

The Influence of Motorcyclists' Attitudes on Traffic Accidents and Offences

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Abstract

This study aims at identifying determinants of motorcyclists's attitudes and analysing their influences on the occurrence of traffic accidents and offences. A self-reported questionnaire survey was distributed in year 2016 among a representative sample of motorcyclists in Denpasar, Bali. The questionnaire consisted variables of socio-economic factors, the use of motorcycle and riding history, learning method and experience on riding motorcycles, motorcyclist attitudes and involvement in traffic accidents and offences. The results show that age and education level influenced learning method and experiences variables while gender did on motorcyclists' attitude. In addition, learning method and experience and motorcyclists' attitudes on the road were two significant factors respectively that negatively affected motorcyclists' involvement in traffic accidents and offences. In other words, ages, education level and gender have significant indirect influences on motorcyclists' involvement in traffic accidents and offences. The influence of gender implies that compared to females, male motorcyclists are more likely to fail giving priority and violate parking signs. In comparison with females, male motorcyclists therefore, are more likely to get involved in traffic accidents and offences. Interestingly, this study indicated that motorcyclists with a higher education were not a guarantee not to involve in traffic accidents and offences.

Keywords: Motorcyclist's attitude, road safety, traffic accidents, traffic offences.

Abstrak

Penelitian ini bertujuan untuk identifikasi faktor-faktor penentu sikap pengendara sepeda motor dan pengaruhnya terhadap terjadinya pelanggaran dan kecelakaan lalu lintas. Pengambilan data dilakukan pada tahun 2016 dengan menyebarkan kuesioner kepada pengendara sepeda motor di Denpasar, Bali. Kuesioner memuat variabel-variabel sosial ekonomi, rekam penggunaan sepeda motor, teknik latihan dan pengalaman berkendara dengan sepeda motor, sikap pengendara motor dan keterlibatan terkait pelanggaran dan kecelakaan lalu lintas. Hasil penelitian menunjukkan bahwa usia dan tingkat pendidikan berpengaruh kepada teknik latihan dan pengalaman berkendara sementara jenis kelamin berpengaruh pada sikap pengendara sepeda motor. Teknik latihan dan berkendara dan sikap pengendara sepeda motor adalah dua faktor penting yang berdampak negatif terhadap keterlibatan pengendara sepeda motor dalam pelanggaran dan kecelakaan lalu lintas. Usia, tingkat pendidikan dan jenis kelamin memiliki pengaruh tidak langsung pada keterlibatan pengendara sepeda motor dalam pelanggaran dan kecelakaan lalu lintas. Pengendara sepeda motor pria, dibandingkan dengan wanita, mempunyai kemungkinan untuk tidak memberikan prioritas kepada pengendara bermotor lainnya dan pelanggaran rambu lalu lintas (parkir). Dengan perkataan lain, pengendara sepeda motor laki-laki di Denpasar, mempunyai kemungkinan terlibat pelanggaran dan kecelakaan lalu lintas. Penelitian ini juga memperlihatkan bahwa pengendara sepeda motor dengan pendidikan tinggi bukan jaminan tidak terlibat dalam pelanggaran dan kecelakaan lalu lintas.

Kata-kata Kunci: Sikap pengendara sepeda motor, keselamatan jalan, kecelakaan lalu lintas, pelanggaran lalu lintas.

1. Introduction

Risky behaviour demonstrated by motorcyclists in developing countries may be due to their lack of knowledges on traffic rules and regulations and road safety matters (Chakrabarty, et al., 2013) As an example, failed to yield were found to influence motorcycle casualties in Bali (Wedagama, 2010a). This indicated that road safety measures such as road signs and markings have not been self-enforcing. Few studies conducted in Indonesia have also shown that road user behaviours highly contributing on road accidents (Indriastuti and Sulistio, 2010; Ramli, et al., 2014). Comprehending factors affecting risky behaviours, such as traffic rule violations, therefore are important to encourage road safety in urban roads (Joewono, et al.,

2015). In addition, some attitudes consist of failing to keep lane, failing to yield, speeding, maintaining gap too close, riding recklessly, and overtaking on the wrong side were responsible for motorcycle accidents in Indonesia. These kinds of attitudes were the most frequent traffic violation types conducted among urban motorcyclists in Indonesia (Susilo, et al., 2015).

