes toward behaviors and their consequences, their subjective norms derived from important patterns of life, and the sense of efficiency and their perceived behavioral control indirectly determine their behavior through behavioral intention. Thus, behavioral intention is the main predictor of behavior (9) and external abnormal norms (e.g., norms promoted in society and pressures from parents, friends, etc.) and internal abnormal norms (e.g., internalized norms), will determine a person's attitude toward behavior and their perceived sense of self-efficacy and control, intentionality, and motivation to engage in behavior.

Regarding traffic safety behaviors, it has been shown that a person's knowledge of road safety is an independent protective factor for RTI, and students who have a large number of high-risk traffic behaviors or little knowledge of road safety rules are more affected by the accidents (10). Also, positively perception of the misbehavior (subjective norm) of others and attitudes toward road safety and perception of danger are negatively associated with high-risk road behaviors of children and adolescents (5). Evidence from studies confirms that people who are highly prone to high-risk road behaviors may also have a negative attitude toward traffic safety (11). In addition, it should be noted that when behavior is not fully pre-planned, complementary factors such as a sense of self-efficacy and control over behavior are important to explain the actions observed by road users (5).

Considering the above and the usefulness of the theory of planned behavior in explaining and predicting behaviors, this study aims to investigate the relationship between the constructs of the theory of planned behavior and performance of safe traffic behaviors in male high school students of Hamadan city.

Method

Study design

This is a cross-sectional-analytical study. The study population included all male high school students in Hamadan in the academic year 2020; 414 of whom were selected by stratified random sampling, in such a way that the research community was divided into eight classes based on the two education districts of Hamadan, public and private schools and the first (seventh, eighth and ninth grade) and second (tenth, eleventh and twelfth) grades of secondary schools. Then, the number of samples for each class was selected according to the number of students in each class of the research community.

Entry and exit criteria

Students studying in high school, and living in Hamadan were among the entry criteria, and the agreement form was not filled by students and their parents was the criterion for leaving the study.

Instrument

The data collection tool was an researcher-made self-rating questionnaire that was designed after conducting semi-structured interviews with students and the recommended process of Ajzan (12) and Francis (4) was used in its construction. According to these researchers, except behavior, the variables of the theory of planned behavior include psychological (internal) constructs. Thus, each predictor variable can be measured directly or indirectly by asking respondents about their general attitudes; for example, by asking respondents about specific behavioral beliefs and evaluations. However, since neither of these two methods is complete, a combination of these two methods should be used to construct a questionnaire for measuring the variables of the theory of planned behavior. On the other hand, these researchers use the principle of Target, Action, Context and Time (TACT) to define target behavior and divide behavior into these four elements. Also, in the arrangement of items, those related to measuring attitude are presented along with those measuring subjective norms and perceived behavioral control. Other cases of constructing a questionnaire for measuring the variables of the theory of planned behavior are presented in detail in the mentioned studies.

After obtaining the consent form of the participants as well as their parents, the students participated in the study voluntarily. The response rate of the participants in the present study was 87%. In this study, a questionnaire including questions was used which was related to students' knowledge and behavior.

Part one

The first part of the questionnaire was related to the demographic variables of the participants (7 items).

Part two

The second part to the knowledge items (5 items), behavioral perception (6 items), subjective norms (6 items), perceived controlled behavior (6 items), behavioral intention (3 items) and behavior (3 items). Items about knowledge were 4-choice questions (one true choice/three wrong choices) with a minimum score of zero and a maximum score of 5 (example: Which occupant should wear a seat belt?), items about attitudes were questions with five-points Likert Scale, with a minimum score of 6 and a maximum score of 30 (example: I like to wear a helmet while cycling), subjective norms were questions with five-points Likert Scale with a minimum score of 6 and a maximum score of 30 (Example: People who matter to me recommend that I fasten my seat belt in the car), items about perceived behavioral control were questions with five-points Likert Scale with a minimum score of 6 and a maximum score of 30 (example: In any situation, I can cross from pedestrian crossings, overpasses and authorized underpasses), behavioral intention questions with five-points Likert Scale had a minimum score of 3 and a maximum score of 15 (example: I plan to use a helmet for cycling for greater safety from now on) and behavioral items were questions with five-points Likert Scale with a minimum score of 3 and a maximum score of 15 (example: I fasten my seat belt in the car).

