Psychological Factors Influencing the Speeding Intentions of Car Drivers and Motorcycle Riders

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Abstract: The aim of this study was to examine and compare psychological factors influencing the riders' and drivers' speeding behaviour, using the theory of planned behaviour (TPB). Traffic psychology modules including attitude (AT), subjective norm (SN), perceived behavioural control (PBC) are used to determine speeding intentions in urban areas. A sample of 188 car drivers and 174 motorcycle riders were collected from the two universities within Khon Kaen Province, Thailand. The Structural Equation Models (SEM) was used to examine and explain speeding intentions. The results indicated that the TPB could explain 35% and 41% of the variance in drivers' and riders' intentions, respectively. Drivers' speeding intention was determined by attitude (AT) where riders' intention was determined by perceived behavioural control (PBC) and subjective norm (SN). The outcome of this study help to understand drivers and riders behaviour and can be useful for safety measures development.

Keywords: TPB, Attitude, Perceived behavioural control, Intention, Speeding, SEM

1. INTRODUCTION

Speeding is the main cause of road traffic deaths in all countries, therefore speed control measures are necessary to reduce the death toll. Research has confirmed that reducing speed also reduces the risk and severity of the crashes (Elvik et al., 2004).

A World Health Organization (WHO) reported a death rate per 100,000 population of 38.1 from Thai road traffic accidents, with Thailand ranked the third highest in the world at twice the mean value (WHO, 2013). Most of traffic death are young male motorcyclist. In Thailand there were over 10,000 accidents every year on the highways. On straight roads, there were 7,000 accidents per year, assumed to be caused by driving over the speed limit (DOH, 2014).

Speed limit enforcement in Thailand is ineffective. WHO rated the speeding enforcement level in Thailand at three out of ten, compared to developed countries at over seven. Thailand has a road hierarchy problem very different to developed countries, which results in a higher number of road traffic accidents and deaths due to speed difference.

Another problem relating to road speed in Thailand is a different speed limit to developed countries that have 50 km/h for urban roads. In Thailand the speed limit is 80 km/h in municipal areas, which is not in accord with the Global Road Safety Partnership (GRSP) (GRSP, 2008 & WHO, 2013). In this study, speeding is defined as 'Road users who use a higher speed than others on an identical road'. There are many different factors that affect the

behaviour of road users including style, speed and enforcement regulations.

The Thailand authorities are trying to change the speeding behaviour of road users. Education is the main control measure utilized (e.g. driving license education and campaigns), with also enforcement (e.g. police surveillance and speed cameras). However, these measures have been limited. What can be done to improve Thai driving safety and behaviour? The field of traffic psychology is very large and many studies concerning driver speeding behaviour have followed the Theory of Planned Behaviour (TPB).

The aim of this study was to examine and compare psychological factors influencing the riders' and drivers' speeding intentions, using the theory of planned behaviour (TPB).

2. LITERATURE REVIEW

2.1 The theory of planned behaviour (TPB)

TPB has been widely used to explain and predict human behaviour, which is influenced by intention. This intention is also influenced by three main factors including *attitudes towards the behaviour*, *subjective norm about the behaviour* and *perceived behavioral control* of the behaviour. These three factors have a direct influence on behaviour (Ajzen, 1991). Figure 1 shows a schematic representation of the theory.

