ปัจจัยทำนายพฤติกรรมการป้องกันอุบัติเหตุจากรถจักรยานยนต์
ของนักเรียนชั้นมัธยมศึกษาตอนปลาย
Factors Predicting Motorcycle Accident Prevention Behaviors of High School Students

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Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาพฤติกรรมการป้องกันอุบัติเหตุและปัจจัยทำนายพฤติกรรมการป้องกันอุบัติเหตุจากรถจักรยานยนต์ของนักเรียนชั้นมัธยมศึกษา **วิธีการศึกษา:** การศึกษาแบบภาคตัดขวางเชิงทำนายนี้มีตัวอย่างเป็นนักเรียนชั้นมัธยมศึกษาตอนปลายของโรงเรียนพุทธชินราชพิทยา อ.เมือง จ.พิษณุโลก จำนวน 241 คน เก็บข้อมูลโดยใช้แบบสอบถามพฤติกรรมการป้องกันอุบัติเหตุจากรถจักรยานยนต์ การรับรู้โอกาสเสี่ยงต่อการเกิดอุบัติเหตุ การรับรู้ความรุนแรงของอุบัติเหตุ การรับรู้ประโยชน์ของการป้องกันอุบัติเหตุ และการรับรู้อุปสรรคของการป้องกันอุบัติเหตุ การมีใบอนุญาตขับขี่รถจักรยานยนต์ จำนวนปีที่ขับขี่มอเตอร์ไซค์ การสวมหมวกกันน็อค ประสบการณ์อุบัติเหตุ และความรู้เกี่ยวกับกฎหมายจราจร วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา และการวิเคราะห์ความถดถอยเชิงพหุคูณแบบขั้นตอน **ผลการศึกษา:** พฤติกรรมการป้องกันอุบัติเหตุจากการขับขี่รถจักรยานยนต์ส่วนใหญ่อยู่ในระดับปานกลาง (ร้อยละ 78) ตามด้วยระดับมาก (ร้อยละ 10.8) ปัจจัยที่สามารถร่วมกันทำนายพฤติกรรมการป้องกันอุบัติเหตุได้สูงที่สุด ได้แก่ การรับรู้อุปสรรคของการป้องกันอุบัติเหตุ (β = 0.443) รองลงมาได้แก่การมีใบอนุญาตขับขี่รถจักรยานยนต์ (β = 0.313) การรับรู้โอกาสเสี่ยงต่อการเกิดอุบัติเหตุ (β = 0.224) และอายุ (β = -0.106) ตามลำดับ โดยตัวแปรทั้ง 4 ตัวร่วมทำนายพฤติกรรมการป้องกันอุบัติเหตุได้ร้อยละ 39.8 อย่างมีนัยสำคัญทางสถิติที่ระดับ 0.05 **สรุป:** พฤติกรรมการป้องกันอุบัติเหตุจากรถจักรยานยนต์ของนักเรียนชั้นมัธยมศึกษาอยู่ในระดับปานกลาง (ร้อยละ 78) และการรับรู้อุปสรรคของการป้องกันอุบัติเหตุ การมีใบอนุญาตขับขี่รถจักรยานยนต์ การรับรู้โอกาสเสี่ยงต่อการเกิดอุบัติเหตุ และอายุสามารถทำนายพฤติกรรมดังกล่าวได้อย่างมีนัยสำคัญ

คำสำคัญ: ปัจจัยทำนาย, การป้องกันอุบัติเหตุ, รถจักรยานยนต์, นักเรียนชั้นมัธยมศึกษา

Abstract

Objective: To determine motorcycle accident prevention behavior and its predicting factors in high school students. **Methods:** In this cross-secional predictive study, the sample was 241 high school students of Buddhachinarajpittaya School, Muang district, Phitsanulok province. The data were collected by using questionnaires assessing accident prevention behaviors, perceived risk or susceptibility of road traffic accident, perceived severity of road traffic accident, perceived benefits of road traffic accident prevention, perceived barriers or obstacles of road traffic accident prevention, having a driving license for motorcycle, experience in motorcycle riding in years, helmet wearing, having motorcycle accident, and knowledge about laws and regulations regarding road traffic. Data were analyzed by using descriptive statistics and stepwise multiple regression analysis. **Results:** The motorcycle accident prevention behavior was mostly at a moderate level (78% of students) followed by high level (10.8%). The perceived barrier of accident prevention was the strongest predictor of accident prevention behaviors (β = 0.443), followed by having a motorcycle driving license (β = 0.313), perceived susceptibility of accident (β = 0.224) and age (β = -0.106). These four variables could explain 39.8% of the variance of the accident prevention behaviors with a statistical significance at 0.05 level. **Conclusion:** The motorcycle accident prevention behavior among high school students was at a moderate level. Perceived barrier of accident prevention, having a motorcycle driving license, perceived susceptibility of accident and age significantly predicted the behavior.