Meanwhile, road safety issues including accident rates, collision and accident risks have long been considered to associate with risky behaviour. In comparison with motorists with a low score, those who had a high score on self-reported risk behaviour surely tend to continually engage in traffic accidents (Iversen and Rundmo, 2004). This study results certainly showed that attitudes influencing the prediction of behaviour. In theory, attitudes are propensity to assess an individual

with some degree of respect or disrespect usually stated in cognitive, affective and behavioural responses (Eagly and Chaiken, 1993 in Iversen and Rundmo, 2004).

In terms of age, gender and driving/riding exposures, younger and male motorists and those who hold a licence for less than 10 years were found to have more negative attitudes towards traffic safety. In addition, risky behaviours were found to have a direct impact on both involvements in near accidents and in accidents by 21% of the total variance (Iversen and Rundmo, 2004). In details, the study investigated the elements of attitude that significantly influencing traffic risk behaviour. The study also compared the effect of individuals with high and low score on tendency for risk behaviour towards traffic safety. Motorists' attitudes towards road safety were related with involvement in risky behaviour particularly violating traffic rules and regulation, exceeding maximum speed and driving/riding thoughtlessly (Iversen and Rundmo, 2004).

In Bali however, the high numbers of road traffic accidents and injuries involving motorcycles were attached to their supremacy within urban transportation systems. The potential injury related with any traffic accident is usually higher for motorcyclists and their pillioners, mainly due to a lack of protection provided by the physical structure of a motorcycle. Some past studies on road safety in Bali demonstrated that motorcyclists significantly to influence road accidents and fatalities. For instance, motorcyclists were at fault and failed to yield on two arterial roads to contribute more than 33% of accidents (Wedagama and Dissanayake, 2010a). In Tabanan regency, motorists were at fault to affect about 30% of motorcycle fatal accidents (Wedagama, 2009a). In terms of age, young motorists aged between 17 and 26 years influenced

about 38% of motorcycle fatal and serious injuries on two arterial roads in Bali (Wedagama, 2009b). In addition, age was found to contribute to approximately 50% of all type of vehicle fatalities in Bali (Wedagama and Dissanayake, 2010b). These past studies generally show that age and motorcyclists' behaviour were significantly influencing factors to road accidents and injuries in Bali.

The study aims to examine the determinants of motorcyclists's attitudes and analyse the influence of the attitudes on traffic accidents and offences. The general hypothesis is these motorcyclists' attitudes are influenced by socio economic, the use of motorcycle and riding history, and learning method and experience on riding motorcycles and if properly understood have a significant impact on the occurrence of traffic accidents and offences in Denpasar, Bali.

2. Data

Local motorcyclists in Denpasar were informed on the purpose of the survey and asked for their cooperation to take part before the survey begins. As the results, there were 350 effective samples were used for this study. In this study, a Driver Behavior Questionnaire (DBQ) was adopted in accordance to the study objective. The DBQ is employed because bias due to socially desirable responding is found relatively small in the responses (Lajunen and Summala, 2003). In addition, the validity of the DBQ is significantly relevant for road safety researchers and practitioners who examining riding attitudes of a population of interest (de Winter and Dodou, 2010).

The questionnaire consisted six (6) items containing a total of 65 questions as shown in **Table 1**. The self-report method was used to this study because it

Table 1. Items on questionnaire

No.	Items	Factor
A1	Age	Socio economic
A2	Gender (1= male ; 2=female)	
A3	Education level	
A4	Marital Status	
A5	Number of children	
A6	Household income	
B1	Years of experience on riding motorcycle	The use of motorcycle and riding history
B2	Years of licence ownership	
B3	Number of working days per week	
B4	Number of working hours per day	
B5	Riding a motorcycle for main trip purpose	
B6	Kilometres travelled with a motorcycle	
C1	Learning traffic safety at school/college	Learning method and experience on riding motorcycles
C2	Learning to ride a motorcycle at school/college before obtaining licence	
C3	Learning methods in riding a motorcycle	
C4	Illegal riding (without license)	
D1	Involved in traffic accidents for the past 10 years	Involvement in traffic accidents and offences
D2	Involved in traffic offences for the past 5 years	
E1-E30		Self reported attitudes of motorcyclists riding on the road
F1-F17		Indicator of road safety improvement

provides the same respondent with such various attitudes and is recorded more conveniently (Rhodes and Pivik, 2011). This methodology was in line with a past study by Ulleberg and Rundmo (2003) showing that it is appropriate to consider self-reported driving/riding behaviour as it showed a stable behaviour pattern and also predicted a consistent indicator of riding behaviour.

