



Structural Equation Modeling in Road Safety Behaviour Integration with Psychological and Spiritual Factors

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DOI: <https://doi.org/10.30880/ijie.2019.11.09.005>

Received 05 February 2019; Accepted 20 September 2019; Available online 30 December 2019

Abstract. Road safety is major concerns in Malaysia. Human errors are the most contributing cause of road accident. Human bad attitude is mainly influenced by their psychology and spiritual aspects. This research is conducted based on those assumption to enhance driver safety behaviour. The main of objective is to identify and analyze the psychological and spiritual factors that contribute to safe driving behaviour. A total of 256 respondents from various type of background were distributed handed with a self-administered questionnaire. Demographic and experience of respondents was analysed using a descriptive statistics. Education level and traffic summons are the only has show significant association to safety driving by Chi-square test at significant level ($p < 0.05$). This finding is demonstrated by correlation analysis that shows attitude of drivers towards safety driving has a significant relation ($p < 0.05$) on psychological factors and spiritual factors. Then, a Structural Equation Modelling (SEM) was performed used to postulate the hypothesis. The structural model showed that psychological and spiritual factors is influenced and would enhance drivers to practice safe driving behaviour, and this might reduces number of road accidents. Therefore, this study will contribute to related agencies as useful guidelines in order to mitigate road safety among drivers.

Keywords : Road safety, psychology, spiritual, structural equation model

1. Introduction

The increase of the injuries and deaths from the road accidents have become a serious public health matter that challenges not only Malaysia but worldwide. World Health Organization (WHO) stated that in 1993 traffic accidents injuries were ranked 9 out of 15 death causes apart from the diseases. Alarmingly, it will become 3rd ranking in year 2020. WHO reported that statistics around the world shows about 1.2 million people were killed annually by road accidents. In fact, there are 20 to 50 million persons injured annually in road accidents worldwide. Furthermore, road traffic injuries cost low income and middle-income countries between 1% and 2% of their gross national product-more than the total development aid received by these countries [1]. In Malaysian context, during the year 2009 itself the country faces great loss due to road accident, about RM 8.09 million (1.5% of our GDP-Gross Domestic Production).

The statistics of road accident data in Malaysia shows that the totals number of road accidents had increased from 373,071 cases in 2005 to 533,875 cases in 2017 which have reach more than 70% of accident cases over 10 years [2]. Road accidents in Malaysia have been increasing in the average rate of 9.01% per annum from 1974 to 2010 [3]. Besides that, Malaysia estimated to have over 20 fatalities per 100,000 people in 2020 because of road accidents [3,4]. In relevance to road safety issues, the Malaysia government has taken several actions to increase the safety of road users. One of the important steps that the government has taken to reduce road accidents is centralized safety plan which are (i) exposure control (ii) prevention and reduction of road accidents (iii) injury control and (iv) reduction after injury [5]. Thus, the government should make a new act for road safety that introduces alternatives for driving.

Behaviour research in traffic psychology often deals with subjects like age, gender and experiences differences [6]. A classification of behavioural factors that promotes bad driving behaviour are partitioned into those with short- and long-term impact which can helps the problems and contribute to prioritizing of driving behaviour. There is a comprehensive approach in behavioral sciences theories that consider able to deal with this problem. Behavioural and social sciences theories and models have the potential to enhance efforts to reduce unintentional injuries [7]. The behavioral sciences or social psychological theories such as Theory of Planned Behavior (TPB) [8], Health Belief Model (HBM) [9] and Technology Acceptance Model TAM) [10] provide a potentially fruitful framework to understand in prediction of behavioral intention. Nevertheless, this so-called theory was grounded and originated from western, perhaps other school of taught.

Spiritual factor also influences human behaviour and attitude. By stating about spiritual concept and religion on previous research, religion can make someone control or reject themselves, release stress and show worry for life and death [11]. Developing nations that are not also developing in spiritual approach of their people especially vehicle driver have problem leading to increasing number of road accidents [12]. He also said that the way religion teaches its followers especially Islam religion teaching which states anything that brings harm to oneself or to others like driving recklessly is a sin. If everyone embraces this teaching, road accidents can be reduced. Besides that, driver that integrates good spiritual awareness such as patience, humble and not in hurry like in accordance to religion can also reduce road accident [12].