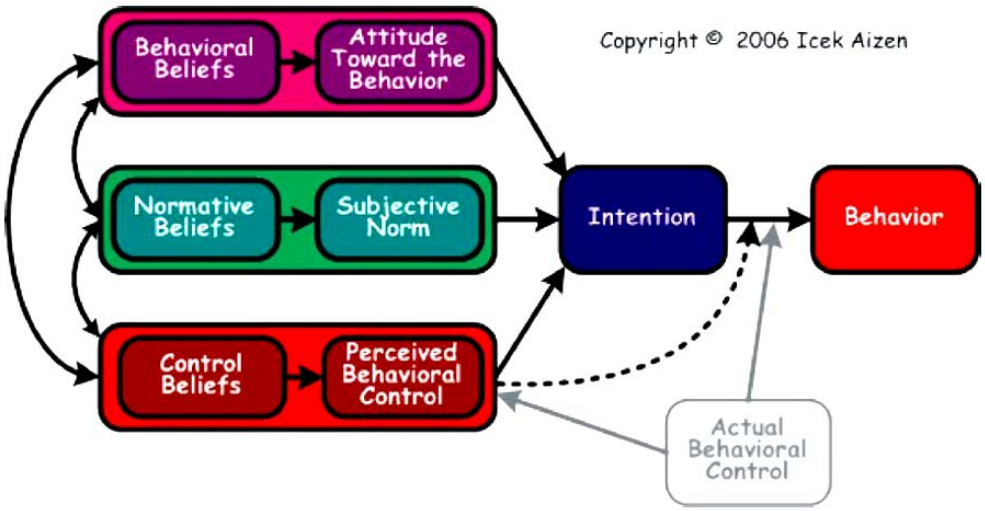

Figure 1. The theory of planned behaviour (Ajzen, 2006)

The attitude towards a behaviour refers to the degree to which a person is favourable or unfavourable. Subjective norm refers to the perceived social pressure to perform or not to perform the behaviour. Perceived behavioural control refers to the perceived ease or difficulty of performing the behaviour and this is assumed to reflect past experience, as well as anticipated impediments and obstacles. "As a general rule, the more favourable the attitude and subjective norm with respect to a behaviour, and the greater the perceived behavioural control, the stronger should be an individual's intention to perform the behaviour under consideration" (Ajzen, 1991).

TPB has been successfully and widely used to explain and predict human behaviour. The theory has been applied to many studies including marketing, business, health science and traffic safety. Traffic safety research applied TPB to look at issues such as using mobile telephones while driving, complying with speed limits and exceeding speed limits (Cassandra et al., 2014, Mark et al., 2005, Warner & Aberg, 2006).

2.2 Factors influencing speeding intentions

Several traffic safety studies related to speeding in developed countries have used the three factors of TPB to explain behavior as shown in Table 1. The numerical values are path coefficients of psychological factors (Attitude (AT), Subjective norm (SN) and Perceived behavioural control (PBC)) toward intentions. In general, some found attitude towards the behaviour as the highest factor (Cristea et al., 2013, Dinh & Kubota, 2013), while some (Warner & Aberg, 2006; 2008; Warner et al., 2009; Elliott, 2010) found the perceived behavioral control of the behaviour to be the highest.

Table 1. Speeding intentions from TPB factors

Study	Road users	Country	Influence of psychological factors			R^2
			AT	SN	PBC	
Drivers' decision to speed… (Warner & Aberg, 2006)	Car drivers	Sweden	0.22	-0.27	**0.29**	0.39
Drivers' beliefs about exceeding the speed limits… (Warner & Aberg, 2008)	Car drivers Urban (Rural)	Sweden	0.23 (0.19)	0.26 (0.30)	**0.48** **(0.51)**	0.70 (0.73)
Cross-cultural differences in drivers' speed choice… (Warner et al., 2009)	Car drivers	Sweden (Turkey)	0.22 (0.15)	0.06 (0.09)	**0.73** **(0.77)**	0.85 (0.84)
Young drivers and speed selection… (Mauricio Leandro, 2012)	Car drivers	Costa Rica	0.002	**0.382**	0.021	n.a.*
The role of behavioral options and additional factors in predicting speed behavior… (Cristea et al., 2013)	Car drivers	France	**0.16**	0.13	0.10	0.37
Speeding behavior on urban residential streets… (Dinh & Kubota, 2013)	Car drivers	Japan	**0.41**	0.19	0.25	0.47
Exploring the speeding behavior of riders of heavy motorcycles… (Chen F. & Chen W., 2011)	Motorcycle riders	Taiwan	**0.30**	-0.09	-0.12	n.a.*
Predicting motorcyclists' intentions to speed… (Mark A. Elliott , 2010)	Motorcycle riders	Scotland	**0.37**	0.04	-0.33	0.43

*n.a. = Not available

Considering drivers' and riders' intention in the developed countries, it can be seen that the major psychological factor influence intentions were PBC and attitude, respectively. These may results from good education, speed management, strictly speed enforcement, and good road design etc. However, the road and enforcement situation in developing countries are different from the developed countries. Besides, previous TPB studies on intentions toward speeding and other safety knowledge are very limited. For example, in Thailand, car and motorcycle share the same road space. In urban area, both type of vehicles have the same

speed limit of 80 km/h. To safer Thailand's roads, it is interesting to reveal what factor are important for the drivers and riders in the country.

3. METHODOLOGY

3.1 Participants

Data was collected from a population of students and workers at both Khon Kaen University and the North Eastern University.

