Original Article

Prediction of taxi drivers' safe-driving behaviors based on the theory of planned behavior: The role of habit

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Abstract:

BACKGROUND: Safe-driving behaviors of taxi drivers are fundamental to health. The present research aimed to predict the taxi drivers' safe-driving behaviors based on the theory of planned behavior (TPB) and habit.

MATERIALS AND METHODS: The present research is of a descriptive/analytical cross-sectional type conducted on 184 taxi drivers in Bandar Abbas who were selected through a multiple-stratified sampling method. Data collection instrument was a questionnaire comprised of two sections (demographic information and the constructs of TPB.

STATISTICAL ANALYSIS USED: The data were later on analyzed via SPSS ver 19 and Pearson's correlation coefficient as well as multiple regressions.

RESULTS: The mean age of the participants was 45.1 (standard deviation [SD = 11.1) years, and they had an average experience of taxi driving for 10.3 years (SD = 7.5). Subjective norms, perceived behavioral control, and habits were the predictors of one's intention of driving safely ($r^2 = 0.30$, $F = 18.7$, $P < 0.001$). Moreover, attitude, perceived behavioral control, and habits were found to be the predictors of safe-driving behaviors ($r^2 = 0.19$, $F = 8.1$, $P < 0.001$). Finally, habits showed to be a stronger predictor of safe-driving behaviors than attitude and perceived behavioral control.

CONCLUSION: Consideration of individuals' behavioral habits and correction of unsafe habits, focus on the adverse effects of unsafe-driving behaviors, goal setting to change incorrect driving habits, attention to influential groups in altering unsafe-driving behaviors, and careful monitoring of abiding by the rules are suggested to promote safe-driving behaviors.

Keywords:

Drivers, safety, taxi, theory of planned behavior

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Introduction

Although taxis play a primary role in urban transportation system, they have been scantily explored in the related literature.[1] A relevant significant issue is safe-driving behaviors of taxi drivers that not only affect the driver's own life but also affect matter for passengers' lives.[2] On the one hand, taxi drivers' professional life is described as economically insecure and unstable due to low income. Working long hours with minimum income, insurance, and holidays, taxi drivers have limited knowledge of safety in streets.[3]

According to the latest report made by the World Health Organization, an annual rate of 1.25 million people died in car accidents. Ninety percent of this mortality occurs in low-to-average-income countries. Road accidents have been predicted to stand as the seventh most fatal event by 2030.[4]

Human behavior is closely related to safe behaviors,[5] and that is why behavioral

theories and models can be appropriately used to see how unsafe-driving behaviors can be predicted. There can be many barriers to behavior change such as cultural norms and criteria which can be recognized with the help of behavioral theories and linked to social and cultural factors.[6] An influential model which can be used to explore driving behaviors is the theory of planned behavior (TPB),[7] following a sociocognitive approach to behavior change. Intention is the main predictor of behavior in this model, which is influenced by three independent factors including attitude, subjective norms, and perceived behavioral control. According to this model, one intends to change a given behavior on three conditions: (1) S/he perceives it as useful (attitude). (2) S/he is under social pressure, e.g., the police to do so (subjective norms). (3) Despite the existing barriers, s/he feels capable of adopting safe behaviors (perceived behavioral control).[8]

Driving behaviors are among people's cultural behaviors in communities and are concerned with their attitudes and habits. It is well recognized that habits can tremendously affect one's intention and behavior. Therefore, habits have been mentioned as an additional predictor in sociocognitive models by several researchers.[9] According to Ajzen, habits can be a key factor involved in TPB as it accounts for the effectiveness of the model to a great extent.[7] On the other hand, habit factor has been widely used to predict and explain the human behavior.[10] Nevertheless, Gardner downgraded the significance of this factor in predicting health-related behaviors.[11]

