Determinants of helmet use behaviour among employed motorcycle riders in Yazd, Iran based on theory of planned behaviour

Mehri Ali a,*, Mazloomy Mahmoodabad Seyed Saeed b, Morowatisharifabad Mohammad Ali c, Nadrian Haidar d

a Department of Health, Islamic Azad University, Sabzevar, Iran
b Department of Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
c Department of Health, Yazd Shahid Sadoughi University of Medical Sciences, Iran
d School of Nursing, Islamic Azad University - Sanandaj Branch, Iran

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ABSTRACT

This paper reports on predictors of helmet use behaviour, using variables based on the theory of planned behaviour model among the employed motorcycle riders in Yazd-Iran, in an attempt to identify influential factors that may be addressed through intervention efforts. In 2007, a cluster random sample of 130 employed motorcycle riders in the city of Yazd in central Iran, participated in the study. Appropriate instruments were designed to measure the variables of interest (attitude, subjective norms, perceived behaviour control, intention along with helmet use behaviour). Reliability and validity of the instruments were examined and approved. The statistical analysis of the data included descriptive statistics, bivariate correlations, and multiple regression. Based on the results, 56 out of all the respondents (43.1%) had history of accident by motorcycle. Of these motorcycle riders only 10.7% were wearing their helmet at the time of their accident. Intention and perceived behavioural control showed a significant relationship with helmet use behaviour and perceived behaviour control was the strongest predictor of helmet use intention, followed by subjective norms, and attitude. It was found that that helmet use rate among motorcycle riders was very low. The findings of present study provide a preliminary support for the TPB model as an effective framework for examining helmet use in motorcycle riders. Understanding motorcycle rider’s thoughts, feelings and beliefs about helmet use behaviour can assist intervention specialists to develop and implement effective programs in order to promote helmet use among motorcycle riders.

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* Corresponding author. Tel.: +98 9159741837.
E-mail addresses: hadimehri1386@gmail.com, alimehri1885@yahoo.com (M. Ali),
Mazloomy_S@yahoo.com (M.M.S. Saeed),
morowaty@yahoo.com (M.M. Ali), haidar5885@yahoo.com (s.S. Haidar).

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Introduction

Of all the systems that people have to deal with on a daily basis, road transport is the most complex and the most dangerous. In 1990, traffic crashes were the ninth most common cause of death in the world. Road traffic injuries cause a significant amount of injury-related mortality and morbidity around the world with an estimated 1.2 million people killed and about 20–50 million injured on the roads annually; road traffic injuries are ranked among the top 10 leading causes of death worldwide. Projections estimate that these accidents will be the third most common cause of death by 2020. Nearly 85% of the global burden of road traffic injuries is accounted for by the low- and middle-income countries.

Each year about 28,000 people die on Iran roads and the highway police say that every 3 min there is a crash and every 19 min someone dies in a crash. Road traffic crashes are considered to be the second highest cause of mortality in Iran next to coronary heart disease. Based on the Ministry of Health and Medical Education death registry data, in 23 out of 28 provinces in Iran, road traffic injuries (RTI) caused 31,800 deaths in 2003, which accounted for 9.9% of total deaths and 17.4% of years of life lost (YLLs). The cause-specific death rate due to traffic injuries is 47.8 in 100,000 (76.5 and 17.9 in males and females, respectively). The victims’ average age is 35.6 years.

Among the cases of injury caused by traffic crashes, victims of motorcycle accidents and the pedestrian group had higher percentage of relatively severe head injury. For example, per vehicle mile (or kilometre) of travel (VMT), motorcycle riders in the US are 34 times more likely than car occupants to die in a traffic crash and eight times more likely to be injured. Approximately 42% of the injuries in men are due to motorcycle accident in Iran. WHO (2004) considers traffic crashes to be predictable and targetable by interventions consisting of multidisciplinary efforts aiming at their prevention, which means that the main cause of traumatic death in the world can be considerably avoided.