Keywords: predictive factors, accident prevention, motorcycle, high school students

Introduction

Motorcycle accident has become a major public health problem worldwide. Each year, every country encountered the loss of valuable human resource, a large sum of assets, socioeconomics well-being, and ultimately people's quality of life. In 2015, based on the survey data of the World Health Organization (WHO), there were approximately 1.25 million deaths and 20 – 50 disability cases according to road traffic accidents annually.[1] In South and East Asia, mortality rate of road traffic accident was about 17 per 100,000 populations.

In Thailand, road traffic accidents in 2014 as estimated by the WHO was the second most in the world with 24,237 deaths or 36.2 deaths per 100,000 populations. Data from the Ministry of Public Health of Thailand also indicated 15,045 deaths or 23.16 per 100,000 populations, which could be averaged as 40 deaths per day or 2 per hour. It was also estimated that there were 107,123 accident cases hospitalized in that year. In addition, rate of road traffic accidents was found high in provinces with a large number of industrial plants

such as Prachinburi, Chasoengsao and Rayong. Especially in the industrial area, among all road traffic accident incidents, 45.0% were of motorcycles, 42.3% of cars and 12.7% of trucks. These road traffic accidents caused the loss of life and assets both at individuals and society as a whole.

Based on the national injury surveillance system in 2013, motorcycles were the leading cause of injury (83.20%), followed by cars (6.56%) and bicycles and tricycles (2.94%).[2] Among those motorcycle riders not wearing helmets while having accidents, 87.32% experienced severe injury. Such severe injuries were found in 86.13% of riders themselves and 93.96% of the passengers. Furthermore, based on the data of injuries and deaths relating to motorcycles in all age ranges, individuals aged 15 – 19 years old were found the most. Most severe injuries were found in those not wearing helmet. In 2014, the surveillance network for road safety called "Road Safety Watch" reported that helmet was worn in only 24% of those teenagers experiencing road traffic accidents.[2] Regarding age groups, individuals aged 15 - 19 years were the most likely to face road traffic accidents; while their younger (10 – 14 years) and older (20 – 24 years) counterparts were less likely. All three age groups combined were accounted for 35% of road traffic accidents. These findings indicated that road traffic accidents have been a major cause of death among teenagers, especially those in senior high schools (age of 15 – 19 years old).[2]

In Phitsanulok province, road traffic accident has always been the third leading cause of death in the last three years from 2016 to 2018 with 261, 229 and 303 deaths, respectively.[2] Those death cases could be viewed as rates of 29.82, 26.00 and 34.27 per 100,000 populations, respectively. Economic burden on families and society as a whole has been increasing since road traffic accident cases with disabilities could lead to both immense direct and indirect medical costs. In the fiscal year of 2016, which was from October 1, 2015 to September 30, 2016, a total of 280 deaths relating to road traffic accidents were reported in Phitsanulok. More than half of these death cases were found in the Muang district and as high as 63.14% were dead at the accident spot. These indicated severe road traffic accidents especially around newyear's eve where more accidents cases occurred with 8 deaths and 416 injuries in 2014, 5 deaths and 210 injuries in 2015, and 5 deaths and 345 injuries in 2016. This ascending trend of road traffic accident injuries is of a great concern by Phitsanulok Provincial Public Health Administration Office and measures to prevent and alleviate the injuries have been continuously enforced.