Lheureux *et al*. observed that besides the constructs of TPB, habits managed to affect drivers' speed and drinking habit to a large extent.[12] As revealed by Conner *et al*., TPB was a strong predictor of drivers' speed, but habits as an independent variable were also a strong predictor of intention.[13] In another study, O'Callaghan and Nausbaum found that subjective norms and perceived behavioral control as well as one's experiences were the best predictors of wearing helmets.[14] In some other similar attempt, Şimşekoğlu *et al*. reported attitude and subjective norms as the main predictors of intention to wear a seatbelt. However, habits showed to have no effect on this behavior.[15] TPB also showed to be effective in promoting the use of helmets in Ross *et al*.'s investigation.[16] Drivers' risky behaviors are seriously involved in the occurrence rate of accidents. Even in several cases, human behavior is the main factor involved in such accidents. The existing evidence shows that experienced drivers especially those who spend long hours driving during a day pay inadequate attention to driving rules and regulations as well as safe behaviors.[16]

Considering that in the most previous researches, the driving behaviors of other drivers such as truck drivers[17] and motorcyclists[18] have been studied and driving behaviors of taxi drivers are less concerned, the present study addressed driving behaviors among taxi drivers who are an important and considerable group of drivers. Furthermore, in the present study, the role of habit as an additional predictor variable in the TPB is discussed, while in the previous studies,[19] this subject has been less well-considered. Hence, the aim of this study was to predict the safe-driving behaviors based on TPB and also explore the role of habit among taxi drivers in Bandar Abbas, a city in the south of Iran.

Materials and Methods

The present research is of a descriptive/analytical cross-sectional type performed in 2016. The target population of this study was all taxi drivers in Bandar Abbas. The sample size was determined in accordance with the body of related literature and was decided to be 184.[20] Those who had at least 1-year experience of taxi driving entered the study. They were supposed to be literate and residents of Bandar Abbas. The final sample was selected among those who transferred passengers inside the city. To do so, initially, 24 taxi stations were identified in different parts of the city, and then, eight stations were randomly selected from this number. The number of participants to be included from each station was determined in accordance with an approximate total number of the resident drivers. Visits were paid to the target stations twice, once in the morning and once again in the evening to do the sampling. The first driver entering each station was included if and only if he met the inclusion criteria and consented to take part in the research. Afterward, every fifth driver entering the station would be selected until the required sample size was met.

The data collection instrument was a self-rating questionnaire developed by the present researchers. The first section contained subjects' demographic information (age, education, driving experience, taxi driving experience, tickets received due to violations of rules, and experience of accidents in the past). The second section was comprised of TPB constructs as well as driving habits and behaviors. The design of the second section was in the light of previous related literature and the results of a pilot test. In the pilot test, 12 taxi drivers were invited to join a group discussion on safe-driving behaviors, its benefits and barriers. The items to be included in the questionnaire were designed accordingly. The items exploring TPB constructs were to be rated on a 5-level Likert scale. The five choices included were totally agree, agree, undecided, disagree, and totally disagree. To avoid halo effect, a few items were written in

a reversed form. The items exploring driving behaviors were to be rated on a 4-level Likert scale ranging from always to never (a score of 1–4).

To validate the questionnaire, content validity was done with the help of a panel of experts. To this aim, the questionnaire was availed to a panel of 15 drivers very similar to the participants. They were asked to comment on the relevance, simplicity, clarity, and legibility of the items. If more than half of them agreed on the low quality of an item, that item would be either omitted or corrected. No item was omitted from the questionnaire in this research and only a few were revised. Moreover, the questionnaire was submitted to eight health education and traffic safety experts whose comments led to a further revised version.

Cronbach's alpha was estimated to test the reliability of each TPB constructs as presented below.

Attitude toward safe-driving behaviors
This component was represented by eight items within the questionnaire, and the overall score it received would vary between 8 and 40. Cronbach's alpha was estimated at 0.63 for this component. Wearing a seatbelt is discomfort while driving.

Subjective norms
There were six items included in this component to be rated between 6 and 30. Cronbach's alpha was estimated at 0.71 for this component. Most family and friends believe I should obey the traffic rules.

Perceived behavioral control
This component was to be measured through five items, and the overall score would range between 5 and 25. Cronbach's alpha was estimated at 0.62 for this component. Even in heavy traffic, I am capable of driving safely and carefully.

Intention of safe-driving behaviors
There were three items included here, and the overall score this component got ranged between 3 and 15. Cronbach's alpha was estimated at 0.93. From now on, I will obey all traffic rules under any condition.