Data respondents collected include socio-economic factors (A1-A6), the use of motorcycle and riding history (B1-B6), learning method and experience on riding motorcycles (C1-C4), involvement in traffic accidents and offences (D1-D2), motorcyclist attitudes on the road (E1-E30; 1 = always to 5 = never) and road safety improvement indicators (F1-F17; 1 = extremely agree to 5 = extremely disagree). **Table 1** shows all items on questionnaire and number of questions on each item.

The average age of the sample was 28.6 years (range 16–72 years) consisting of 191 males and 159 females. Based on the data, the highest percentage of age of the respondent by 59.7% was young motorcyclists (i.e. between 16 and 25 years), followed with ages between 26 and 60 years and above 60 years by 38.6% and 1.71% respectively. Meanwhile, male and female respondents were relatively equal by 54.6% and 45.4% respectively. The education level of the respondent was dominated with graduated from colleges or universities by 57.7%, followed with those who passed senior high school by 36.3% while those who passed elementary school and junior high schools were both relatively equal by 3%. There were 167 (47.71%) and 220 (62.85%) respondents were not involved in traffic accidents and offences during the last 10 years. Most of traffic offences included riding motorcycles without wearing helmets, riding without license and with expired licenses.

Hypothesised models are initially required to test the relationship among the measures shown in **Table 1** as follows:

- H_1 = Socio-economic characteristics are expected to influence motorcyclists' attitudes riding on the road and learning method and experience on riding motorcycles.
- H_2 = The use of motorcycle and riding history are expected to influence motorcyclists' attitude on riding motorcycles and learning method and experience on riding motorcycles.
- H_3 = Motorcyclists' attitudes riding on the road and learning method and experience on riding motorcycles are expected to influence involvement in traffic accidents and offences.

3. Model Development and Analysis

3.1 Principal Component Analysis (PCA)

In order to examine the variable inclusion in the model, each attitude variable represented in ordinal data

containing 30 questions no E1-E30 in **Table 1** is subjected to Principal Component Analysis (PCA). The maximum variance method (MVM) is used to determine the main components. As shown in **Table 2**, loading factors of four observations in a group of failed to give other priority and violated traffic sign consisting question no E16 (made *U turn* despite the vehicle on right side approached), E17 (failed to stop or give way despite no give way sign is present), E18 (failed to give way at roundabout) and E29 (parked despite 'No Stop/No Park sign' is present) are considered significant in which the variances explained more than 20% and loading factors measured by Cronbach' Alpha more than 0.7 (Hooper, et al., 2008). This demonstrates that these four items achieve relative internal consistency values more than 0.70. **Table 2** shows attitude factor and its variables included in the model development.

Table 2. Attitudes variables selection using PCA

Factor	% Variance Explained	Questions no.	Mean	S.D	Loading	Cronbach' Alpha
Failed to give other priority and violated traffic signs (failed to obey parking sign)	22.754 %	E16	4.069	0.909	0.664	0.783
		E17	3.948	0.918	0.685	
		E18	3.863	1.006	0.663	
		E29	4.355	0.841	0.695	

Note: (1) indicates very often to (5) never on a 5-point scale.

Further, the analysis indicates these types form of attitudes consisting failed to give priority to other motorists while on the road and violated traffic signs in particular stopped/parking sign significantly represented common attitudes of motorcyclists in Denpasar, Bali. These findings are similar to past studies by Wedagama (2009a) and Wedagama and Dissanayake (2010a) which found that failed to yield was significant factor to influence motorcycle fatal accidents and traffic accidents respectively in Bali.