The main risk factor for motorized two-wheeler users is the non-use of crash helmets. Use of helmets has been shown to reduce fatal and serious head injuries between 20% and 45% and to be the most successful approach for preventing injury among motorized two-wheeler riders. Motorcycle helmets significantly reduce the risk of death attributable to head injury. Riders with helmets have a 69% reduction in their risk of head injury (OR 0.31, 95% CI 0.25–0.38) and a 42% reduction in their risk of death (OR 0.58, 95% CI 0.50–0.68). Despite these evidences that helmet use can prevent motorcyclists from serious injuries and death, unfortunately, in the study done in Tehran in 2004 the helmet use rate was only 6% among motorcycle riders.

Enforcement of the helmet use law put into action and concurrently initiated in March 2005 in Iran. Law enforcement strictly have been on penalties for motorcyclists who do not obey traffic laws including helmet use (50,000 Rials = 5 Dollar) and even seizing their vehicles. This law covers both, riders and pillion passengers. Despite this helmet use law, the rate of helmet use is still rather low in Iran. For example, in a cross-sectional interview-based study on victims’ characteristics and pre-hospital care in West Azarbajian province of Iran, in 2009, among the motorcyclists, only 18% were said to be habitual helmet-wearers.

Although having safety helmet is a precondition for using it, several studies have been shown that it does not automatically lead to high wearing rate. As Jacques stated, helmet use seems to depend mostly on a cyclist’s motivation to use bicycle helmets rather than environmental, exposure, or cost related factors.

The theory of planned behaviour (TPB)

The TPB (Fig. 1) is an important social cognitive model that aims to explain variance in volitional behaviours. The central premise of this theory is that people make decisions rationally by systematically using accessible information. The theoretical model hypothesizes that the causal antecedents of behaviour are a logical sequence of cognitions. The theory hypothesizes that an individual’s overtly stated intention to act is the most proximal predictor of behaviour. TPB was developed as an extension of the Theory of Reasoned Action (TRA) model. Glanz et al. reported that the TRA components might not be sufficient for predicting behaviours in which volitional control is reduced. A person who has a high motivation to perform the behaviour may not actually perform the behaviour due to intervening environmental conditions. Environmental conditions may have an impact on the use of supplements. Access and economic factors may interrupt actually attaining supplements. Addressing that concern specifically is the extension to the original TRA model, with the theory of planned behaviour.

The basic premise of the TPB is that the most proximal predictor of behaviour is behavioural intention (i.e., a person’s readiness to perform a given behaviour). Intention is hypothesized to mediate the influence of three sets of personal, social, and control-related judgments on the target behaviour. Behavioural intention, in turn, is predicted by attitudes toward the behaviour (i.e., one’s affective and instrumental evaluations of performing the behaviour); subjective norms (i.e., one’s perceived social pressure to perform a behaviour or not); and perceived behavioural control (PBC) (i.e.,...
the perceived ease or difficulty of performing the behaviour). Furthermore, each of these three major variables reflects a set of underlying accessible beliefs. These are behavioural beliefs (i.e., the perceive advantages and disadvantages of performing a behaviour) in the case of attitudes; normative beliefs (i.e., one’s perceptions of the extent to which significant others want him or her to perform the behaviour) for subjective norm, and control beliefs (i.e., the perceived barriers and facilitators of engaging in a behaviour) for PBC. The theory of planned behaviour (TPB) has been successfully applied to the prediction of bicycle helmet use and wearing of seatbelts.15,32,34,35

Quine et al. in a previous study noted that theoretically driven intervention based studies on multiple determinants of helmet use are the most successful at inducing behaviour change.35 The first step in designing effective interventions is conducting basic research to explore and identify fundamental determinants of helmet use intention and behaviour among motorcyclists that are amenable to change.7 Efforts to understand the determinants of helmet use among Iranian motorcyclists using a theoretical framework, however, have been scarce. To our knowledge, no study has tested the utility of a theoretical framework in an Iranian context. This paper reports on predictors of helmet use behaviour, using variables based on the TPB model among the employed motorcycle riders in Yazd-Iran, in an attempt to identify influential factors that may be addressed through intervention efforts.

