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Original Article

The Effect of Educational Intervention Based on the Theory of Planned Behavior on the Seat Belt Use Behavior of Rural Adolescent Students

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Abstract

Background: Positive attitudes or beliefs toward seat belt use can improve the probability of seat belt use among drivers and occupants. The present study aimed to determine the impact of educational intervention according to the Theory of Planned Behavior (TPB) on seat belt use behavior among rural adolescent students.

Methods: This study was conducted among 122 students in the control group and 108 in the intervention group from junior high school students in rural areas of Hashtrood, Iran, in 2024. The educational intervention for the experimental group included lectures, booklets, pamphlets, posters, educational video clips for students, holding a competition on making wall newspapers and cartoons, awarding prizes to the best works, and a pamphlet for parents. The data were collected using a TPB-based questionnaire.

Results: The results showed that the mean score of all TPB constructs, including attitude, subjective norms, perceived behavioral control, behavioral intention, and behavior significantly increased in the intervention group three months after the educational intervention compared to before the intervention ($P<0.01$). Based on ANCOVA analysis, after adjusting for pre-intervention differences in subjective norms, attitude, perceived behavioral control, behavioral intention, and behavior between the intervention and control groups, there was a significant difference in post-intervention scores between the two groups ($P<0.01$), and mean scores of all constructs in the intervention group were significantly more than those in the control group.

Conclusion: The findings suggest that educational intervention programs can effectively enhance seat belt use intentions and behaviors among rural adolescent students. Such interventions should be more widely implemented to promote seat belt use in this population.

Keywords: Seat belt, Prevention, Educational intervention, Theory of planned behavior, Students

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Introduction

According to the Iranian Legal Medicine Organization, road traffic-related injuries (RTIs) led to 20,045 deaths and 391,069 injuries in 2023. Moreover, between 2004 and 2019, the number of fatalities due to road traffic accidents increased in rural areas of Iran (1).

Although the mean number of traffic-related crashes is usually higher in urban areas, a much greater proportion of rural traffic-related crashes result in death (2). Per 100 million vehicle miles traveled, the traffic-related death rate on rural roads (1.84) is 2.6 times higher than that on urban roads (0.71) (3).

Beck et al demonstrated that seat belt use is lower in rural areas (4). A review study indicated that not fastening a seat belt is a risk factor for road traffic injury-related mortality in Iran (5). According to the study by Tavakoli Kashani et al, seat belt use on rural roads was one of the most important factors influencing the severity of injuries

in traffic crashes (6).

Demographic characteristics, including age, gender, and educational level, may influence safety belt use (7). However, Şimşekoğlu and Lajunen found that gender and age did not have a significant influence on seat belt use behavior (8). Positive attitudes and beliefs toward seat belt use can enhance the likelihood of wearing a seat belt (8,9). Watson and Austin reported that rural drivers tend to exhibit less favorable attitudes and beliefs about seat belt use than urban drivers, highlighting the need for interventions designed to address and improve these unfavorable attitudes and opinions held by rural drivers (10).

The theory of planned behavior (TPB) is a well-established framework for predicting traffic safety-related behaviors. Its constructs include perceived behavioral control, attitude, intention, subjective norms, and behavior. Intention is the strongest predictor of behavior that is shaped by attitude, subjective norms, and perceived behavioral control. Behavior itself is influenced by both intention and perceived behavioral control (11). TPB has been shown to be a suitable theory for predicting seat belt use behavior (12,13).

Seat belt usage rates are relatively low in rural communities, and the proportion of rural traffic-related crashes resulting in death is greater than in urban areas. It is necessary to improve seat belt use in rural communities. Increasing awareness of adolescent students is especially important for promoting seat belt use behavior. Educational intervention can improve adolescents' beliefs and attitudes about seat belt use, especially in rural regions. Accordingly, this study aimed to assess the impact of an educational intervention on the seat belt use behavior of rural adolescent students.

Materials and Methods

Participants

This randomized controlled trial study was conducted in 2024 among 246 randomly selected female and male junior high school students (grades 7, 8, and 9) from rural areas of Hashtrood, East Azerbaijan Province, Iran. A total of 123 students were assigned to the experimental group and 123 to the control group. All selected students were randomly assigned to two groups: experimental (n = 4 schools) and control (n = 4 schools).

Entrance criteria were as follows: female and male students in junior high schools in grades 7, 8, and 9, residency in rural areas, willingness to participate in the study, and provision of parental consent. Exclusion criteria were the unwillingness of students or parents to participate in the study, absence from training sessions, and failure to complete the post-test.

During the follow-up period, 16 students were lost, and data were collected from 230 students (122 in the control group and 108 in the experiment group). Non-participation in educational intervention sessions and incomplete questionnaires were the main reasons for the drop in sample size.

Data Collection

The data collection tool was a questionnaire on seat belt use behavior, designed based on TPB in our previous study (14). The content validity index (CVI) and content validity ratio (CVR) of the questionnaire were above 0.90 and 0.80, respectively. Cronbach's alpha values were ≥ 0.70.