There were 188 car drivers, 56% were men and 44% women, with an average age of 26. The car drivers had eight years' driving experience and averaged 45 km daily. 10% of the car drivers had been involved in a serious accident, and 34% had received speeding tickets during the previous three years.

There were 174 motorcycle riders, 29% men and 71% women, with an average age of 20. The motorcycle riders had 6 years' road experience, riding 8 km daily. 14% of the motorcycle riders had been involved in a serious accident during the previous three year period.

3.2 Questionnaire survey

The questionnaire was divided into two sections. The first asked for demographics (see section 4.1). The second consisted of psychological questions that examined latent variables, following the principles of TPB (Francis et al., 2004). This study examined direct measurements only. All questions were measured on a 7-points scale and related to reasons for driving or riding faster than other road users.

3.2.1 Attitude

Attitude towards the behaviour was measured by two items: "DA2&DA3: For me driving/ridding fast in urban environment over the next three months that would be….. :" *harmful/beneficial and would not like to do/ would like to do*.

3.2.2 Subjective norm

Subjective norm was measured using three items: "DSN2: I think people who are important for me (Parent/friend/relative) would ……. with me to drive/ride fast in urban environment over the next three months" *Strongly disagree/ Strongly agree*, "DSN3: I think people who are important for me (Parent/friend/relative) would be …….. me to drive/ride fast in urban environment over the three months", *Never support/always support* and "DSN4: I think people who are important for me (Parent/friend/relative) would ……. me to drive/ride fast in urban environment over the next three months" *Never disapprove/ always approve*.

3.2.3 Perceived behavioural control

Perceived behavioural control was measured by two items: "DPBC1: How confident are you that you will always be able to drive/ride at speeds higher than other road users in urban areas over the next three months" *not very confident/very confident*, and "DPBC2: For me to

drive/ride at speeds higher than other road users in urban areas over the next three months would be" *very difficult/very easy.*

3.2.4 Intention

Intention to speed faster than other road users was measured by three items: "DI1: Would you intend to drive/ride at a higher speed than other road users in urban areas over the next three months?" *Definitely not/definitely do*, "DI2: How likely would you like to drive/ride at speeds higher than other road users in urban areas over the next three months?" *Very unlikely/very likely*, and "DI3: How often would you like to drive/ride at speeds higher than other road users in urban areas over the next three months?" *Not at all/very much.*

3.3 Analysis of results

The analysis of the results was divided into two parts. The first analysed the different demographics between the groups, using the independent *t*-test at the 5% level. The second used structural equation modeling (SEM) to analyse the latent variables created from the questionnaire (attitude towards the behaviour, subjective norm, perceived behavioural control and intention to speeding). The model to be tested strictly followed the TPB concept: Respondent's factors (AT, SN and PBC) are positively related to the behavioral intention of speeding in urban area. Overall model fit was evaluated against a number of recommended fit statistics and fit indices. Chi-Square was used to evaluate the fit between the measurement models and the data. The Goodness of Fit Index (GFI) should be greater than 0.95. The Comparative Fit Index (CFI) should be greater than 0.90. The Root Mean Square Error of Approximation (RMSEA) should be between 0.03 and 0.08. The Standardized Root Mean Residual (SRMR) should be less than 0.1. These values can be considered as a good fit of the model (Hair, J.F. et al., 2010).

4. RESULTS AND DISCUSSION

4.1 Demographics

Table 2 shows the differences in demographics between car drivers (PC) and motorcycle riders (MC). It can be seen that for age, driving or ridding experience and mileage in kilometers per day there were significant at 0.1% level differences in demographics. Most demographics of drivers have value higher than riders, except rider's number of serious accidents over 3 years which this value is not significant.

Table 2. Differences in demographics

Demographics	Car drivers	Motorcycle riders	*t*
Age Mean (SD)	26.42 (8.13)	20.59 (2.05)	9.55***
Driving or ridding experience Mean (SD)	7.95 (6.37)	5.66 (3.00)	4.37***
Mileage in kilometers per day Mean (SD)	44.89 (47.26)	8.18 (6.43)	10.32***
Number of serious accidents over 3 years Mean (SD)	0.13 (0.44)	0.25 (0.88)	-1.64^{ns}

t = *t*-value: The results are based on independent-samples t-test.
***Significant at 0.1% level, ns: not significant

4.2 Psychological factors

Table 3 shows the result of drivers and riders rating of psychological factors. It was found that most of TPB's factors among car drivers and motorcycle riders are not statistically different. However, car drivers have higher speeding intention than those of the motorcyclists.