2. Conceptual Model and Hypothesis

This science theory of behaviour and social has the potential to increase efforts to reduce accidental injuries during road accidents [7]. The science of behavior or the theory of social psychology like The Theory of Planned Behavior (TPB) [8], Health Belief Model (HBM) [9] and Technology Acceptance Model (TAM) [10] has already made a framework which could lead to a successful understanding on predicting behavioral intention. This research focuses on determining spiritual and psychology factors which leads to safe driving. [13] classified subjective norm as a people behavior influence by family or close friends and descriptive norm as a people behavior influence by other people. While, Perceived safety is defined as the degree to which an individual believes that using a system will affect his or her well-being [14].

The model structure based on spiritual factors to predict safe driving from the theory of Personality Values by Al Ghazali [15] is closely related to emotional construct, motivation, attitude with god, and attitude with people as an inner factor that affects human behaviour. There are 4 main components in the model structure based of spiritual values which are (i) physical fitness, (ii) appreciation of religion, (iii) the practice of “sunnah” and (iv) the practice of “doa” and “zikir”. Thus, the hypothesis was test to identify the significance of this constructs (see Fig. 1). H1: Psychology significant negative impact on driving safety among driver, while H2: Spiritual significant positive impact on driving safety among driver

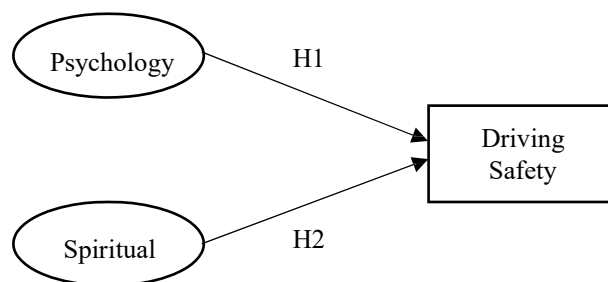


Fig. 1 – Proposed structural model

3. Material and Methods

3.1 Instrument and Measurement

This study used quantitative data by collecting data through questionnaire from respondent. The items in the questionnaire for was developed based on Driver’s Behavior Questionnaire [16,17]. While, for psychological and

spiritual items was adapted based on *Religious Orientation Scale* (ROS) [18]. Table 1 shows items in related to individual perception of psychology and spiritual. Likert scale 1 to 5 was used to determine the agreement of respondents. Data was analyzed by using Statistical Package for Social Science (SPSS) version 22.0. Prior to data analysis, all the collected data should be scrutinized, removed, cleaned and treated (if any). In data analysis, there are two type of statistical analysis were performed, descriptive and multivariate analysis. In descriptive analysis, statistical software (SPSS) was used to perform the analysis for multivariate analysis, while a statistical technique which called Structural Equation Modelling (SEM) was used in modeling exercise with user friendly graphical software, AMOS.

Table 1 - Items related to individual perception of psychology and spiritual

No.	Item
Psychology	
1	Tailgating other vehicle as a signal for driving faster
2	Slow your vehicle during overtake other vehicle
3	Impatient with slow drivers on the fast lane and cut in the slow lane
4	Give early signal before turning
5	Someone beeps horn on you
6	Drive even in nervous condition
7	Drive aggressively and recklessly
8	Driving under stress condition
9	Show off driving skill to others
Driving Safety	
10	Obey traffic light
11	Underestimate other driver speed
12	Take a rest when get tired
13	Obey the speed limit
14	Slow the vehicle if there is road maintenance
15	Comfortably with a slow drive and not in a hurry
16	Drive for fun
17	Do not violate road rules even though seeing others do so
18	Stop and give priority to vehicles from the right side when at the junctions.
Spiritual	
1	Pray/du'a before riding/driving
2	I always feel good and do not easily get angry with other drivers
3	I often listening tazkirah during driving/riding
4	I always practice zikir while driving
5	I always do hajat prayer before driving especially to distant place
6	I always do a charity before driving especially to distant place.
7	Being a religious person, I drive carefully to avoid problems with other drivers
8	Obeying to road regulations is your own choice and not a religious claim
9	Practicing religious such as patience allows me to drive calmly
10	I practice priorities other drivers and not arrogant
11	By praying/zikir, I feel safer while driving
12	Road regulation are human laws and unrelated with religion.
13	Moral values in religion need to be applied in the driving school curriculum