A study by Boonprasom and Petpoom[3] found that motorcycle accident preventing behavior among grade 1 – 6 highs school students was at a moderate level; while perceived risk of accident, knowledge about traffic laws, and male gender were significant predicting factors for the behavior (P-value < 0.05). Based on the report of the Office of Non-communicable Diseases, causes of motorcycle accidents included driving over speed limit and driving under the influence.[2] The study of Jarumanee revealed that factors influencing road accidents included noncompliance or violation of traffic rules, a lack of driving skill, vehicle defects, poor traffic surface, a visibility block on traffic signs and/or low visibility, and disrupted law enforcement.[4] With all problems, studies to prevent motorcycle accidents and factors influencing such accidents are of an urgent need.

In Muang district of Phitsanulok province, the area around Buddhachinnarat High School surrounded by markets is congested with vehicles. Students are dropped off from and picked up onto the car by their parents. In addition, the railroad in front of the school makes the traffic even worse and more road traffic accidents have been observed. With a unique circumstance of road traffic accidents among teenagers and the surrounding, we aimed to determine factors affecting motorcycle accident preventing behaviors of students in Buddhachinnarat High School, Muang district, Phitsanulok province. The study conceptual framework was guided by the Health Belief Model.[5]

Based on the Health Belief Model, the practice of **desirable behavior** is influenced by various factors. Based on **perceived susceptibility or risk**, individuals will perform the desirable behavior if they adequately perceive that their poor bevaior makes them susceptible to the illness or undesirable health outcomes. **Perceived severity** of the potential poor health or illness could also make individuals more prone to adopting the desirable behavior. At the same time, if **perceived benefits** outweigh **perceived barriers** of performing the desirable behavior, individuals are more likely adopt the behavior. In this present study, the desirable behavior was motorcycle accident prevention, while proposed predictive factors included perceived severity of road traffic accident, perceived benefits of road traffic accident prevention, and perceived barriers of road traffic accident prevention.

Specifically, the objectives of the study were to determine 1) levels of motorcycle accident preventing behaviors of students in Buddhachinnarat High School, Muang district, Phitsanulok province, and 2) factors that affect such behaviors among the students. We hypothesized that motorcycle accident preventing behaviors among students in Buddhachinnarat High School were associated with demographic characteristics (gender, age, and education level), having a driving license for motorcycle, experience in motorcycle riding in years, helmet wearing, having motorcycle accident, knowledge about laws and regulations regarding road traffic, perceived risk or susceptibility of road traffic accident, perceived severity of road traffic accident, perceived benefits of road traffic accident prevention, and perceived barriers or obstacles of road traffic accident prevention.

Methods

In this predictive research, factors potentially affecting levels of motorcycle accident preventing behaviors of senior high school students in Buddhachinnarat High School, Muang district, Phitsanulok province were examined. The study survey was conducted from June to September 2019. Study population was 648 senior high school students (i.e., grades 4, 5 and 6) of Buddhachinnarat High School, Muang district, Phitsanulok province in the academic year of 2018. Twelve factors hypothesized to relate with motorcycle accident preventing behaviors included gender, age, education level, having a driving license for motorcycle, experience in motorcycle riding in years, helmet wearing, having motorcycle accident, knowledge about laws and regulations regarding road traffic, perceived risk or susceptibility of road traffic accident, perceived severity of road traffic accident, perceived benefits of road traffic accident prevention, and perceived barriers or obstacles of road traffic accident prevention. Based on the equation of Chirawatkul[6], with a total of 12 variables examined and 20 subjects needed for each variable, a sample size of 241 participants was required. Participants were selected by a systematic random sampling with a sampling interval of 3.

Research instruments

The study instrument was a 4-section questionnaire which was modified by the researchers from the work of Thongroang.[7] The questionnaire was self-administered and took about 20 minutes to complete. The first section collected demographic information of the participants (gender, age, education level, having motorcycle driving license, experience as number of years of motorcycle riding, helmet wearing, and history of motorcycle accidents). The second section asked about knowledge on traffic laws and regulations (16 items). One point was scored for a correct answer while 0 for an incorrect one. With a possible total score of 16 points, three levels of traffic laws knowledge were categorized as low (0 – 9 points), moderate (10 – 13 points), and high (14 – 16 points).