Table 3. Differences in driver and riders rating of psychological factors

	Car divers		Motorcycle riders		*t*
	Mean (SD)	SE	Mean (SD)	SE	
AT	2.91 (1.51)	0.11	2.94 (1.40)	0.11	-0.19
SN	2.08 (1.15)	0.08	1.89 (1.04)	0.08	1.69
PBC	3.12 (1.39)	0.10	2.98 (1.35)	0.10	0.96
Intention	2.28 (1.42)	0.10	1.89 (1.22)	0.09	2.78*

Attitude (AT), Subjective norm (SN), Perceived behavioural control (PBC)
SD = Standard deviation, SE = standard error, *t* = *t*-value: The results are based on independent-samples t-test, * Significant at 5% level.

4.3 Car driver intention model

Figure 2 shows the structural model with standardized path coefficients for car drivers. The model can explain 35% of the variance in car driver intention to speeding behaviour. It shows that the data fitted the model of the theory of planned behaviour (χ^2 = 33.306, df = 29, p = 0.226, GFI=0.967, CFI = 0.995, RMSEA= 0.028, Standardized RMR = 0.031). It also shows that the standardized direct effect on the behaviour intentions are 0.39 for attitude (AT), 0.17 for subjective norm (SN) and 0.12 for perceived behavioural control (PBC). Attitude (AT) was a statistically significant factor for behavioural speeding intention, with maximum influence to speeding intention in car drivers.

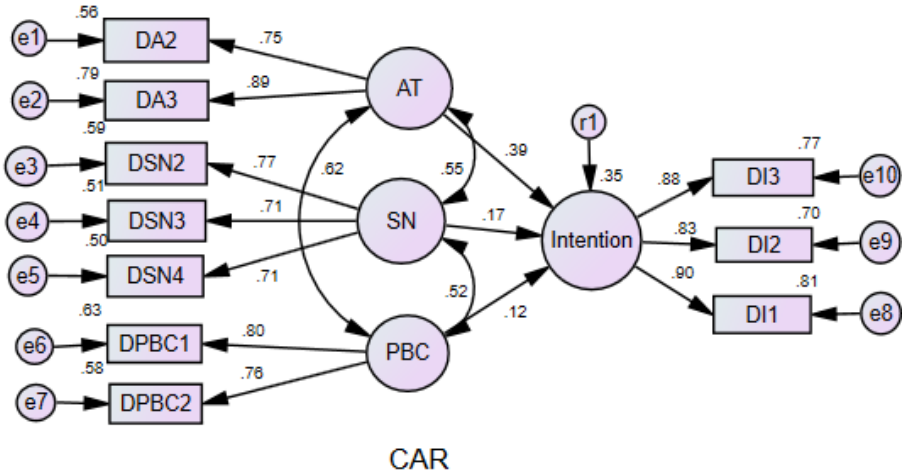

Figure 2. Structural model with standardized car drivers

4.4 Motorcycle rider intention model

Figure 3 shows the structural model with standardized path coefficients for motorcycle riders. The model can explain 41% of the variance in motorcycle rider intention to speeding behaviour. It shows that the data fitted the model of the theory of planned behaviour (χ^2 = 43.643, df = 29, CMIN/DF =1.505, p = 0.040, GFI= 0.954, CFI = 0.982, RMSEA= 0.054, Standardized RMR = 0.036). It also shows that the standardized direct effect on the behaviour intentions are 0.22 for attitude (AT), 0.25 for subjective norm (SN) and 0.34 for perceived behavioural control(PBC). Attitude (AT) was not a statistically significant factor for behavioural speeding intention. The remaining two variables (SN & PBC) were statistically significant where PBC had maximum influence on speeding intention for motorcyclist.