The questionnaire consisted of two sections. The first section included demographic information such as age, students' educational grades. The second part was designed according to the constructs of the TPB, with items addressing subjective norms, attitude, perceived behavioral control, behavioral intention, and seat belt use behavior.

- Attitude towards seat belt use behavior contains two dimensions: behavioral beliefs with seven items (e.g., "Wearing a seat belt protects my health.") and evaluation of behavioral consequences with seven items (e.g., "It is important to me to protect my health by wearing a seat belt").
- Subjective norms toward seat belt use contain two dimensions: normative beliefs with eight items (e.g., "My father highlights that I should wear my seat belt every time I get in the car.") and motivation to comply with eight items (e.g., "My father highlights that fastening a seat belt is important to me").
- Perceived behavior control contains two dimensions: control beliefs with nine items (e.g., "Restricting movement in the car when wearing a seat belt causes me not to wear it.") and perceived power with nine items (e.g., "Restricting movement causes me not to use a seat belt when I get in a car").
- Behavioral intentions were measured with six items (e.g., "I am going to wear a seat belt when riding in the car as a rear-seat occupant inside the city").
- Behavior also includes six items (e.g., "I wear my seat belt when I sit in the rear seat of the car inside the city").

For constructs of subjective norms, attitude, subjective norms, and perceived behavioral control, a 5-point Likert scale was used, ranging from 5 (completely agree) to 1 (completely disagree). For behavioral intention and behavior constructs, a 5-point Likert scale was used, ranging from 5 (always) to 1 (never).

The Intervention

An educational intervention was administered to the experimental group. The contents of the program included lectures, booklets, pamphlets, posters, educational video clips for students, a competition for creating wall newspapers and cartoons, awarding prizes to the top participants, and a pamphlet for parents. The intervention was delivered over four weeks in four 45-minute training sessions. At baseline (pre-intervention) and again three months after the intervention (post-test), students in both the intervention (pre- and post-test) and control groups

completed the questionnaires using a self-reported method.

Statistical Analysis

Data were analyzed using SPSS software (version 16). Paired t-tests were used to compare the mean scores of TPB constructs before and after the intervention, and ANCOVA was applied to compare post-test scores between groups. The significant differences were set at $P<0.05$.

Results

Results of the study showed that the mean ± SD of age of control and experimental groups was 14.04 ± 0.84 and 13.86 ± 0.75, respectively. There was no statistically significant difference in age between the groups ($P=0.107$). Before the intervention, the mean scores of all TPB constructs were similar in the control and intervention groups, with no significant differences ($P>0.05$). In the control group, the mean score of all constructs of TPB did not differ significantly between baseline and three months later ($P>0.05$).

In contrast, in the intervention group, there were significant improvements in all TPB constructs from baseline to three months after the intervention ($P<0.01$). The educational intervention significantly improved all TPB constructs of seat belt use. The mean behavior score in the intervention group increased from 20.39 ± 7.37 before the intervention to 23.08 ± 6.40 at three-month follow-up, which was statistically significant ($P<0.01$) (Table 1).

As shown in Table 2, ANCOVA analysis revealed that, after adjusting for baseline differences in subjective norms, attitude, perceived behavioral control, behavioral intention, and behavior between the intervention and control groups, there were significant differences in post-intervention scores between the two groups ($P<0.01$). The educational intervention significantly increased the mean scores of all TPB constructs in the intervention compared to the control group ($P<0.01$).

Effect size was assessed using partial eta squared coefficients, which measure the proportion of variance in the dependent variable attributable to a given factor, similar to R^2. Partial eta squared values are categorized as small (0.01), medium (0.06), and large (≥ 0.14) (15). Based on Table 2, the partial eta squared effect sizes for all TPB constructs were in the medium range.

Discussion

Although the mean number of traffic-related crashes is usually higher in urban areas, a much greater proportion of rural traffic-related crashes result in death (2). A review study reported that the pooled prevalence of wearing

Table 1. Mean and Standard Deviation of TPB Constructs About Seat Belt Use in the Intervention and Control Groups Before and After the Intervention

Variable	Control group Mean ± SD	Intervention group Mean ± SD	Mean differences ± SE	Independent t-test *P* value
Attitude				
Before	113.72 ± 23.80	113.02 ± 34.93	0.43 ± 4.12	0.917
After	111.96 ± 26.44	128.82 ± 27.07		
Mean differences ± SD	1.77(24.65)	-15.79 (33.43)	-16.89 ± 3.63	
Paired t-test *P* value	0.460	<0.001		<0.001
Subjective norms				
Before	124.10 ± 43.50	123.25 ± 47.32	3.77 ± 6.52	0.563
After	127.84 ± 44.44	152.32 ± 46.64	-28.32 ± 6.14	
Mean differences ± SD	-3.74 ± 43.37	-29.08 ± 38.83		
Paired t-test *P* value	0.408	<0.001		<0.001
Perceived behavioral control				
Before	109.98 ± 53.26	108.84 ± 48.12		
After	95.82 ± 49.80	126.69 ± 63.26	-9.86 ± 6.74	0.145
Mean differences ± SD	6.80 ± 50.01	-17.85 ± 59.56		
Paired t-test *P* value	0.169	0.003	-30.52 ± 7.89	<0.001
Behavioral intention				
Before	23.17 ± 5.26	22.50 ± 4.82	0.49 ± 0.67	0.469
After	22.86 ± 4.28	25.60 ± 4.21		
Mean differences ± SD	0.31 ± 4.94	-3.10 ± 4.25	-2.76 ± 0.57	
Paired t-test *P* value	0.507	<0.001		<0.001
Behavior				
Before	19.59 ± 6.10	20.39 ± 7.37	-0.70 ± 0.90	0.438
After	19.71 ± 5.74	23.08 ± 6.40		
Mean differences ± SD	-0.12 ± 5.05	-2.69 ± 5.17	-3.37 ± 0.80	
Paired t-test *P* value	0.798	<0.001		<0.001