3.2 Sample Size and Location of Study

The sampling method or sampling plan is the procedure used for selecting the sample from the population [19]. Sampling method can be categorized into two types that namely non-probability sampling and probability sampling. Hence, this study used the stratified random sampling method approach to obtain the sample of respondent. Sample size was determined based on [20]. Population was chosen in Batu Pahat and obtained the highest number of sample was 256.

3.3 Analysis Tool

For analysis method, this study uses a static descriptive analysis method for demography to determine the mean score of respondent. To determine the significant between demography to the factor of psychology and spiritual, Chi-Square analysis was used. In order to determine which factor in psychological and spiritual that contributed to the safety driving, Correlation were used. Then, the questionnaire were processed with the aid of SPSS version 22 while for the Structural Equation Modelling AMOS software was used to test the structural model.

4. Results and Discussions

4.1 Descriptive Analysis

Table 2 present the descriptive statistics based on finding from 256 respondents. Results showed most of respondents were males (79%) and the rest (21%) were females. Majority of the respondents aged of 20 – 25 years old (46%). Based on [21] study, singles and young males are the highest group of driver in Malaysia. From 256 respondents, 71 respondents works in private sector and most of them are Muslims and Malay race (95%). Besides that, most of respondents possess full driving licenses (Class D) (81%) and have riding experience 2-5 years (33%). Lastly, (57%) of respondent have no experience involved in road accident and (53%) of respondents were involved in traffic summons.

Table 2 - Characteristic of the respondents (N=256)

Respondents	Frequency	Percentage (%)
Gender		
Male	203	79
Female	53	21
Age		
Below 20 years	12	5
20-25 years	118	46
26-30 years	59	23
30 years above	67	26
Profession		
Self-employed	38	15
Government Sector	33	13
Private Sector	71	28
Student	88	34
Others	26	10
Religion		
Muslim	243	95
Non – Muslim	13	5
Licenses		
Competent (Class D)	207	81
Probationary (Class P)	2	11
Learner (Class L)	5	2
No Licenses	1	6
Experience		
Less than 2 years	38	14
2-5 years	84	33
6-9 years	73	29
10 years above	61	24
Accident Involved		
Yes	110	43
No	146	57
Traffic Summon		
Yes	135	53
No	121	47

4.2 Correlation Analysis

Table 3 shows the result of correlation analysis between psychological factors as variable and safety driving as constant variable. Based on result, psychology factor have a weak positive linear relationship with value $r = 0.24$ while variable for driver's behaviour have a moderate negative linear relationship with $r = -0.274$ meaning that driver's behaviour have significant relationship with safety driving. For other factors variable (driver age, driving experiences, accident involvements, traffic summonses), result shows a strong positive linear relationship ($r=0.479$) and significant ($p<0.05$) towards safety driving. While in Table 4 shows a correlation of spiritual factors, all of independent variable have strong positive linear relationship to safety driving as a dependent variable.

Table 3 - Correlation for Psychological factors towards safety driving

	Safety	Psychology	Drivers	Other
Safety driving	1			
Psychology	0.243*	1		
Drivers attitude	-0.274**	-0.612**	1	
Other factors	0.479**		-	1

* Correlation is significant at the 0.05level (2-tailed).

** Correlation is significant at the 0.01level (2-tailed).

Table 4 Correlation for Spiritual factors towards safety driving

	Safety	Driver's	Driver's
Safety Driving	1		
Driver's	0.542**	1	
Driver's	0.537**	0.34**	1

* Correlation is significant at the 0.05level (2-tailed).