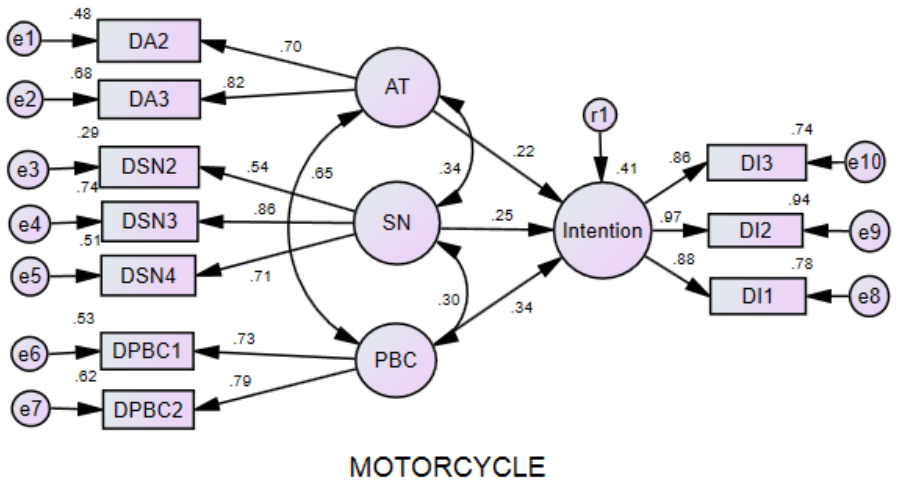

Figure 3. Structural model with standardized motorcycle riders

4.5 Model estimation

Table 4 shows that the model estimation results found that all TPB factors had a correlation with speeding intention ($p < 0.001$). Therefore, AT, SN and PBC could all explain the speeding intention. The structural models found that the highest TPB factor affecting speeding intention was attitude (AT) for car drivers ($\beta = 0.39$, $p < 0.001$) and perceived behaviour control (PBC) for motorcycle riders ($\beta = 0.34$, $p < 0.01$). The subjective norm (SN) was non-significant in car drivers but significant in motorcycle riders ($\beta = 0.25$, $p < 0.01$) and attitude (AT) was non-significant in motorcycle riders. All cronbach's alpha (α) were measured higher 0.7 that is a good rule of internal consistency. All average variance extracted (AVE) were measured higher 0.5 that is a good rule of thumb suggesting adequate convergence. Therefore estimation of models could indicate explanation the speeding intention.

Table 4. Model estimation results

Latent variables	Items	Car driver's intention				Motorcycle rider's intention			
		β	r	A	AVE	β	r	α	AVE
AT	2	0.39***	0.57***	0.79	0.68	0.22 ns	0.52***	0.72	0.58
SN	3	0.17 ns	0.45***	0.77	0.53	0.25**	0.46***	0.71	0.51
PBC	3	0.12 ns	0.45***	0.75	0.61	0.34**	0.58***	0.73	0.58

β = Path coefficient between the latent variables in the SEM (TPB's factor and speeding intention),
r = Correlation with intention, α = Cronbach's alpha, AVE= Average Variance Extracted
*** Significant at 0.1% level, ** Significant at 1% level, ns: not significant

5. CONCLUSIONS AND RECOMMENDATIONS

The aim of this study was to examine and compare traffic psychology with the theory of planned behaviour (TPB) between car drivers and motorcycle riders.

The structural equation models (SEM) was used to examine and explain speeding intentions. Results showed that both structural models fitted data measurements. Final structural models were produced with standardized path coefficients for car drivers and motorcycle riders respectively. The models explained 35% and 41% of the variance in intention to speeding for car drivers and motorcycle riders, respectively. Results showed that drivers' speeding intention was determined by attitude (AT) where riders' intention was determined by perceived behavioural control (PBC) and subjective norm (SN).

The actual behaviour has to change to alter their speeding intentions (Ajzen, 1991; 2006). Therefore this information can apply to the road safety policy that related to speed management. Example, designing social campaigns, education material and training courses for driver and rider in order to reduce speeding (Warner & Aberg, 2008 and Dinh & Kubota, 2013) from changing attitude (AT) and subjective norm (SN). In the part of perceived behavioural control (PBC) can design road safety policy, such as police surveillance, speed cameras, setting a suitable speed limit with road hierarchy, traffic claiming etc.

The difference and suitable speed control measures are required to control passenger car and motorcycle speed in Thailand. It should be noted that the speed control measures used in developed countries may not be suitable for Thailand. Therefore, more researches are needed on this area.

Future studies could look at various participants and implementing new safety measures in structural models. Car drivers must change their attitude (e.g. given knowledge about effect from speeding on road users), and motorcycle riders must change perceived behavioural control (e.g. enforcement by auto speed camera, increased fines and police surveillance). Further analysis of indirect measures following the theory of planned behaviour would be beneficial.

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