In order to analyze the face validity of the questionnaire, it was given to 10 students participating in the study and 10 health education and health promotion specialists in the field of health and safe traffic behaviors, and the level of difficulty and comprehensibility of the items were investigated and corrections were made. To measure the content validity by quantitative method, two coefficients of content validity ratio (CVR) and content validity index (CVI) were used with using a panel of experts. Content validity ratio was confirmed considering the numerous experts used and the score higher than 0.62 in the Lawshe table, and a score higher than 0.79 was used to confirm the content validity index. Also, in this study, confirmatory factor analysis method was used to measure and determine the structural validity.

Data analysis

To evaluate the reliability, the questionnaire was distributed among 30 students and a Cronbach's alpha of 0.95 was obtained. The collected data were analyzed using SPSS version 21 and appropriate statistical test with a significance level of 0.05.

Results

The sample consisted of 414 male high school students. The frequency and frequency percentage of demographic variables and the mean (standard deviation) of the constructs of the theory of planned behavior are presented in Table 1.

Table 1

Frequency and percentage of demographic variables and mean (standard deviation) of the structures of the theory of planned behavior according to each of the demographic variables

Variables	Frequency	Percentage	Mean (standard deviation)						
			Knowledge	Attitudes towards behavior	Subjective norms	Perceived behavioral control	Behavioral intention	Behavior	
Grade									
	12	73	24.1	2.64(1.02)	20.47(4.38)	20.15(5.16)	22.09(6.21)	11.64(3.78)	10.06(3.60)
	11	80	26.4	2.58(0.94)	20.35(3.85)	19.70(4.83)	22.33(6.02)	11.76(3.47)	9.87(3.51)
	10	2	0.7	3.5(0.70)	23.00(1.41)	23.50(2.12)	29.00(1.41)	15.00(0)	14.00(1.41)
	9	64	21.1	2.65(0.91)	19.23(5.13)	18.81(6.64)	21.39(6.73)	11.56(3.58)	9.90(3.33)
	8	83	27.4	2.80(0.84)	19.75(4.90)	19.96(5.59)	22.02(6.53)	11.43(3.79)	9.57(3.39)
	7	1	0.3	3.00(0)	25.00(0)	22.00(0)	25.00(0)	13.00(0)	10.00(0)
Education district									
	1	200	55.2	2.71(0.91)	19.44(5.33)	19.01(6.16)	21.54(6.70)	11.42(3.83)	9.58(3.66)
	2	162	44.8	2.48(1.03)	17.68(6.19)	17.64(6.63)	19.55(7.55)	10.13(4.32)	8.78(3.83)
Level of study									
	1st	232	64.1	2.62(0.93)	18.06(6.17)	17.95(6.85)	20.06(7.41)	10.62(4.24)	9.12(3.81)
	2nd	130	35.9	2.59(1.04)	19.70(4.88)	19.19(5.47)	21.71(6.56)	11.23(3.82)	9.40(3.65)
Type of school									
	Public	299	82.6	2.60(0.99)	18.73(5.74)	18.52(6.46)	20.68(7.19)	10.90(4.15)	9.25(3.76)
	Private	63	17.4	2.64(0.88)	18.25(6.02)	17.82(6.15)	20.49(7.03)	10.53(3.86)	9.11(3.74)
Number of family members									
	3	50	15.7	2.81(0.83)	19.70(4.14)	20.06(4.59)	21.38(6.18)	11.38(3.36)	9.42(3.27)
	4	171	53.8	2.67(0.97)	20.02(4.42)	19.36(5.67)	22.14(5.98)	11.78(3.43)	9.84(3.36)
	5	79	24.8	2.69(0.96)	19.44(5.58)	19.79(5.82)	21.62(7.33)	10.94(4.28)	9.74(3.92)
	6	12	3.8	2.27(0.90)	17.50(6.59)	15.41(7.91)	19.16(7.64)	10.91(4.42)	9.58(4.03)
	7	5	1.6	2.20(0.83)	16.20(10.28)	16.20(10.28)	18.20(11.49)	10.00(6.40)	9.40(5.94)
	8	1	0.3	1.00(0)	24.00(0)	18.00(0)	11.00(0)	3.00(0)	7.00(0)
Father's job									
	Self-employed	153	42.4	2.72(0.92)	18.86(5.13)	18.81(6.00)	21.03(6.58)	11.17(3.79)	9.32(3.50)
	Employee	110	30.5	2.68(0.97)	18.77(6.16)	17.92(6.73)	20.92(7.41)	10.69(4.30)	9.12(4.02)
	Manual worker	29	8	2.34(1.23)	16.72(6.20)	16.55(6.61)	18.24(7.45)	9.72(4.28)	8.65(4.21)
	Driver	20	5.5	2.22(0.87)	16.30(7.17)	17.36(7.31)	17.65(8.23)	9.50(4.75)	8.40(3.64)
	Retired	48	13.3	2.42(0.90)	19.62(5.76)	19.45(6.30)	21.39(7.38)	11.23(4.12)	9.76(3.67)
	Other	1	0.3	3.00(0)	24.00(0)	25.00(0)	30.00(0)	15.00(0)	15.00(0)
Mother's job									
	Self-employed	58	17	2.56(1.24)	16.65(6.91)	16.67(7.23)	19.08(8.09)	9.87(4.70)	8.74(4.18)
	Employee	70	20.5	2.75(6.32)	17.67(6.32)	17.34(6.85)	19.18(7.30)	10.15(4.24)	8.61(3.72)
	Manual worker	4	1.2	1.75(0.95)	11.75(7.27)	11.25(9.25)	13.50(7.32)	7.25(5.31)	4.00(2.00)
	Driver	2	0.6	2.00(1.41)	13.50(10.60)	25.00(0)	14.50(14.84)	9.00(7.07)	6.50(3.53)