Method

Setting

In order to investigate the effectiveness of TPB in predicting helmet use, a research project was carried out from June to September 2007. The estimation of sample size was based on a formula for multiple regression analysis at the .05 level of significance.26 Cluster random sampling was employed to recruit 150 employed motorcycle riders from six offices in the city of Yazd, one of the largest cities in Iran, to participate in the study. The number of subjects participated in the interview was 130; the response rate was 87%. Thirteen percent of the respondents did not signed consent forms and deny to answer all questions while interview and therefore they excluded from the study.

Inclusion criteria for respondents: (1) being an employee in a governmental office, (2) having a motorcycle and riding it between home and office for more than one year. The duration of motorcycle riding ranged from 1 to 35 years with mean of 13.04 (SD = 8.70). The purpose of the study, which included their rights as human subjects for a research study, was explained to participants and all signed consent forms. Face-to-face private interviews were conducted in a private room at their office for the purpose of data collection. Each interview lasted 10–15 min.

Questionnaire

Because there was not any specific questionnaire regarding the predictors of helmet use for Iranian motorcyclists based on theory of planned behaviour, the recommendations for designing TPB questionnaires2,3 were used as a basis for constructing each item of the instruments of interest. A panel of 10 Iranian experts in the area of health behaviour and education were asked to assess the content validity of the instruments by evaluating their appropriateness and relevance of items and response format. The feedback from the panel of experts was used to revise and modify the instruments, which were then pilot tested over 2 weeks by a sample of 30 employed motorcyclists to examine their utility and to identify the problems/benefits associated with the design. The first draft was prepared following consultation with the expert panel team. The data were used to estimate the internal consistency of the scales, using Cronbach’s Coefficient Alpha. The content validity of the scales was also established. This pilot sample was not included in the final sample. This pilot test showed that the subscales of questionnaire have a satisfactory test–retest reliability (r = 0.71–95). The scales, possible and observed ranges, number of items, mean and standard deviations of variables and reliability coefficients of the constructs are listed in Table 1. A brief description of the instrumentation follows.

The questionnaire consisted of two components: Demographic inquiries and the questionnaire designed to assess the subscales of TPB model. Demographic information included age, education level and income. Moreover, three questions regarding duration of motorcycle use, having a history of motorcycle crash since the time of motorcycle riding and using helmet at the time of motorcycle crash was requested. Respondents answered to these three questions with Yes or No.

Subscales of the TPB questionnaire

All items of the subscales are presented in Appendix B.

Attitude

Attitudes refer to an individual’s positive or negative disposition when performing a particular behaviour.12 A 5-item scale was developed for measurement of attitude regarding helmet use while motorcycling. A 5-point Likert-type scaling was used, ranging from 1 (completely disagree) to 5 (completely agree). Negatively worded items were reverse scored. Higher scores indicated positive attitude toward helmet use.

Subjective norms

Subjective norms refer to an individual’s perception of relevant opinions on whether to perform a particular behaviour.38 A 4-item scale was developed for measurement of subjective norms regarding helmet use while motorcycling. The same 5-point Likert-type scaling was used, ranging from 1 (completely disagree) to 5 (completely agree).

Perceived behavioural control (PBC)

A 3-item scale was developed for measurement of perceived behavioural control regarding helmet use while motorcycling. Again the same 5-point Likert-type scaling was used, ranging from 1 (completely disagree) to 5 (completely agree). Negatively worded items were reverse scored. Higher scores indicate more perceived control over reporting behaviour.