3.2 Correlation among variables

The bivariate relationships between participants' self-reported socio-economic factors, the use of motorcycle and riding history, learning method and experience on riding motorcycles, involvement in traffic accidents and offences and motorcyclist attitudes are presented in **Table 3**. Due to incomplete answer for B1 and B2 however, these two variables were excluded in the analysis and subsequently in the model developments.

Table 3 demonstrated that all items of socio economic factor except gender have positive and significant relation to number of working days per week. Gender statistically, has negative and significant association with number of working days per week. All socio economic factors excluding gender have positive and significant relation to number of working hours per day while gender has no association with number of working hours per day. Further, all socio economic factors except gender and education level have negative and significant connection with riding a motorcycle for main trip purpose. Meanwhile, gender and education level have no link with riding a motorcycle for main trip purpose. In contrast to gender, age has a positive and significant association with kilometres travelled with a motorcycle. These indicate that gender may have least or no significant association with a factor of the use of motorcycle and riding history. In addition, education level has negative and significant association

with learning traffic safety at school/college. All items of socio economic factor except gender and number of children positively and significantly associated with learning to ride a motorcycle at school/college before obtaining license. Interestingly, age has positive and significant association with illegal riding a motorcycle (without any license).

Age, marital status and number of children have negative and significant association with involvement in traffic accidents for the past 10 years. In addition, household income negatively and significantly related to involvement in traffic offence for the last 5 years. These indicate that in general socio economic factors negatively associated with both involvement in traffic accidents and offences in the past. In the meantime, number of working days per week and working hours per day, have positive and significant association with learning to ride a motorcycle at school/college before obtaining license and learning methods in riding a motorcycle. Numbers of working days per week and working hours per day however, have negative and significant association with involvement in traffic offences for the last 5 years. Meanwhile, riding a motorcycle for main trip purpose negatively and significantly related to all learning method and experience on riding motorcycles. In contrast to learning to ride a

motorcycle at school/college before obtaining license, learning methods in riding a motorcycle has positive and significant association with involvement in traffic offences for the last 5 years. In addition, illegal riding without a license negatively and significantly associated with involvement in traffic accidents for the past 10 years.

Socio economic factors (shown with A1-A6) generally have positive and significant association with common motorcyclist attitudes of failed to give priority and violated parking sign (shown with E16-E18 and E29). Meanwhile, learning method factors have only one item (i.e. learned riding a motorcycle while at school/college before obtaining a license) that have positive and significant association with common motorcyclist attitudes. An item of learned traffic safety while at school/college has positive and significant relation to made U turn despite another vehicle on right side approaching. A plausible explanation for this is these motorcyclists had just started to learn riding motorcycle at aged below 16 years old while at school/college (official age to obtain riding license in Indonesia). These young adults and students' motorcyclists have been identified to be more likely to frequently violate traffic regulations (Susilo, et al., 2015).

Table 3. Pearson correlations among variables

	A1	A2	A3	A4	A5	A6	B3	B4	B5	B6	C1	C2	C3	C4	D1	D2	E16	E17	E18	E29
A1	1	-.105*	.108*	.700**	.758**	.437**	.390**	.383**	-.172**	.120*	.102	.150**	-.085	.202**	-.135*	-.026	.114*	.181**	.147**	.022
A2		1	-.047	-.045	-.069	-.162**	-.116*	-.084	.074	-.105*	.003	-.044	.102	.070	-.006	.074	.101	.164**	.153**	.129*
A3			1	.139**	.038	.209**	.309**	.315**	-.050	.103	-.121*	.258**	-.059	.075	-.052	-.065	.121*	-.003	.017	.044
A4				1	.703**	.445**	.381**	.374**	-.217**	.028	.080	.120*	-.013	.183**	-.153**	-.037	.089	.125*	.098	-.054
A5					1	.349**	.273**	.280**	-.147**	-.023	.080	.080	-.059	.135*	-.124*	-.016	.085	.138**	.051	.003
A6						1	.508**	.532**	-.280**	.054	.002	.209**	-.059	.093	-.097	-.220**	.156**	.095	.092	.067
B3							1	.899**	-.414**	.175**	.103	.198**	.085	.206**	.024	-.116*	.023	.073	.035	-.005
B4								1	-.417**	.142**	.026	.191**	.082	.184**	-.012	-.138**	.033	.055	.032	.015
B5									1	-.030	-.125*	-.125*	-.118*	-.111*	.054	.046	.067	.044	.011	.080
B6										1	-.030	.051	-.029	-.025	.076	.010	.069	-.003	.040	-.039
C1											1	.124*	-.027	.261**	-.024	-.074	-.190**	.070	.087	.057
C2												1	.018	.142**	-.073	-.129*	.153**	.110*	.229**	.187**
C3													1	.066	.040	.143**	-.096	-.019	-.024	.019
C4														1	-.147**	-.023	-.048	.061	.075	-.012
D1															1	.297**	-.150**	-.060	-.120*	-.108*
D2																1	-.064	-.047	-.148**	-.144**
E16																	1	.480**	.444**	.425**
E17																		1	.496**	.511**
E18																			1	.410**
E29																				1