	Retired	10	2.9	2.30(0.82)	17.70(6.60)	19.30(6.53)	19.90(8.55)	10.50(4.35)	8.70(3.62)
	Housewife	198	57.9	2.62(0.87)	20.06(4.37)	19.49(5.63)	22.09(6.24)	11.60(3.62)	9.77(3.46)
Father's education level									
	Below diploma	89	24.9	2.59(0.91)		18.57(5.92)	20.79(6.80)	11.01(4.02)	9.34(3.68)
	Diploma	112	31.4	2.65(1.03)	18.73(5.14)	18.91(6.10)	21.27(7.11)	11.41(3.72)	9.59(3.61)
	Associate Degree	42	11.8	2.47(0.90)	19.27(5.51)	17.71(6.56)	19.33(7.38)	10.21(4.50)	8.54(3.65)
	Bachelor	70	19.6	2.63(0.94)	18.88(5.61)	17.54(7.24)	19.94(7.17)	10.20(4.25)	8.48(3.99)
	Master	33	9.2	2.60(0.93)	17.47(6.56)	19.87(6.21)	22.06(6.98)	11.21(4.23)	9.75(3.59)
	Ph.D.	11	3.1	2.60(1.26)	19.66(5.80)	15.72(8.16)	20.18(9.63)	10.36(4.80)	9.81(4.35)
Mother's education level									
	Below diploma	85	24.7	2.68(1.04)	19.72(5.30)	18.95(6.07)	21.64(7.25)	11.43(3.98)	9.76(3.81)
	Diploma	128	37.2	2.56(0.83)	19.25(4.87)	18.67(6.04)	21.00(6.84)	11.10(3.94)	9.35(3.78)
	Associate Degree	43	12.5	2.53(0.83)	19.69(4.93)	18.97(5.58)	21.69(5.81)	11.32(3.40)	9.55(3.12)
	Bachelor	67	19.5	2.61(1.02)	18.13(6.69)	18.88(6.87)	20.28(7.32)	10.60(4.28)	8.66(3.74)
	Master	13	3.8	2.76(1.09)	16.38(5.78)	14.91(7.39)	18.23(8.37)	9.53(4.68)	8.69(3.61)
	Ph.D.	8	2.3	2.14(1.57)	9.00(6.18)	10.37(7.90)	11.00(6.07)	5.50(3.74)	5.12(2.99)
Transportation mode									
	On foot	142	41.3	2.60(1.00)	19.78(5.03)	19.10(5.71)	21.54(6.59)	11.32(3.86)	9.75(3.72)
	Bike	25	7.3	2.00(0.89)	15.08(7.78)	15.00(8.25)	17.40(9.21)	9.28(4.14)	7.40(3.88)
	Public transportation	99	28.8	2.69(0.96)	19.43(5.18)	19.35(5.91)	21.30(6.65)	11.18(3.98)	9.58(3.64)
	A combination of three methods	78	22.7	2.73(0.96)	17.96(5.77)	18.03(6.73)	20.19(7.57)	10.64(4.32)	8.64(3.75)