Habit
There was only one item to test habits: "driving safely has turned into a habit for me and that's what I always do," which was to be rated between 1 and 5. Driving safely has turned into a habit for me and I always abide by it.

Safe-driving behaviors
These behaviors were measured by 32 items. The overall score would vary from 0 to 96, and a higher score would represent safer driving behaviors. Cronbach's alpha was estimated at 0.79.

This study was approved by the ethics committee of Hormozgan University of Medical Sciences (Code: HUMS. REC.1396.38). Before the data collection, the purpose of the study was explained to the participants and informed consent was obtained.

The data were then analyzed statistically via SPSS V. 17.0, SPSS Inc., Chicago, IL, USA. The score of each TPB construct was calculated independently. A higher score would imply a more positive attitude, more subjective norms, higher perceived behavioral control, and firmer intention of safe driving. A higher habit score showed a more firmly established habit of driving safely. To test the correlation between TPB constructs and driving behaviors, Pearson's correlation coefficient was estimated, and so as to predict safe-driving behaviors in the light of TPB, multiple regressions were run.

Results

A total number of 184 questionnaires were submitted to the participants, from among which 180 were returned in full and were analyzed later on (response rate = 97.8%). The mean age of the participants was 45.1 years (standard deviation [SD] = 11.1). They had on average 18.7 years of driving experience in general (SD = 10.8) and 10.3 years of taxi-driving experience (SD = 7.5). 22.2% had experience of accidents in the past, and 30.6% had been fined for rule violations while carrying passengers before. Table 1 represents mean scores and SDs of TPB constructs, habits, and safe-driving behaviors.

Correlation coefficients of TPB constructs (attitude, subjective norms, perceived behavioral control, and intention), habit, and safe-driving behaviors have been included in Table 2. Subjective norms and habit were significantly correlated with one's intention of safe-driving behaviors. Similarly, attitude, behavioral intention, and habit showed to be positively correlated with safe-driving behaviors.

Table 1: Mean and standard deviations of the theory of planned behavior constructs, habit and safe-driving behaviors

Variable	Mean	SD	Range of score	Range of obtained by participants
Attitude	35.4	4.2	8-40	14-40
Subjective norms	25.6	2.6	6-30	16-30
Perceived behavioral control	18.8	3.1	5-25	12-25
Intention	13.6	2.2	5-15	5-15
Habit	4.6	0.68	3-5	1-5
Safe-driving behaviors	85.1	6.2	0-96	66-96

SD=Standard deviation

Multiple regression revealed that subjective norms and perceived behavioral control could predict one's intention of safe-driving behaviors ($r^2 = 0.18$, $F = 13.02$, $P < 0.001$). Drivers with more desirable subjective norms and lower perceived behavioral control were more likely to intend to drive safely. Furthermore, multiple regression indicated that attitude can be a predictor of safe-driving behaviors ($r^2 = 0.09$, $F = 4.39$, $P < 0.002$). Drivers with a stronger attitude were more likely to show safer driving behaviors [Table 3].

Multiple regression analysis revealed that subjective norms, perceived behavioral control, and habits can predict intention of safe-driving behaviors ($r^2 = 0.30$, $F = 18.7$, $P < 0.001$). Drivers who had higher subjective norms, and developed the habit of safe driving along with those whose perceived behavioral control was lower tended to show safe driving behaviors more often. multiple regression analysis indicated that attitude, perceived behavioral control, and habit can predict safe-driving behaviors ($r^2 = 0.19$, $F = 8.1$, $P < 0.001$). Those with stronger attitudes, lower perceived behavioral control, and more established habits of safe driving were more likely to perform safe-driving behaviors. Habit showed to be a stronger predictor of safe-driving behavior compared to attitude and perceived behavioral control [Table 4].