Table 1

<table>
<thead>
<tr>
<th>Studied constructs</th>
<th>Number of items</th>
<th>α in pilot sample</th>
<th>α in final sample</th>
<th>Possible range</th>
<th>Observed range</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helmet use behaviour</td>
<td>2</td>
<td>–</td>
<td>–</td>
<td>0–10</td>
<td>0–10</td>
<td>3.78</td>
<td>3.39</td>
</tr>
<tr>
<td>Intention</td>
<td>4</td>
<td>.95</td>
<td>.96</td>
<td>4–20</td>
<td>4–20</td>
<td>14.69</td>
<td>4.37</td>
</tr>
<tr>
<td>Attitude</td>
<td>5</td>
<td>.72</td>
<td>.77</td>
<td>5–25</td>
<td>5–25</td>
<td>19.77</td>
<td>3.25</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>4</td>
<td>.78</td>
<td>.82</td>
<td>4–20</td>
<td>4–20</td>
<td>15.79</td>
<td>3.11</td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td>3</td>
<td>.71</td>
<td>.79</td>
<td>3–15</td>
<td>3–15</td>
<td>9.72</td>
<td>2.20</td>
</tr>
</tbody>
</table>
Hierarchical regression analysis for the TPB constructs.

Table 3
TPB constructs with helmet use behaviour correlation matrix, n = 130.*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helmet use behaviour</td>
<td>1</td>
<td>.62</td>
<td>.57</td>
<td>.35</td>
<td>.58</td>
</tr>
<tr>
<td>Intention</td>
<td>1</td>
<td>.59</td>
<td>.60</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>1</td>
<td>.42</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norms</td>
<td></td>
<td>1</td>
<td>.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

* All correlations were significant at \( p < .01 \).

**Intention**

A 4-item scale was developed for measurement of intention regarding helmet use while motorcycling. A 5-point Likert-type scaling was used, ranging from 1 (completely disagree) to 5 (completely agree).

**Behaviour (helmet use)**

The helmet use scale was a one-item scale designed to measure the degree which the subjects use their helmet while motorcycling. This item asked the participants “On the average, how many times have you used helmet in every 10 times of motorcycling? (Please, only note a number from 0 to 10)?” Therefore, the total possible scores ranged from 0 to 10, in which higher scores were representative of higher helmet use behaviour practiced by the participants.

**Data analysis**

The Statistical Package for the Social Sciences (SPSS) was used for the purpose of data entry, manipulation, and analysis. Measures of central tendency and variability were used to summarize and organize the data. A Spearman’s correlation coefficient was used to demonstrate the nature of associations between helmet use behaviour and the TPB variables; and in order to explain the variation in helmet use behaviour scores on the basis of these TPB variables, multiple regression analysis was performed. The level of significance was set, a priori, at .05.

**Results**

The mean age of the respondents was 34.8 (SD = 8.4) years ranging from 21 to 64. Majority (54.7%) of the participants had high level (college) education. The mean monthly income of the respondents was 220,700 (SD = 68,970) Rials (1 Dollar = 9700 Rials).

Fifty-six (43.1%) out of all respondents had the history of accident while driving their motorcycles. In response to the question “Since the beginning of motorcycle riding, were you wearing helmet at the time of motorcycle crash?”, only 10.7% out of all respondents with the history of motorcycle crash were using a helmet at the time of their accidents.

The results showed that the mean of attitude, subjective norms and intention were relatively favourable. But the mean of perceived behavioural control (56.0%) and helmet use behaviour (37.8%) was found to be low. As there is shown in Table 2, all of our study’s variables were significantly correlated with intention to helmet use scores. Intention (\( r = .62 \)) and perceived behavioural control (\( r = .58 \)) had a strong relationship with helmet use behaviour (\( p < .01 \)). Perceived behavioural control (\( r = .65 \)) and subjective norms (\( r = .60 \)) had strong relationships with intention, followed by attitude (\( r = .59 \)) (\( p < .01 \)).