Most of the samples (n=83) (27.4%) studied in grade of eight and 41.3% of students travel on foot. The highest average behavioral scores was related to those who were in 10th grade, district one in terms of educational district, second period in terms of the course, public schools in terms of type of school, four-member families in terms of number of family members, retired fathers in terms of father's job, housewife in terms of mother's job, doctorate in terms of father's education, lower than diploma degree in terms of mother's education, school transportation mode of walking.

The mean and standard deviation of the constructs of the theory of planned behavior are presented in Table 2.

Table 2
Mean and standard deviation of the constructs of the theory of planned behavior (N = 414)

Variable	Mean	SD	Range of obtained scores
Attitudes towards behavior	18.65	5.79	6-30
Subjective norms	18.40	6.40	6-30
Perceived behavioral control	20.65	7.15	6-30
Behavioral intention	10.84	4.10	3-15
Behavior	9.22	3.75	3-15

Due to the lack of data normality hypothesis using the Kolmogorov-Smirnov test, Spearman correlation coefficient was used to investigate the relationship between the constructs of the theory of planned behavior (Tables 3 and 4).

Table 3

Relationship between the constructs of the theory of planned behavior and the behavioral intention of safe traffic behavior of students

Constructs of the theory of planned behavior	Correlation coefficient	P-value
Knowledge	0.192	<0.001
Attitudes towards behavior	0.671	<0.001
Subjective norms	0.649	<0.001
Perceived behavioral control	0.772	<0.001

Table 4

Relationship between the constructs of planning behavior theory and students' safe traffic behavior

Constructs of the theory of planned behavior	Correlation coefficient	P-value
Perceived behavioral control	0.738	<0.001
Behavioral intention	0.783	<0.001

There is a significant positive relationship between the constructs of the theory of planned behavior and students' behavioral intention ($P < 0.001$). There is a significant positive relationship between the structure of behavioral intention and students' safe traffic behavior. There is also a significant positive relationship between perceived behavioral control structures and students' safe traffic behavior ($P < 0.001$). Multiple Regressions was used to investigate the role of the constructs of the theory of planned behavior and other demographic variables in predicting safe traffic behavior (Table 5).

Table 5

Summary of the model examining the role of constructs in the theory of planned behavior and other demographic variables in predicting safe traffic behavior

Model	R	R ²	Adjusted R ²	F	Significance level
1	0.82	0.67	0.65	39.27	0.00

As shown in Table 5, the multiple correlation values and the coefficient of determination are 0.82 and 0.67, respectively. In fact, the coefficient of determination shows that approximately 67% of the changes in safe traffic behavior are explained by the model (predictor variables). Also, the results of analysis of variance of the regression model showed that since the p-value of the test is less than 0.05, the regression model is significant. That is, the model is able to predict changes in safe traffic behavior. The coefficients of the Multiple Regression model are presented in Table 6 for the predictor variables.

As shown in Table 6, based on the results of the regression model, the effect of attitude towards behavior, perceived behavioral control, behavioral intention and number of family members is significant on the safe traffic behavior. For example, keeping other variables constant, the score of safe traffic behavior increases by 0.82.

Table 6

Results of multiple regression model of safe traffic behavior score

Variable	Coefficients	Standard deviation	Confidence interval	P value
Intercept	-0.89	1.380	(-3.607,1.826)	0.519
Knowledge	0.007	0.135	(-0.257,0.272)	0.956
Attitude toward behavior	0.086	0.041	(0.005,0.166)	0.036
Subjective norms	-0.009	0.032	(-0.071,0.053)	0.778
Perceived behavioral control	0.129	0.035	(0.061,0.197)	<0.001
Behavioral intention	0.527	0.050	(0.428,0.626)	<0.001
District	0.018	0.252	(-0.477,0.514)	0.942
Educational level	-0.379	0.264	(-0.899,0.141)	0.153
Type of school	0.144	0.336	(-0.518,0.806)	0.669
No. of family members	0.348	0.151	(-0.051,0.645)	0.022
Father's job	0.035	0.091	(-0.144,0.213)	0.701
Mother's job	-0.095	0.063	(-0.220,0.30)	0.134
Father's education	0.049	0.110	(-0.168,0.265)	0.659
Mother's education	-0.215	0.135	(0.480,-0.050)	0.112
Transportation mode to school	-0.103	0.101	(0.302,-0.096)	0.310