Discussion

This study aimed to predict safe-driving behaviors based on TPB with a focus on habits in taxi drivers of Bandar Abbas. According to the findings, subjective norms were one of the predictors of intention of safe-driving behaviors. This finding was confirmed by O'Callagha and Nausbaum, who found that those wearing helmets strongly believed to do so under the effect of peers.[14] Lajunen and Räsänen emphasized the role of parents and peers in encouraging the use of helmets.[21] There were other related studies which confirmed the present finding.[9,18,22] It seems that taxi drivers in the present study were highly affected by subjective norms which managed to strengthen their intention of safe driving. The role of the police is probably involved as a subjective norm in this study as people naturally tend to violate rules, and if not controlled, they show unsafe behaviors. Direct control is possible when official forces including the police make one obey the rules. On the other hand, experienced drivers working in each line can dramatically influence others. Each taxi driving line is usually run by a supervisor annually selected from among the same community. These supervisors are commonly selected among the highly experienced and professional drivers often respected by all.[19] Therefore, the potentials of influential groups should be recognized in safety campaigns. In their research,

Table 2: Correlation of theory of planned behavior constructs with behavioral intention and safe-driving behaviors

TPB constructs	Behavioral intention	Safe-driving behaviors
Attitude	0.09	0.26*
Subjective norms	0.38*	0.1
Behavioral control	0.13	−0.04
Habit	0.37*	0.35*
Behavioral intention	-	0.15*

*Significant correlation ($P<0.01$). TPB=Theory of planned behavior

Table 3: Linear regression of predicting safe-driving intention and behaviors based on theory of planned behavior constructs and habits

Variables	r^2	B	SE	β	P
Behavioral intention					
Constant	0.18	7.19	1.82		<0.001*
Attitude		0.006	0.04	0.01	0.88
Subjective norms		0.35	0.06	0.40	<0.001*
Behavioral control		−0.14	0.05	−0.20	<0.005*
Safe-driving behaviors					
Constant	0.09	69.8	5.61		<0.001*
Attitude		0.40	0.11	0.27	<0.001*
Subjective norms		−0.02	0.19	−0.009	0.91
Behavioral control		−0.16	0.15	−0.08	0.29
Intention		0.32	0.22	0.11	0.14

*Significant. SE=Standard error

Table 4: Linear regression analysis of predicting safe-driving behaviors and intention based on theory of planned behavior constructs and habit

Variable	r^2	B	SE	β	P
Behavioral intention					
Constant	0.3	4.29	1.77		<0.02*
Attitude		−0.016	0.04	−0.03	0.66
Subjective norms		0.31	0.05	0.36	<0.001*
Behavioral control		−0.18	0.05	−0.25	<0.001*
Habit		1.18	0.21	0.36	<0.001*
Safe-driving behaviors					
Constant	0.19	64.7	5.43		<0.001*
Attitude		0.35	0.10	0.23	<0.002*
Subjective norms		0.004	0.18	0.002	0.98
Behavioral control		−0.32	0.14	−0.16	<0.02*
Intention		0.07	0.22	−0.02	0.74
Habit		3.27	0.7	0.35	<0.001*

*Significant. SE=Standard error

Ketphat *et al*. observed no effect of subjective norms on youths' speed of driving.[23] This finding is contrary to the present finding, which was also contrasted in a body of related research.[17,24,25] These differences can be partly explained by different research goals and populations as well as cultural and social divergences in terms of the rules applied. As an instance, the youth are generally driven by emotions rather than logic in speed driving. They, therefore, might be barely influenced by family or friends. In a similar fashion, Ludwig *et al*. observed that young drivers felt much less pressures by

the people around.[26] It is suggested to include public awareness raising of traffic rules and close affinity with the police besides subjective norms in programs aimed at promoting safe-driving behaviors among drivers. It is expected to lead to more responsibility felt by the public of unsafe-driving behaviors.