The statistical procedure recommended by Ajzen for examining the utility of the TPB, based on hierarchical regression models with two and three predictor variables, power of .80, and alpha of .05, adequate power was obtained to conduct these analysis. The order and content of the blocks of variables for the hierarchical regression analysis (HRA) were based on the theoretical tenets of the TPB and previous research. In the first HRA, helmet use behaviour (dependent variable) was, linearly, regressed on attitude and subjective norms (Block 1). Intention and perceived behavioural control explained 48% of the variance in helmet use behaviour (\( F = 52.15, p < .001 \)). Both intention (\( \beta = .44, p < .001 \)) and perceived behavioural control (\( \beta = .29, p < .001 \)) were significant predictors of the behaviour. For behaviour, intention was the strongest predictor.

In the second HRA, intention (dependent variable) was regressed on attitude and subjective norms (Block 1), and perceived behavioural control (Block 2). Attitude and subjective norms (Block 1) explained 47.2% of the variance in intention (\( F = 56.35, p < .001 \)), with attitude (\( \beta = .37, p < .001 \)) and subjective norms (\( \beta = .441, p < .001 \)) providing significant contributions. The addition of perceived behavioural control in Block 2 explained an additional 11.3% of the variance in intention (\( F = 58.97, p < .001 \)), with attitude (\( \beta = .207, p < .01 \)) and subjective norms (\( \beta = .355, p < .001 \)) maintaining its unique contribution, perceived behavioural control (\( \beta = .397, p < .001 \)) (Table 3).

Table 3
Hierarchical regression analysis for the TPB constructs.

<table>
<thead>
<tr>
<th>Variable</th>
<th>( R^2 )</th>
<th>( F )</th>
<th>( p )-Values</th>
<th>Standardized beta coefficients</th>
<th>Change statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predicting behaviour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1</td>
<td></td>
<td>52.15</td>
<td>&lt;.001</td>
<td>.480</td>
<td>.472</td>
</tr>
<tr>
<td>Intention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1</td>
<td>.472</td>
<td>56.35</td>
<td>&lt;.001</td>
<td>.472</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td>.585</td>
<td>58.97</td>
<td>&lt;.001</td>
<td>.585</td>
<td>.113</td>
</tr>
<tr>
<td>Intention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived behavioural control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1</td>
<td>.472</td>
<td>56.35</td>
<td>&lt;.001</td>
<td>.472</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Attitude</td>
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<tr>
<td>Subjective norms</td>
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</tr>
<tr>
<td>Perceived behavioural control</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Discussion

In the present study, the mean percent of helmet use was 37.8% and only 10.7% of the motorcyclists who had the history of accident while riding a motorcycle were using helmet at the time of their accident which was somewhat similar to the findings of studies reported by Roudsari et al. in Tehran (mean percent of helmet use = 6%) and Khorasani-Zavareh et al. in West Azarbaijan province, Iran (mean percent of helmet use = 18%). The increasing rate of helmet use in this study and also our study may be as a result of law enforcement of helmet use which initiated in 2005 in Iran. In spite of helmet use compulsion, we can see that the rate of helmet use is still very low in comparison with developed countries. Therefore, it may be presumed that there are some other factors which prohibit performing this behaviour in Iran.

Similar with the findings of these studies and also our study, the frequency of helmet use in developing countries is low. For example, in the study done in India69.8% of the drivers of motorcycle riders and passengers (34% and 71%, respectively) didn’t wear a helmet while motorcycle riding.

Also, the rate of helmet use in Vietnam was only 23.3%. The results of these studies showed that the rate of helmet use in Iran as a developing country compared to the developed countries is really low. For example, the rate of helmet use among motorcycle riders in Indonesia, New Zealand and Germany was 89%, 92% and 98.8%, respectively. Thus, developing and implementing effective programs in our society, in order to promote helmet use among motorcyclists is recommended.

Attitude, subjective norms, and perceived behavioural control had significant correlations with and significant predictors of helmet use intention. In this study, based on regression analysis, motorcyclists’ perceived behavioural control was the most important predictor of the helmet use intention. But in the studies done by Quine et al. and Lajunen and Räsänen subjective norms was the most important predictor of helmet use intention.