Discussion

The findings showed that there is a significant positive relationship between the constructs of the theory of planned behavior with behavioral intention and safe traffic behavior among students. Also, the effect of attitude was significant on behavior, perceived behavioral control, behavioral intention and the effect of the number of family members was also significant on safe traffic behavior.

The findings of this study indicate the positive and significant relationship between safe traffic behavior of students and their attitudes, which is consistent with the study of Hemmati and Gharlipour (13), who showed a positive and significant correlation between safe traffic behavior by high school students with their attitude towards the consequences of this behavior ($r = 0.20$). Lajunen & Räsänen (14, 15) also showed in their studies that all constructs of the theory of planned behavior had a positive and significant relationship with the behavior of adolescents using helmets when cycling. Also, Tabibi and Kiafer (16) showed that traffic risk education can increase the attitude and perception of preschool children towards the dangerous consequences of unsafe behaviors and bring it to the perception level of 9-year-old children. In addition, Zhou et al. (17) showed that in the basic TPB model, attitude structure had a significant relationship with unsafe pedestrian behaviors. In this regard, it can be stated that expectations of students in terms of the positive consequences of performing safe traffic behaviors and the negative consequences of not doing them (outcome expectance) and estimating and evaluating these consequences (outcome value) (18) is effective on their intention to perform safe traffic behaviors. However, in the study of Queen et al. (19) on students, behavioral intention was predicted by subjective norm (regression coefficient of 0.45) and perceived behavioral control (0.22), while attitudes toward behavior were not effective on intention to use helmet when cycling.

Another finding of the present study was that there is a positive and significant relationship between students' safe traffic behavior and their perceived behavioral control. In this regard, it has been shown that there is a positive and significant relationship between safe behavior of students crossing the street with their perceived behavioral control ($r = 0.24$) (13). Also, in another study, a significant relationship was observed between safe road crossing behavior and behavioral intention constructs, perceived behavioral control, compliance motivation, outcome evaluation, and normative beliefs (20). Regarding this finding, it should be noted that perceived behavioral control refers to a person's perception of how easy or difficult the behavior is and has two dimensions: believing in the ability to control behavior and confidence in the ability to complete and perform the behavior (self-efficacy) (8). Thus, according to the theory of planned behavior, when a person considers himself capable of performing a particular behavior, it will increase the intention to perform that behavior. The results of the present study showed that there is a positive and significant relationship between students' safe traffic behavior and subjective norms. In this regard, other studies have reported a significant relationship between safe behavior on the road and subjective norms (20). Lajunen & Räsänen (14) also mentioned that the most effective factor to increase the use of helmets when riding a bicycle among students is the influence of peers and parents' awareness about the benefits of using helmets. However, in contradiction to the present study, Diaz (21) study showed that, compared to subjective norms, attitude has a greater effect on behavioral intention. In addition, in Hemmati and Gharlipour (13) study, no significant relationship was observed between students' safe behavior and subjective norms. It is likely that in Hemmati and Gharlipour's study, significant others (such as parents, teachers, and traffic police) were unable to influence students' decisions about safe road crossing behavior and the necessary training have not been provided.

The present study also showed a significant relationship between students' safe traffic behavior and their intention to do so. In this regard, studies have shown that there is a significant relationship between safe road crossing behavior and behavioral intention (13, 20). Also, Jiang et al. (22, 23) and Piazza et al. (24)

showed in their studies that behavioral intention and other constructs of the theory of planned behavior have a significant relation with using mobile phones while cycling and crossing the street.

Although in the present study, no significant relationship was observed between students' age and safe traffic behaviors, but the number of family members was a significant predictor of safe traffic behaviors in students. In this regard, Tabibi and Kiafer (16) showed that the growth of the ability to identify high-risk and unsafe points when crossing the road and related arguments will be sustainable after age 10. However, according to the present study, the presence of family members as a model can create commitment to safe traffic behaviors in students and children and adolescents among family members, and therefore, by influencing their subjective norms it increases behavioral intention and performance of safe traffic behaviors.