Attitude also showed to be a predictor of safe-driving behaviors in the present results. This finding attests to the fact that taxi drivers enjoyed a positive attitude toward safe-driving behaviors and were aware of the benefits. One assumption of TPB is that before any certain intention, one begins to evaluate its application and consequences. If and only if the behavior is perceived as logical, the decision is firmly made to adopt it. As described by Ajzen, a change of attitude is followed by a change of intention which in turn influences the behavior.[27] Attitude was found to be the best predictor of drivers' wearing helmets by Torquato *et al*.[22] In an investigation conducted by Warner and Åberg, drivers with a positive attitude toward safe behaviors had more intentions of adopting such behavior.[28] Cyclists showed to have a positive attitude toward wearing helmets in a study carried out by O'Callaghan and Nausbaum. They believed that a positive attitude such as feeling safe and protected from wearing a helmet as a must can have a better effect on adopting the right behavior.[14] There were other investigations which also confirmed the positive effect of attitude on safe-driving behaviors.[17,21,29] Some other research in Queensland, Australia, showed that drivers' attitude, as a key factor in safe driving, can be altered through educating driving techniques and skills as well as the adoption of TPB.[30] Therefore, education is to be taken seriously in changing attitude to driving behaviors. In contrast, Husain *et al*. and Hu *et al*. observed no significant effect of attitude on risky driving behaviors. This finding was not scientifically supported as it is yet known whether attitude affects driving behaviors or the vice versa. In other words, it is unclear which of the two have been primary.[2,31] Although a change of behavior as a result of changing attitude can be adequately attractive, not all studies have proved so.[15,32] This body of research does not agree with the present finding. These divergences can be partly due to the populations' different natural and behavioral features, contextual features affecting attitude formation, cultural and social norms, research type, sample size, subjects' income, and past behavioral habits. With this concern, it was shown in an investigation that one's attitude was a function of one's personality and surrounding context.[33] Attitude was reported by Ozkan *et al*. to be influenced by cultural norms and values.[34] Drivers of a higher income were observed to have a more positive attitude toward high speed of driving.[23] In their research, Cook and Bellis indicated that a positive attitude not always lead to an intention and adoption of safe behaviors.[35] It

can be concluded that one's positive attitude does not suffice for promoting safe behaviors. There are other factors involved such as behavioral habits, personality, and social context.

As revealed in the present research, perceived behavioral control was a predictor of safe-driving intention and action. It is noteworthy that drivers of lower perceived behavioral control showed to have higher intention of safe-driving behaviors and vice versa. In a similar fashion, Lajunen and Räsänen observed that cyclists of lower perceived control tended more to wear a helmet.[21] Moreover, Bazargan *et al*. found that drivers of lower perceived behavioral control had less intention of unsafe-driving behaviors (e.g., text reading while driving).[36] The above-mentioned research findings approved the present results concerning drivers' perceived behavioral control. In a number of cases, high perceived behavioral control leads to an intention and performance of unsafe behavior. With this respect, some research findings revealed that motorcyclists, despite their high perceived behavioral control, believed that external obligations to wear a helmet encouraged them to adopt the behavior.[14] Therefore, this finding indicates that perceived behavioral control depends on the facilitators and barriers of a certain behavior or depends on the perceived power. Concerning the same issue, Ludwig *et al*. indicated that a combination of certain actions such as provision of free helmets, credit cards, and safety information to people helps increase the rate of wearing helmets twice as before.[26] A body of related literature showed a significant positive correlation between perceived behavioral control and intention.[18,33,37] In another investigation, perceived behavioral control and intention showed to be correlated, but this correlation was not strong.[38] Ahmed *et al*. found no significant correlation between perceived behavioral control, intention, and behavior.[39] Similarly, Walsh *et al*. reported no effect of perceived behavioral control on the intention of using cellphones while driving.[40] In an investigation carried out by Warner and Åberg, perceived behavioral control did not show to predict drivers' speed.[28] These researchers justified this finding by the fact that experienced drivers usually think that they already have the capability of controlling the target behavior and require no education or guidance. The abovementioned findings did not agree with the present finding which can be caused by differing subjects, behavior type, and purpose of research. With this regard, Ajzen believed that the correlation of perceived behavioral control and intention and behavior depended on the type and context of the target behavior.[27]

Habits showed to be capable of predicting the intention and performance of safe-driving behaviors. It is noteworthy that habits showed to be a stronger predictor

of safe-driving behaviors than attitude and perceived behavioral control. Nevertheless, in the majority of the related literature on drivers, this key factor was ignored. The habit factor acts among the independent variables of TPB and forms a strong linear correlation between perceived behavioral control and intention and behavior.[9] The present findings show that the habit factor, besides the attitude, subjective norms, and perceived behavioral control, adds to the predicting power of the model.