Note: ** = $p < 0.01$; * = $p < 0.05$

Meanwhile, involvement in traffic accidents in the past 10 years and traffic offences for the last 5 years positively and significantly associated with common motorcyclist attitudes. Interestingly, the use of motorcycle and riding history had no association at all with these common attitudes. This indicates that variables on riding experiences and kilometres travelled did not have impacts in changing motorcyclists' attitudes. Further, the more experienced a motorcyclist would not be a guarantee not to fail in giving priority and violate parking signs. A plausible explanation for this is the appropriate licensing system in Indonesia may have not been strictly implemented for example in obtaining driving/license system and punishment for the traffic offences.

With regard to these correlations, all items of the use of motorcycle and riding history factor, learning methods in riding a motorcycle and illegal riding without a license are not used in the model development. Considering the Pearson correlations in **Table 3**, the independent/exogenous variables consist of items A1-A6, C1-C2, E16-E18 and E29, while the dependent/endogenous variables contain of D1-D2. These variables are subsequently used for the construction of SEM. Meanwhile, the indicators of road safety improvement consisting items F1-F17 were used to recommend suggestions for this study.

3.3 Structural Equation Model (SEM)

SEM is employed to explain the relationships among latent/hypothetical/unobserved and observed variables. Latent variables remove all measurement errors therefore more valid coefficients are attained. In addition, all coefficients in SEM are determined simultaneously hence the significance and strength of a particular relationship within the final model are able to be evaluated. SEM can be regarded as a grouping of two types of statistical techniques comprising factor analysis and simultaneous equation models. Either exogenous or endogenous variable in SEM is conceded to handle indirect, multiple, and reverse relationships (Hair, et al., 2010).

Goodness of fits to validate the model is basically a comparison between the full model and the no model at all (Joreskog and Sorbom, 1993, in Hooper, et al., 2008). In addition, Chi-Square value is employed to measure overall model fit. This value shows the discrepancies between the sample and fitted covariance matrices. Further, the relative chi square defined as the ratio between χ^2 and df (degree of freedom) is used to measure model fit (Wheaton, et al., 1977 and Tabachnick and Fidell, 2007 in Hooper, et al., 2008). Some important measures are also usually employed including Normed Fit Index (NFI), and Comparative Fit Index (CFI). Meanwhile, Lai (2011) considered Parsimony Normed Fit Index (PNFI) as a fit index and put in criteria to measure goodness-of-fit for overall SEMs as shown in **Table 4**. In this study, SEM is constructed with IBM SPSS AMOS software (version 23). For detailed discussions on PCA and SEM the reader is referred to Hair, et al. (2010).

Table 4. Goodness of fit for SEM

Test Statistics	Fit Indices	Indicator Value
Absolute fit test	χ^2/df	< 5
	p-value	< 0.05
	RMSEA	< 0.08
Incremental fit test	NFI	Between 0 and 1, close to 1 is better
	CFI	Between 0 and 1, close to 1 is better
Parsimonious fit test	PNFI	> 0.5

Source: Lai (2011)

Table 5 shows the fitted model of traffic accidents and offences. Having compared between **Tables 4** and **5**, the developed model is statistically acceptable.