Limitations

The present study also had some limitations. For example, in this study, a self-report instrument was used to collect data, which can be associated with participants' biases in providing answers due to the factor of social desirability. In addition, the findings of the present study were limited to male high school students in the city of Hamadan, which requires caution in generalizing the findings to other gender and age groups.

Conclusion

Considering the positive and significant relationship between the constructs of the theory of planned behavior and performing safe traffic behaviors, it can be concluded that this theory can provide a useful framework for strengthening safe traffic behaviors. Families and schools can be effective in enhancing adolescent safe traffic behaviors by increasing knowledge and motivation. Also, development and promotion of laws related to safe traffic behaviors (for example, wearing a helmet when using a bicycle or motorbike, crossing pedestrian lanes on the streets, or not using a cell phone when crossing the street or driving with Bicycles and motorcycles) can influence the intentions and performance of safe traffic behaviors by influencing the structures of the theory of planned behavior.

Abbreviations

TPB: Theory of planned behavior; TACT: Target, Action, Context and Time; CVR: content validity ratio; CVI: content validity index; RTI: Road traffic injuries

Declarations

Acknowledgments

The present study has been approved and financially supported by Hormozgan University of Medical Sciences. (Project Number: 980457). We appreciate all the students participating in this project, as well as all those who helped us in schools and traffic police.

Authors' contributions

LH, FRSH and ASHJ designed the study. VR wrote the first draft. GHR conducted the analyses. All authors contributed to writing, revising, and approved the final manuscript.

Funding

This study is sponsored by Hormozgan University of Medical Sciences in Hormozgan, Iran. The funding agencies had no role in the design of study, data collection and analysis, or presentation of the results.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study on which these data analyses are based was approved by the Ethical Board Committee of Hormozgan University of Medical Sciences (specific number of the ethics committee: IR.HUMS.REC.1398.484). Participants were provided information about the study and consented by proceeding to take the survey; this implied consent was approved by the Ethical Board Committee of Hormozgan of Medical Sciences.

Consent for publication

Not applicable.

Competing interests

The authors have no conflicts of interest.