As guided by the Health Belief Model, the third section evaluated the participants about their perception on risk and severity of road traffic accidents (12 and 6 items, respectively), and benefits and obstacles of road traffic accident prevention (8 and 9 items, respectively). Response for this section was a 5-point Likert-type rating scale ranging from 1-least agreed to 5-most agreed, with reverse scores for negative statements. The total score of each of the four parts of the third section was categorized into three levels: 12 – 27, 28 – 44, and 45 – 60 points for low, moderate and high level of perceived risk of road traffic accidents, respectively; 6 – 13, 14 – 21, and 22 – 30 points for low, moderate and high level of perceived severity of road traffic accidents, respectively; 8 – 18, 19 – 29, and 30 – 40 points for low, moderate and high level of perceived benefits of road traffic accident prevention, respectively; and 9 – 20, 21 – 32, and 33 – 45 points for low, moderate and high level of perceived obstacles of road traffic accident prevention, respectively.

The last section assessed the participant's motorcycle accident preventing behaviors (18 items). Response for this section was a 4-point Likert-type rating scale ranging from 1-never practice to 4-practice regularly, with reverse scores for negative behaviors. With the total score of 73 points, three levels of behavior were categorized as low, moderate and high (18 – 35, 36 – 53, and 54 – 73 points, respectively).

Instrument quality assurance

Content validity of the questionnaire was examined by three experts using the Item Objective Congruence Index (IOC) of 0.66 – 1.00 as the acceptability criteria. Once found acceptable after revisions, the questionnaire was tested for internal consistency reliability with 30 individuals with characteristics comparable to the prospective participants. For the section on knowledge of road traffic laws and regulations, reliability was found high with Kuder-Richardson's coefficient

of 0.87 and difficulty level was moderate with values for all items in a range of 0.53 – 0.73. Internal consisteny reliability for the third and fourth sections was found high with Cronbach's alpha coefficients of 0.86 and 0.78, respectively.

Participant's right protection

The study protocol was approved by the Ethics Committee for Human Studies of Pibulsongkram Rajabhat University (approval number: EC No. 2018/002) Participants were provided with study objectives and steps. With the voluntary nature of the study, participants were informed that they could withdraw from the study at any time point with no adverse consequence. Their answers and information were secured and presented as summary results, not individual participant's data, and only for educational purpose. Written informed consent was obtained as a proof of voluntary participation.

Data collection procedure

Permission to conduct a survey at Buddhachinnarat High School was formally requested to the school director. Once approved, the researchers approached the prospective students identified by the systematic sampling method. The investigator (NS) introduced himself to the students and provided them with objectives and steps of the study. Once informed consent was obtained, participants were asked to complete the questionnaire. Once completed, the researcher inspected the questionnaire for any incomplete answers and correct according.

Statistical analysis

Descriptive statistics including frequency with percentage, mean with standard deviation, and maximum and minimum values were used for demographic characteristics and scores of knowledge, perceptions based on the Health Belief Model, and motorcycle accident preventing behaviors. To test the association between the behavior score and potential affecting factors, stepwise multiple regression analysis was conducted.

All statistical significance was set at a type I error or 5% (or P-value < 0.05). Statistical software program SPSS version 17 was used for analysis. All assumptions of multiple regression analysis were met.

Results

Of the 241 participating students, there were more female than male participants (64.32% and 35.68%, respectively) (Table 1). The majority were 17 years old (34.02%), followed by 16 (31.54%), 18 (19.09%), 15 (13.28%) and 19 years old (2.07%). With the sampling method, numbers of participants in each grade were relatively evenly distributed (33.20%, 32.78% and 34.02%, for grades 4, 5 and 6, respectively). Almost two-thirds had no motorcycle driving license (63.49%); while 36.51% did. The majority had 1 – 3 years of motorcycle riding experience (39.42%), followed by 4 – 6 years (28.22%) and no experience (25.72%). Almost all of them wore helmet (96.27%) and had no accidents (89.21%).

Table 1 Demographic characteritsics and motorcycle accident experience of the participants (N = 241).