Note. TPB: Theory of planned behavior; SD: Standard deviation; SE: Standard error.

Table 2. The ANCOVA Analysis for TPB Constructs About Seat Belt Use Behavior

Variable	Source	Sum of squares	df	Mean square	F	*P* value	Partial Eta squared
Attitude	Intercept	71467.49	1	71467.49	126.63	<0.001	0.38
	Attitude-before	32544.66	1	32544.66	57.90	<0.001	0.219
	Control-Intervention	15445.42	1	15445.42	27.47	<0.001	0.117
	Error	116350.07	207	562.07			
Subjective Norms	Intercept	95704.69	1	95704.69	70.27	<0.001	0.238
	Subjective norms-before	128667.52	1	128667.52	94.48	<0.001	0.347
	Control-intervention	28226.52	1	28226.52	20.72	<0.001	0.104
	Error	242405.81	178	1361.83			
Perceived behavioral control	Intercept	112003.65	1	112003.65	44.92	<0.001	0.180
	Perceived behavioral control- before	155175.95	1	155175.95	62.24	<0.001	0.234
	Control-Intervention	39800.65	1	39800.65	15.96	<0.001	0.073
	Error	508563.24	204	2492.95			
Behavioral Intention	Intercept	2083.13	1	2083.13	156.76	<0.001	0.419
	Behavioral intention-before	1055.03	1	1055.03	79.37	<0.001	0.268
	Control-intervention	503.24	1	503.24	37.87	<0.001	0.149
	Error	2883.49	217	13.28			
Behavior	Intercept	1856.47	1	1856.47	94.58	<0.001	0.300
	Behavior-before	3850.77	1	3850.77	196.76	<0.001	0.471
	Control-intervention	460.50	1	460.50	23.53	<0.001	0.096
	Error	4325.15	221	19.57			

Note. ANCOVA: Analysis of covariance; TPB: Theory of planned behavior; df: Degrees of freedom.

a seat belt was 43.94% among drivers, 38.47% among front-seat passengers, and only 15.32% among rear-seat passengers (16).

The results of the present study showed that the educational intervention improved attitude, subjective norms, perceived behavioral control, behavioral intention, and seat belt use behavior among rural adolescent students. Specifically, the mean behavior score in the intervention group increased from 20.39 ± 7.37 before the intervention to 23.08 ± 6.40 after the intervention. Previous studies have similarly reported that educational interventions can improve traffic safety-related behaviors among students (17-19).

Burkett et al implemented the Drive Alive Pilot Program (DAPP) to improve seat belt use among rural high school students. The DAPP model, derived from the Theory of Reasoned Action, Social Cognitive Theory, and Fuzzy-trace Theory, was implemented through four steps: 1) high visibility surveys, 2) incentives, 3) disincentives (enforcement), and 4) programmatic interventions (education/media). The results indicated that DAPP was effective in enhancing seat belt use among rural high school teenagers (20).

In a recent review, Lourens et al reported that behavioral education-based interventions may promote seat belt use behavior (21). An educational intervention program in Mexico on road safety among children and teenagers demonstrated significant improvements in participants' knowledge, practices, and attitudes about road safety after the educational intervention. The programs also improved perceptions of risk in behaviors such as traveling on overcrowded public transportation, not wearing seat belts in cars, and not using helmets on motorcycles, crossing the street while playing with friends or using mobile phones, and riding with intoxicated drivers (22).

DiMaggio and Li demonstrated that the Safe Routes to School program decreased pedestrian injuries among school-aged children (5-19 years old) (23). Houston et al reported that an educational intervention through a traffic safety campaign increased seat belt use among teen students and concluded that social pressure and poor perception of injury risk were major barriers to seat belt use among teenage high school students (24). The major limitation of the present study was the use of a self-reported method for data collection.

Conclusion

The results indicated that educational intervention programs effectively improved attitude, subjective norms, perceived behavioral control, behavioral intention, and seat belt use behavior among rural adolescent students. These findings highlight the importance of implementing educational interventions to promote seat belt use in this population.

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Competing Interests

The authors declare no conflict of interests.

Ethical Approval

The present study was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1401.940) and conducted according to ethical norms and guidelines.

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