** Correlation is significant at the 0.01level (2-tailed).

4.3 Chi Square Analysis

Table 5 shows the result of chi – square analysis between factor of psychology and spiritual with background of respondent demography towards safety driving. Based on the result, all variables for spiritual factors had p more than 0.05 show that there had no associated to safety driving.

Table 5 - Chi - Square analysis

	Psychology			Spiritual		
	χ^2	P	Result	χ^2	P	Result
Age and safety driving	0.02	0.88	Not	2.00	0.15	Not
Gender and safety	0.10	0.74	Not	0.53	0.46	Not
Experience and safety	1.03	0.30	Not	2.09	0.14	Not
Summon and safety	2.75	0.09	Not	1.12	0.28	Not

4.3 Structural Equation Modeling

The analysis is involving full structural model which are Spiritual and Psychology as an exogenous variables that can predict safety driving among driver. Based on the analysis, this model is over identified. Over identified model is the model that has the number of distinct parameter to be estimated less than the number of distinct sample moment and resulting positive degree of freedom (Number of Distinct parameter < Number of distinct sample moment) [22]. Therefore, based on the analysis in the Table 6, the differences between (65-32) resulting positive degree of freedom (33). Ghozali [22] stated that only over identified model can be analysis. While, chi-square model is ($\chi^2=77.54$, $p < 0.05$) which means the model is significant but [22] stated that the best fit model is insignificant. However, Ghozali [22] also indicated that the chi square is very sensitive to the size of samples. The larger the size sample, the more significant. Besides that, Awang [23] also stated that chi square is sensitive to sample size greater than 200. Hence, the other parameters model fit such as CFI, NFI, and RMSEA is taken into consideration. Table 7 shows goodness of fit indexes

Table 8 the standardized regression weight and square multiple correlation for extended model. The regression weight table shows the regression weight (estimate), Standardized Regression Weight, Standard error (S.E) value and Critical ratio (C.R). The smaller value of standard error, the greater the ability of exogenous variables (independent

variable) to predict endogenous variable (dependent variable). While, the critical ratio is the value obtained from path coefficients in the regression model between endogenous variable and exogenous variables [24]. Therefore, C.R values that are not in range ± 1.96 is considered as significant at the level of $p < .05$. Thus, all exogenous variables are significant towards endogenous variable.

Square multiple correlation shows the variance values in endogenous variables that predicted by exogenous variables [24]. The square multiple correlation for driving safety is .355 which means that psychology and spiritual have been contribute 35.5% towards driving safety among driver. In other word, the error variance of driving safety among driver is 64.5% of the variance of itself.

Table 6 - Measurement model identification from AMOS

Computation of degrees of freedom (Default model)	Value
Number of distinct sample moments	65
Number of distinct parameter to be estimated	32
Degree of freedom (65-32)	33
Result (Default Model)	
Minimum was achieved	
Chi-Square	77.524
Degree of freedom	33
Probability level	.000
χ^2 / df	2.349

Table 7 - Goodness of fit indexes for model

Name of Index	Level Acceptance	Result	Comment/Description
Chi square	$P >$	77.54	Go
RMSEA	RMSEA < 0.08	0.073	Go
C	CFI > 0.90	0.921	Go
T	TLI > 0.90	0.868	Margin
N	NFI > 0.90	0.875	Margin
Chisq/df	Chisq/df < 5.0	2.349	Go

*The indexes in bold are recommended since they are frequently reported in literatures [23].

**One could ignore the absolute fit index of discrepancy chi-square if the sample size obtained for the study is greater than 200 [23].

Table 8 - The standardized regression weight and square multiple correlation for extended model

Regression Path	Estima	Standardized Regression	S.	C.	P
Psychology → Driving Safety	-.348	-	.09	-	**
Spiritual → Driving Safety	.574	.4	.11	5.01	**
Squared Multiple					
Spiritual	.000				
Psychology	.000				
Driving Safety	.355				

Note: S.E = Standard Error. C.R = Critical Ratio, P = Significant Value.

4.4 Hypothesis Testing

This study was conducted the hypothesis test to show correct or incorrect theories to render the result of study (see Fig. 2). Then, the full structure model for psychology and spiritual factor in safety driving is shows in Fig. 3.