Characteristics and experiences	N	%
Age (years)		
15	32	13.28
16	76	31.54
17	82	34.02
18	46	19.09
19	5	2.07
Mean = 16.65, S.D. = 1.002, min = 15, max = 19		
Gender		
Male	86	35.68
Female	155	64.32
Education level		
High school grade 4	80	33.20
High school grade 5	79	32.78
High school grade 6	82	34.02
Having a driving license for motorcycle		
Yes	88	36.51
No	153	63.49
Experience in motorcycle riding (years)		
None	62	25.72
1 – 3 years	95	39.42
4 – 6 years	68	28.22
7 – 10 years	16	6.64
Helmet wearing		
Yes	232	96.27
No	9	3.73
Having motorcycle accident		
No	215	89.21
Yes	26	10.79

Level of each study variable

It was found that all of the participants had a high level of **knowledge** about laws and regulations regarding road traffic (100.0%) (Table 2). Based on the **Health Belief Model**, majority of the participants had a moderate level of **perceived risk** of road traffic accident (66.4%), followed by those with high and low levels (32.0% and 10.7%, respectively). About

two-thirds had a high level of **perceived severity** of road traffic accident (69.63%), followed those with moderate and low levels (30.3% and 0.4%, respectively). For the **perceived benefits** of road traffic accident prevention, slightly more than half of the participants rated their opinion at a moderate level (56.8%); while 42.3% provided a high level and 0.8% rated it at a low level. Almost two-thirds of the participants had a low level of **perceived obstacles** of road traffic accident prevention (63.5%) followed by those with moderate (27.0%) and high levels (9.5%). The majority of participants had a moderate level of **motorcycle accident preventing behaviors** (78.8%), followed by those with high and low levels (10.8% and 10.4%, respectively) (Table 2).

Table 2 Levels of study factors (N = 241).

Factors	N	%
Knowledge about laws and regulations regarding road traffic		
High	241	100.0
Moderate	0	0
Low	0	0
Perceived risk of road traffic accident		
High	77	32.0
Moderate	160	66.4
Low	4	1.6
perceived severity of road traffic accident		
High	167	69.3
Moderate	73	30.3
Low	1	0.4
Perceived benefits of road traffic accident prevention		
High	102	42.4
Moderate	137	56.8
Low	2	0.8
Perceived obstacles of road traffic accident prevention		
High	23	9.5
Moderate	65	27.0
Low	153	63.5
Motorcycle accident preventing behaviors		
High	26	10.8
Moderate	190	78.8
Low	25	10.4

Predicting factors of motorcycle accident preventing behaviors

Based on the regression standardized regression coefficients (β) in a descending order, significant predictors of the motorcycle accident preventing behaviors included perceived obstacles of road traffic accident prevention (X_{13}), having motorcycle driving license (X_5), perceived risk of road traffic accident (X_{10}), and age (X_1) (Table 3). With all four predictors together, a correlation coefficient (R) of 0.638 indicated a 39.8% of the behavior variance explained ($R^2 = 0.398$) with statistical significance (P-value < 0.05). The

equation to predict motorcycle accident preventing behaviors by the unstandardized stepwise regression coefficients (B) could be depicted as follows.

$$Y' = 33.711 - 0.454 (X_{13}) + 5.833 (X_5) + 0.353 (X_{10}) + 0.949 (X_1),$$

where

Y' = score of motorcycle accident preventing behaviors,
X_{13} = score of perceived obstacles of road traffic accident prevention,
X_5 = having motorcycle driving license,
X_{10} = score of perceived risk of road traffic accident, and
X_1 = age in years.

Hence, the score of motorcycle accident preventing behaviors decreased with the increase in score of perceived obstacles of road traffic accident prevention. On the other hand, the behavior score increased with having motorcycle driving license and increase in the score of perceived risk of road traffic accident and age (Table 3).

Table 3 Predictive factors of motorcycle accident preventing behaviors based on stepwise multiple regression (N = 241).

Predictive factors	B	SE_b	β	t	P-value
perceived obstacles of road traffic accident prevention (X_{13})	0.454	0.053	0.443	8.523	< 0.001
having motorcycle driving license (X_5)	5.833	0.955	0.313	6.110	< 0.001
perceived risk of road traffic accident (X_{10})	0.353	0.084	0.224	4.215	< 0.001
age (X_1)	-0.949	0.464	-0.106	-2.043	0.042

Note: ANOVA model: constant (a) = 33.711, R = 0.638, R^2 = 0.408, Adjusted R^2 = 0.398, F = 1.902.

Discussions and Conclusion

Among senior high school students in Buddhachinnarat High School, Muang district, Phitsanulok province, our study found four significant predictors of the motorcycle accident preventing behaviors including age, having motorcycle driving license, perceived risk of road traffic accident, and perceived obstacles of road traffic accident prevention. The score of motorcycle accident preventing behaviors decreased with the increase in score of perceived obstacles of road traffic accident prevention. On the other hand, the behavior score increased with having motorcycle driving license and increase in the score of perceived risk of road traffic accident and age. The discussions were as follows.