Similarly, Lheureux *et al.* found habits to strongly affect driving speed and drinking alcohol while driving, besides TPB constructs.[12] In Bazargan *et al.*'s research, drivers who were used to reading and writing text messages while driving tended to do so in the future much more than others.[36] In some other research by Ketphat *et al.*, the habit of watching sports matches showed to affect the driving speed.[23] Past behaviors showed to be a strong predictor in comparison to other factors in O'Callaghan and Nausbaum's investigation.[14] This finding was also confirmed in other studies.[23,41] Therefore, these studies attest to the role of habits in safe-driving behaviors as Ajzen maintained that the formation of unsafe habits among drivers cuts down on the rate of conscious control.[27] In Şimşekoğlu and Lajunen's study, habits did not turn out as a predictor of wearing seatbelts.,[33] which is not consistent with the present finding. To justify these divergent findings, it can be stated that the predicting power of habits is a function of the strength or weakness of the habit. It is likely that strong behavioral habits (highly frequent and stable) are better predictors than weak habits. Therefore, there is a need to consider and evaluate habits in predicting people's intention and behavior more than before. It is required for the use of interventions to break the past habits and help promote the safe-driving behaviors.

In the present research, a statistically significant correlation was found between intention and safe-driving behaviors. This significant positive correlation probably supports the assumptions of TPB and indicates that intention is dependent on key factors such as attitude, subjective norms, and perceived behavioral control. With this respect, Ajzen maintained that intention is a true predictor of behavior.[7] The probability of showing safe-driving behaviors showed to be higher among drivers who had a stronger intention in Ashoogh *et al.*'s research.[17] Momeni *et al.*'s study revealed that the more one intends to follow unsafe-driving behaviors, the more hazardous behaviors s/he would show.[42] Atombo *et al.* observed that intention was a predictor of speed rule violation.[29] A research conducted by Ashoogh *et al.* showed that the stronger the correlation between intention and behavior, the significantly higher the occurrence rate of health-related behaviors.[43] There

are other studies which confirm the present finding.[9,22] The correlation between intention and behavior was not statistically significant as investigated by O'Callaghan and Nausbaum, who pinpointed that occasionally one's ordinary behaviors are not capable of predicting a logical intention. This was not, however, consistent with the present finding.[14] What Şimşekoğlu and Lajunen reported was also contrary to the present finding.[33] This difference can be partly due to divergent cultural aspects, features of the target behavior, and the contrast between intention and actual behavior across studies. With this respect, Chliaoutakis *et al.* mentioned the lack of significant correlation between intention and actual behavior as the point of departure.[44] Why intention was not capable of predicting actual behavior was attributed by Rothengatter and Manstead to the features of the target behavior as well as cultural differences among people.[45] It needs to be reminded that intention is the pre-action stage and does not necessarily lead to action in those unprepared for a certain behavior. That is because internal and external factors through time can cause changes in one's intention of a certain behavior. Therefore, for an intention to turn into an actual behavior, a myriad of factors are involved that should be taken into account.

One limitation of the present research was that the data related to unsafe-driving behaviors were to be obtained through self-reports which might lack the required care and precision. Generalizability is another limitation of this study. As the participants were all taxi drivers, the results cannot be generalized to drivers of other vehicles. On the other hand, investigating habits as a factor involved in drivers' safe behaviors was strength of the present research as this factor has been less explored in the Iranian context.

Conclusion

The present study revealed that subjective norms, perceived behavioral control, and habits were the predictors of the intention of safe-driving behaviors. Moreover, attitude, perceived behavioral control, and habits were the predictors of safe-driving behaviors. However, habits showed to be a stronger predictor of safe-driving behaviors than attitude and perceived behavioral control. Therefore, a number of relevant suggestions are made in the light of the present findings: consideration of people's behavioral habits and correcting unsafe habits, emphasis on the negative consequences of unsafe-driving behaviors aiming at the change of incorrect driving habits, attention to influential groups in safe-driving behaviors, close monitoring of the application of traffic rules, elimination of barriers, and attention to the facilitating factors.

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Conflicts of interest

There are no conflicts of interest.

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