Perceived behavioural control refers to the degree of which an individual feels that the performance of a behaviour is under his or her volitional control. It will be expected that the perceived difficulty (or ease) of helmet use may have impact on the possibility of doing this behaviour. In this study the mean of perceived behavioural control was somewhat low (9.72 out of 15).

Therefore, we can conclude that there may be some other variables which prevent motorcyclists feel helmet use is under their volitional control. Future studies for determining these obstacles are recommended. Promoting motorcyclists’ confidence through educational programs in order to enabling them in overcoming any perceived barriers to helmet use, will improve adherence to helmet use behaviour among this population.

Based on the results, there was significant correlations between subjective norms and helmet use or intention to use it (p < 0.01). Similar with the findings of Frances and Nausbaum in Australia, subjective norms was a much more stronger predictor than attitude of motorcyclists (Block 1) and the second strongest predictor of the intention to helmet use (Block 2) because helmet use is a much public behaviour and consequently, is influenced by a variety of norms in the society. Thus, we can infer that a favourable opinion of significant others (usually cooperates and friends) increases the intention to use a motorcycle helmet. As a conclusion, educational interventions should aim mainly at changing colleagues and friends’ attitudes.

Our findings also indicated that attitude towards behaviour is a significant determinant of behavioural intention. Attitude has long been shown to influence behavioural intentions. This relationship has received substantial empirical support. For our research context, the motorcyclists’ attitudes could strongly determine their willingness to use helmet during riding on motorcycle.

Based on our results, intention and perceived behavioural control showed a significant relationship with motorcyclists’ helmet use behaviour. These findings illustrate that motorcyclist’s motivation for wearing helmet (i.e., their intention), and their evaluation of the ease or difficulty of using helmet (i.e., their perceived behavioural control), most strongly influences their helmet use. Researchers aiming to increase helmet use may need to focus on the strategies that strengthen motorcyclist’s plans and objectives to helmet use.

In conclusion, the results of this study demonstrated that TPB can be used as a conceptual framework for intervention programs aimed at increasing motorcycle helmet use intention and behaviour. The simultaneous predictive power of attitudes, subjective norms and perceived behavioural control on intention in terms of the R² was .585 (i.e., explained 58.5% of variance) which supports previous researches involving the TPB model and helmet use. Thus, as we conclude before, TPB could be used as a framework for examining helmet use intention among motorcycle riders in Iran.

The results of present study provide evidence for the TPB, hypothesizing that control beliefs play a crucial role in predicting behaviours. These results are also in line with reviews of the TPB research suggesting perceived behavioural control is the strongest predictor of intention. Our results also reinforces that the inclusion of perceived behavioural control significantly improved the prediction of intentions. Therefore, based on TPB, it will be expected that motorcyclist’s perceived constraints of helmet use may have impact on the possibility of performing this behaviour.

Limitation

A number of issues must be considered while interpreting the results of this study: first of all, due to correlational nature of the study, the reader is cautioned that no causal inferences are drawn. Secondly, the sample size was relatively low, which may reduce the power of conducted analysis. Third, the majority of the participants had high level of education (college education). Thus, the results may not generalize to the other populations. Forth, some other factors (e.g., hot weather) may affect on helmet use among participants’ responses. It should be noted that despite of the potential influences of extraneous variables, the TPB was successful in predicting motorcycle rider’s helmet use intention and behaviour. Fifth, we used a regional sample from the Yazd City that may not be representative of the whole population in Iran. A longitudinal study with all TPB variables should be considered before applying the TPB to design an intervention study, and finally, the outcome – helmet use behaviour – was determined based on only one question. For future studies, it is recommended that the behaviour be determined by a score of few questions.

Conclusion

Rate of helmet use among motorcycle riders was found to be very low; the findings of this study provide preliminary support for the TPB model as an effective framework for examining helmet use in motorcycle riders. Understanding motorcyclist’s thoughts, feelings, and beliefs about helmet use can assist intervention specialists to develop and implement effective programs in order to promote helmet use among motorcycle riders.

Conflict of interest

None declared.
Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.injury.2010.08.030.

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