Perceived obstacles of road traffic accident prevention was significantly associated with the motorcycle accident

preventing behaviors among senior high school students. Perceived obstacles to driving behavior modification could cause difficulties and/or inconvenience in daily life which could further affect the change in the actual accident preventing behavior. Our finding was consistent with the study of Upathump[8] where those with no motorcycle related injuries had a lower level of perceived obstacles of safe motorcycle driving behaviors compared with those with injuries.

We found that having a motorcycle driving license was associated with a higher score of the motorcycle accident preventing behaviors. This could be due to the fact that to obtain driving license, one needs to attend the short-course training, pass the paper examination, and pass the actual driving test. [9] This requirement forces the driving license holders to have more knowledge and awareness in their actual driving than those having no license. However, the study of Upathump examined the perceived benefits, perceived obstacles, and perceived self-efficacy in relation to safe driving behaviors among those with and without motorcycle related injuries in tertiary care hospitals in the south of Thailand and found that students had similar motorcycle driving behaviors regardless of driving license holding status.[8]

Perceived risk of road traffic accident was predictive for the motorcycle accident preventing behaviors in our study. This perceived risk of accident is an acquired perception of the driver on an involvement in and the anxiety on encountering a foreseeable accident. This was consistent with the concept of the Health Belief Model.[5] Perceived risk of road traffic accident or related injuries reflects the drivers' capacity to estimate the risk in a given traffic circumstance and to prevent themselves from the injuries. This capacity reduces the risky driving behavior. Drivers with poor perceived risk of road accident are prone to reckless driving and subsequent road accidents. A study also showed that perceived risk of road accident could predict motorcycle accident preventing behavior among high school students (grade 1 – 6) with statistical significance (P-value < 0.05).[3] It was also consistent with the study of Yingratanasuk et al where perceived risk of motorcycle accident was associated with the safe road traffic behavior with statistical significance (P-value < 0.05) among students and staff at Bhurapa University. [10] The study of Leelawiwat also showed that perceived risk of motorcycle accident was predictive for motorcycle accident preventing behavior among high school students with statistical significance (P-value < 0.05).[11]

Age was significantly associated with the motorcycle accident preventing behaviors among these senior high school students as hypothesized. Age is an influencing factor of given behaviors since all behaviors are related with past experience. The greater the age, the better decision for self-care is made. This is based on the Health Belief Model[5] that age is a modifying factor which has its indirect effect through the person's perception. In addition, based on Orem's concept, age is related to development and past experience which could result in differences in individuals' expressing, handling, understanding, reasoning and making decision on their behaviors. [12] In short, the more maturity, the better choice selection and decision making. Our finding was also consistent with the work of Jongkae et al were they found that older teenagers were more likely to have a better behavior of motorcycle accident prevention than their younger peers. [13] However, our result was in contrast to the study of Boonprasom and Phetphum[3] of which age was not associated with motorcycle accident prevention behavior among grade 1 – 6 high school students at a tutorial school in Phitsanulok.

Other factors were not significantly associated with the motorcycle accident preventing behavior among senior high school students. These included gender, education level, experience in riding motorcycle, wearing helmet, experience in motorcycle accident, knowledge about laws and regulations on traffic, perceived severity of the accident, and perceived benefits of accident preventing behavior. However, in few other studies, knowledge about laws and regulations on traffic, gender, experience in motorcycle riding, and experience in motorcycle accident were significantly predictive for accident preventing behavior.[3,12]

Our findings could be used for public policy making. All involving parties such as department of road transportation and public health offices could cooperate in initiating campaign or program to promote awareness among high school students about road accident and compliance with traffic laws and regulations. In terms of future research, studies on student's participation on motorcycle accident preventing behavior modification with social support should be conducted. Monitoring factors potentially causing motorcycle accidents should also be studied.

In conclusion, age, having motorcycle driving license, perceived risk of road accident, and perceived obstacles of road traffic accident prevention were significantly predictive for

motorcycle accident preventing behavior among senior high school students.

Acknowledgement

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