H1: Psychology significant negative impact on driving safety among driver.

Hypothesis testing shows that Psychology has a significant relationship and negative impact on driving safety among driver. Therefore, H1 is accepted.

H2: Spiritual significant positive impact on driving safety among driver.

Hypothesis testing shows that spiritual has a significant relationship and positive impact on driving safety among driver. Therefore, H2 is accepted.

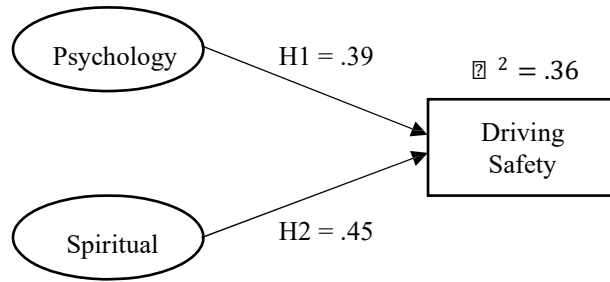


Fig. 2 – Hypothesis test on proposed structure model

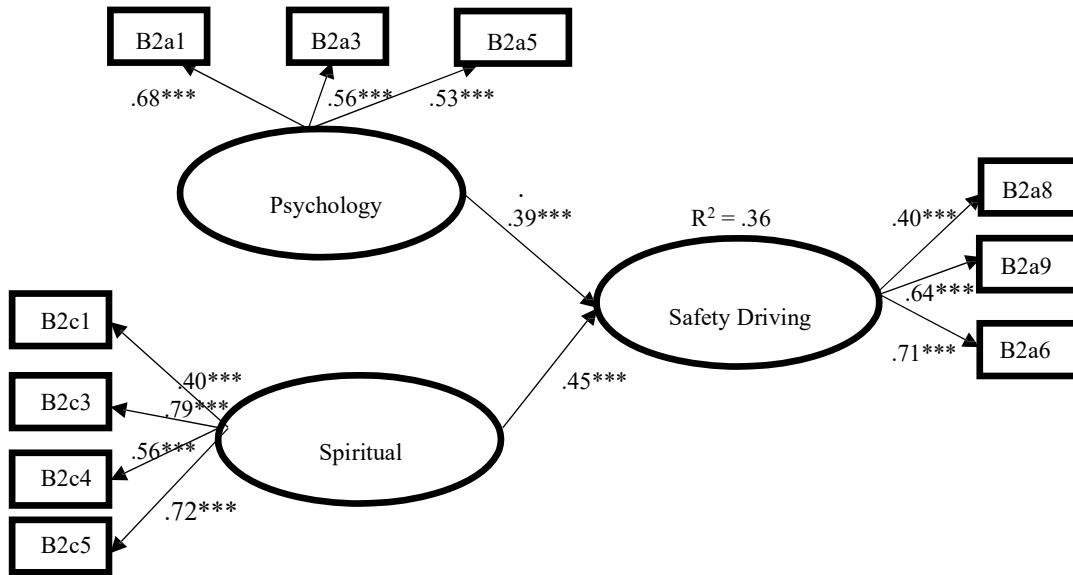


Fig. 3 - The full structural model for psychology and spiritual in safety driving

5. Conclusions

Every year, road accident recorded alarming statistic. Most of road accident happen because of human behaviour. Human behaviour are related to psychology and spiritual. In a nutshell, this study presents that driving safety are influenced by psychology and spiritual effect. The most dominant factor is spiritual which are driver always practicing prayer, listening tazkirah, zikir and do Hajat prayer before or while driving. This shows that, most human believe that faith and practice religion can make them safer in risk situation such as driving/riding in a road. Respondent also shows that they driving safe by obey the traffic light and having a rest if they are feel tired during driving. Therefore, spiritual and psychology factor are important to implement in a road safety awareness.

Acknowledgement

Authors would like to thanks Research Management Centre (RMC) providing Research Fund GPPS (H285). Also, thanks to Faculty of Civil and Environmental Engineering, UTHM and Smart Driving Research Center (SDRC) for support and provided facilities to accomplish the study.

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