References

1. Soltani G, Ahmadi B, Pourreza A, Rahimi A. Investigating Prevalence of deaths from Traffic Accidents and Factors Associated with it in Yazd in 2009. *SSU_Journals*. 2014;21(6):831-9.
2. Omid 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.
3. Shadmani FK, Mansori K, Karami M, Zayeri F, Shadman RK, Hanis SM, et al. Avoidable burden of risk factors for serious road traffic crashes in Iran: A modeling study. *Journal of preventive medicine and public health*. 2017;50(2):83.
4. Francis J, Eccles MP, Johnston M, Walker A, Grimshaw JM, Foy R, et al. *Constructing questionnaires based on the theory of planned behaviour: A manual for health services researchers*. Centre for Health Services Research, University of Newcastle upon Tyne; 2004.
5. Alonso F, Esteban C, Useche S, Colomer N. Effect of road safety education on road risky behaviors of Spanish children and adolescents: findings from a national study. *International journal of environmental research and public health*. 2018;15(12):2828.
6. Assailly J. Road safety education: What works? Patient education and counseling. 2017;100:S24-S9.
7. Kelishadi R, Jari M, Qorbani M, Motlagh ME, Djalalinia S, Safiri S, et al. Association of socio-economic status with injuries in children and adolescents: The CASPIAN-IV study. *International Journal of Pediatrics*. 2016;4(5):1715-24.
8. Ajzen I. The theory of planned behavior. *Organizational behavior and human decision processes*. 1991;50(2):179-211.
9. Sheeran P, Orbell S. Augmenting the theory of planned behavior: roles for anticipated regret and descriptive norms 1. *Journal of Applied Social Psychology*. 1999;29(10):2107-42.
10. Dong X, Peek-Asa C, Yang J, Wang S, Chen X, Chi G, et al. The association of road safety knowledge and risk behaviour with paediatric road traffic injury in Guangzhou, China. *Injury prevention*. 2011;17(1):15-20.
11. Nabi H, Salmi LR, Lafont S, Chiron M, Zins M, Lagarde E. Attitudes associated with behavioral predictors of serious road traffic crashes: results from the GAZEL cohort. *Injury Prevention*. 2007;13(1):26-31.
12. Ajzen I. Constructing a TPB questionnaire: conceptual and methodological considerations. 2002. Revised January. 2006.
13. Hemmati R, Gharlipour Z. Study of the safe behavior in road crossing using the theory of planned behavior among middle school students. *International Journal of Pediatrics*. 2017;5(5):5003-12.
14. Lajunen T, Räsänen M. Why teenagers owning a bicycle helmet do not use their helmets. *Journal of safety research*. 2001;32(3):323-32.
15. Lajunen T, Räsänen M. Can social psychological models be used to promote bicycle helmet use among teenagers? A comparison of the Health Belief Model, Theory of Planned Behavior and the Locus of Control. *Journal of safety research*. 2004;35(1):115-23.
16. Tabibi Z, Kiafar M. Ability of preschool children in perception of traffic dangers: an interventional study. 2013.
17. Zhou H, Romero SB, Qin X. An extension of the theory of planned behavior to predict pedestrians' violating crossing behavior using structural equation modeling. *Accident Analysis & Prevention*. 2016;95:417-24.
18. Maddux JE, Norton LW, Stoltenberg CD. Self-efficacy expectancy, outcome expectancy, and outcome value: Relative effects on behavioral intentions. *Journal of Personality and Social Psychology*. 1986;51(4):783.
19. Quine L, Rutter DR, Arnold L. Predicting and understanding safety helmet use among schoolboy cyclists: a comparison of the theory of planned behaviour and the health belief model. *Psychology and Health*. 1998;13(2):251-69.
20. Khalife Nilsaz m, tavasoli e, ramazankhani a, dehdari t, sori h, akbarpoor s, et al. Survey on Relationship Between Constructs of The Planned Behavior and Road Crossing Safe Behaviors Among The Fourth Grade Students of Tehran City. *scientific journal of ilam university of medical sciences*. 2013;21(3):156-62.
21. Diaz EM. Theory of planned behavior and pedestrians' intentions to violate traffic regulations. *Transportation Research Part F: Traffic Psychology and Behaviour*. 2002;5(3):169-75.
22. Jiang K, Ling F, Feng Z, Wang K, Guo L. Psychological predictors of mobile phone use while crossing the street among college students: An application of the theory of planned behavior. *Traffic injury prevention*. 2017;18(2):118-23.
23. Jiang K, Yang Z, Feng Z, Yu Z, Bao S, Huang Z. Mobile phone use while cycling: a study based on the theory of planned behavior. *Transportation research part F: traffic psychology and behaviour*. 2019;64:388-400.
24. Piazza AJ, Knowlton AP, Hibberd E, Leeper J, Paschal AM, Usdan S. Mobile device use while crossing the street: utilizing the theory of planned behavior. *Accident Analysis & Prevention*. 2019;127:9-18.

Figures

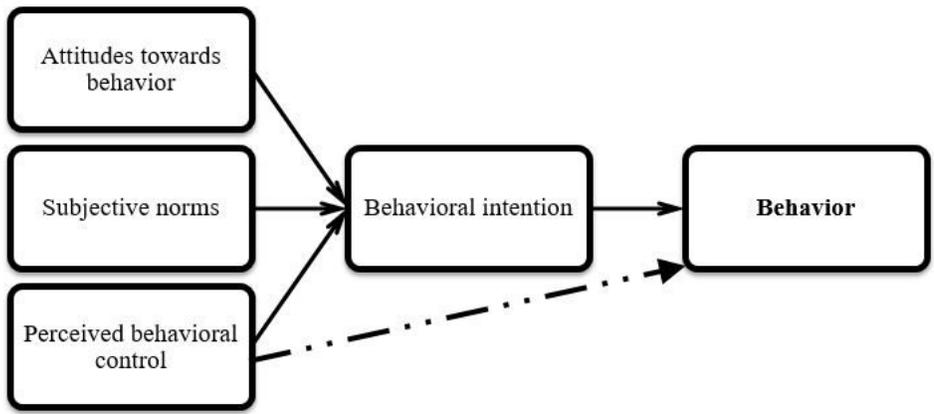


Figure 1

Framework of the theory of planned behavior [TPB] (Ajzen, 1991).