As shown in **Figure 1** the structures of developed model were constructed in accordance with the correlations between observed and latent variables, as

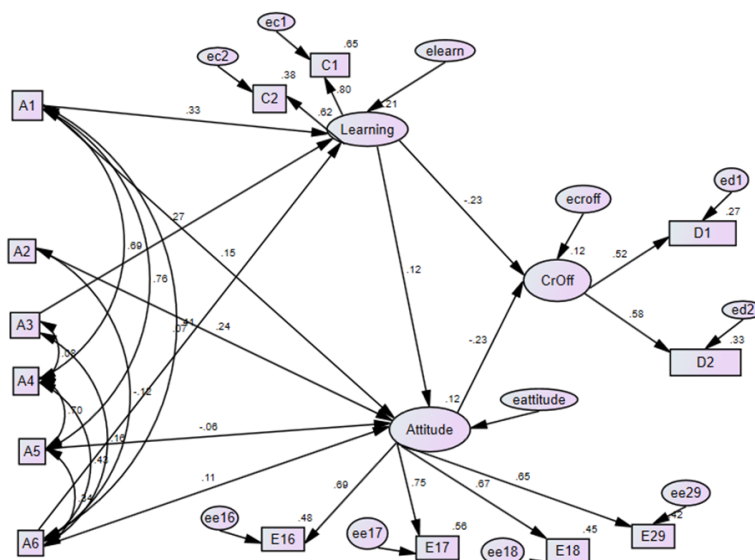


Figure 1. Standardised path diagram of traffic accidents and offences model

Table 5. Model fit

Fit Measures	χ^2	df	p-value	χ^2/df	RMSEA	NFI	CFI	PNFI
Accident & Offence Model	119.076	64	0.000	1.861	0.050	0.917	0.958	0.559

well as correlations among latent variables. Three latent variables were constructed consisting learning (learning method and experiences on riding motorcycles), attitudes (motorcyclist attitudes on the road) and CrOff (motorcyclists' involvement in traffic accidents and offences).

Figure 1 shows a conceptual path model of motorcycle accidents and offences with three-level influential paths. This begins with socio economic characteristics of motorcyclists in Denpasar (items A1-A6) followed with latent variables of learning and attitudes and subsequently to a latent variable of CrOff. For that reason, the levels of CrOff, attitude and learning were identified as endogenous variables in SEM, while socio economic variables consisting age, gender, education level, marital status, number of children and household income were indicated as exogenous variables.

A latent variable of learning is determined by two observed variables of C1 (learning traffic safety at school/college) and C2 (learning to ride a motorcycle at school/college before obtaining the license). Meanwhile, attitude is measured by four observed variables of E16 (made *U turn* despite the vehicle on right side approached), E17 (failed to stop or give way despite no give way sign is present), E18 (failed to give way at roundabout) and E29 (parked despite 'no stop/no park sign' is present). In addition, CrOff (motorcyclists' involvement in traffic accidents and offences) is quantified by two observed variables of D1 (Involved in traffic accidents for the past 10 years) and D2 (Involved in traffic offences for the past 5 years).

The standardised path coefficients (factor loadings) are presented in **Figure 1** while the unstandardised coefficients and their p-values are presented in **Table 6**.

These standardised coefficients represent the amount of change in the endogeneous variable given a standard deviation unit change in the exogeneous variable. Meanwhile, unstandardised coefficients represent the amount of change in the endogeneous variable given a single raw score unit change in the exogeneous variable.

Figure 1 and **Table 6** reveal that learning method and experience (factor loading = -0.229, p-value = 0.033) and motorcyclists attitude on the road (factor loading = -0.231, p-value = 0.024) are two significant factors respectively that having negative influence on motorcyclists' involvement in traffic accidents and offences. Based on the collected data, 31% and 24% of motorcyclists have learned traffic safety while at school and learned to ride a motorcycle while at school/college before obtaining the license. **Figure 1** suggests that when the measures of learning method and experience and motorcyclist attitude increase by one unit, measures of involvement in involvement in traffic accidents and offences would decrease both by 0.23 units respectively.

As shown in **Table 6**, the study found that age (A1) and education level (A3) have their effect on learning variable while gender (A2) does on attitude variable. These three variables have direct influences on learning and attitude by 0.33, 0.27 and 0.24 respectively. In other words, these indicate that age, education level and gender have significant indirect (negative) influence on motorcyclists' involvement in traffic accidents and offences through variable latents of learning method and experience and motorcyclists' attitude on the road. This is in line with a study of young motorcyclists in Taiwan found that the degree of a male's speeding and rule violation was significantly higher than that of a female (Chen, 2009).

Table 6. Regression weight of traffic accidents and offences model

Path					Path				
			Estimate	p-value			Estimate	p-value	
Learning	←	A1	0.012	< 0.001	CrOff	←	Attitude	-0.150	0.024
Learning	←	A3	0.134	< 0.001	D2	←	CrOff	0.634	0.007
Learning	←	A6	0.021	0.272	E17	←	Attitude	1.095	<0.001
Attitude	←	A1	0.009	0.104	E18	←	Attitude	1.073	<0.001
Attitude	←	A2	0.310	<0.001	E29	←	Attitude	0.868	<0.001
Attitude	←	A5	-0.041	0.474	C1	←	Learning	1.000	-
Attitude	←	A6	0.051	0.092	C2	←	Learning	0.720	<0.001
Attitude	←	Learning	0.183	0.127	E16	←	Attitude	1.000	-
CrOff	←	Learning	-0,233	0.033	D1	←	CrOff	1.000	-

Young motorcyclists in fact, dominated the age classification of the respondents for this study. This is supported with past studies findings that young motorcyclists have been considered to contribute on traffic accidents (Joewono and Susilo, 2017). The influence of gender implies that compared to females, male motorcyclists are more likely to fail to give priority and violate parking signs. Male motorcyclists in Denpasar therefore, are more likely to get involved in traffic accidents and offences compared to females. This is consistent with past study that also demonstrated that male motorcyclists were more likely to get involved in motorcycle accidents in comparison to females (Wedagama, 2009b). Interestingly, considering the dominated respondents were graduated from colleges or universities indicating that a higher education would not be a guarantee that a motorcyclist not to involve in traffic accidents and offences.

Meanwhile, motorcyclists in Denpasar generally agreed with most of the suggested remedial measures shown in **Table 1** (items F1-F17). They very agreed on improvement on several blackspots on highway in Bali and more provision of pedestrian facilities. In addition, they accepted improvement on road network and more provision on footways, traffic lights, road hump to reduce speed in urban area and more strict enforcement to traffic offenders. They less agreed however, to increase the amount of traffic ticket fines to reduce traffic violations by motorcyclists. In addition, they less agreed on a statement that 'enforcement of traffic rules by the police in Bali have been very effective. In general they claimed that most frequent road safety problems in Denpasar consisted of speeding offences and traffic violations (e.g. run red light), ease of obtaining riding license, the need for strict enforcements and the need for motorcyclist awareness programs.

4. Conclusions

1. This study has a restriction applied on self-reported of motorcyclists on their incidence of traffic violations and offences. The respondents may have under-reported the occurrence of their traffic violations and offences.
2. The present study indicate that age and education level have their effect on learning method and experiences variable while gender does on motorcyclists' attitude on the road. Further, learning method and experience and motorcyclists' attitudes on the road were found to be two significant factors respectively that negatively influenced motorcyclists' involvement in traffic accidents and offences.
3. Male compared to female motorcyclists in Denpasar therefore, were more likely to get involved in traffic accidents and offences. More specifically, young and male respondents had more negative attitudes towards safety than others did. Further specific campaign target on accident reductions for these young and male motorcyclists are recommended.
4. Motorcyclists with higher education would not be a guarantee not to involve in traffic accidents and

offences. This shows that disobedience to traffic rules and regulations is possibly explained with inattention related to riding behaviour in general. The complexity to establish the connection between education and traffic accident involvement can be justified with the fact that traffic accidents are infrequent and difficult to determine.

5. Appropriate motorcycle learning method via strict riding license system can be considered as a promising method to increase traffic safety attitude. In addition, this system should work properly with strict enforcement in traffic rule and regulations and publicity campaign.
6. Further similar studies should also be conducted on motorcyclists involving both national and international tourists and local security officers on an administrative village (pecalang) in Bali. These studies are necessary to capture the complete portraits of the impact of motorcyclists' attitude towards traffic accidents and offences in Bali.

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