International Journal of Road Safety

Journal homepage: www.ijrs.my

OPEN ACCESS

Factors Contributing to Riding Anger Among Motorcyclists

Sharifah Liew[1,*], Zulhaidi Md Jawi[2], Rizati Hamidun[3] & Azhar Hamzah[4]
*Corresponding author: sharifahliew.miros@gmail.com

[1]*Behavioural Analysis and Education Unit, Malaysian Institute of Road Safety Research, 43000 Kajang, Selangor, Malaysia*
[2]*Vehicle Safety and Biomechanics Research Centre, Malaysian Institute of Road Safety Research, 43000 Kajang, Selangor, Malaysia*
[3]*Data Intelligence & Traffic Exposure, Malaysian Institute of Road Safety Research, 43000 Kajang, Selangor, Malaysia*
[4]*Road User Behavioural Change Research Centre, Malaysian Institute of Road Safety Research, 43000 Kajang, Selangor, Malaysia*

ABSTRACT

Anger has been shown to have a correlation to road crashes among drivers. However, riding anger among motorcyclists on the road is still less researched among scholars especially in relation to factors that cause anger the most while riding on the road. This study examines the factors that cause riding anger among motorcyclists in Malaysia with the aim of finding out the main contributing factor that scored highest among all the factors that provoked riding anger among motorcyclists. Participants in this study consisted of 352 males and 55 females who were randomly selected from the government and private sectors to complete the newly-developed Riding Anger questionnaire. The Exploratory Factor Analysis (EFA) indicates that 59 items were grouped into eight factors, namely unsafe/inappropriate actions, rude/sluggish actions, road conditions and design, police enforcers' presence, illegal actions on the road, hazards on the road, rainy conditions and obstructions on the road. First order (FO) through pooled-data (CFA) found that all items indicated a value loading of 0.40 and none of the items were eliminated. Second order (SO) indicated that all values could be accepted and significantly fitted into this study data. Results found that the main factor contributing to riding anger was road conditions and design (0.898). The research suggests that local authorities should pay greater attention to improving poor road conditions and design such as traffic lights not functioning, manholes not being covered, confusing road signages and fixtures, and the like immediately to avoid "anger ecosystems" among road users to reduce road crashes in Malaysia.

ARTICLE INFO

Article History:
Received 15 Sep 2021
Received in revised form
10 Oct 2021
Accepted
25 Nov 2021
Available online
01 Nov 2021

Keywords:
Riding anger
Motorcyclist
Confirmatory Factor Analysis (CFA)

1. Introduction

In Malaysia, motorcyclists have been known to record the highest fatality rate in road crashes for the past ten years. The number of fatalities was between 6,000 to 7,000 cases every year except for the year 2016 when it reached 7,152 cases (RMP, 2018). In total, 60% to 65% of deaths involved motorcyclists every year. Motorcyclists are considered vulnerable road users and they are exposed to high risks while riding on the road especially in several ASEAN countries such as Thailand, Vietnam, and Malaysia. Some scholars have identified anger as one of the risk sources of road crashes. Research carried out by the AAA Foundation for Traffic Safety (1997) shows that driving anger has been identified as a predictor of traffic crashes. Studies conducted by Mesken et al. (2007) found that anger has a strong relationship with excessive speeds. Sullman et al. (2014) found that driving anger was significantly related to crash-related conditions such as near misses, loss of concentration, loss of control of a vehicle, and being ticketed.

Anger has physical effects including raising the heart rate and blood pressure and the levels of adrenaline and noradrenaline (Clausen, 2007). Anger is an emotional state that may range in intensity from mild irritation to intense fury and rage (Spielberger et al., 1983). Some motorcyclists are prone to react angrily and aggressively while riding on the road due to many factors. Studies on anger among motorcyclists have yet to be done in Malaysia. However, quite several studies on anger among drivers have been done in Malaysia and other countries.

One of the initial researches done back in 1994 on driving anger by Deffenbacher et al. (1994) found that 33 items consisting of six subscales involving hostile gestures, illegal driving, police presence, slow driving, discourtesy, and traffic obstructions potentially provoked anger while driving. The study also found that men were more angered by police presence and slow driving, whereas women were more angered by illegal behavior and traffic obstructions. A study done by Sullman et al. (2014) in Malaysia on 339 drivers found that female drivers reported more anger than males caused by traffic obstruction and hostile gestures. Age was negatively related to discourtesy, traffic obstruction, hostile gestures, slow driving, and police presence. Research also found that there was a significant relationship between driving anger and crashes related to conditions such as near misses and loss of concentration.

The factors that might provoke riding anger while on the road include the human factor, obstructed objects on the road, surroundings, and the environment. The human factor might be caused by other road users, regardless of the types of vehicles on the road, such as illegal actions, sluggish actions, unsafe actions by other road users, and also the presence of authorities on the road. The objects may include objects obstructing the middle of the road or road shoulder, trees and signages, surrounding, etc., whilst the environment includes the weather, road conditions, etc. Hence, the purpose of this study is to explore the contributing factors which could provoke motorcyclists' anger while riding on the road. Furthermore, the research aims to find out the main contributing factor that scored highest among all factors to provoke riding anger among motorcyclists.

2. Method

2.1 Participants

This study involved 352 males and 55 females who were randomly selected from government and private sectors in the Klang Valley (Central of Peninsular Malaysia). The target population for this study comprised of motorcyclists who owned valid riding licenses. The mean age for participants was 35 years (SD = 9.31) and the mean for riding experience was 16 years (SD = 8.60).

2.2 Materials

The questionnaire was adapted and adopted from the Driving Anger Scale developed by Deffenbacher, Oetting, and Lynch (1994) to measure the self-reported questionnaire of riding anger among motorcyclists. Six subscales and 33 driving anger items were identified in the study (alpha reliability = 0.90). The six subscales consist of; slow driving, hostile gestures, police presence, illegal driving, discourtesy, and traffic obstructions. Fifty-nine (59) items along with eight subscales were formed based on the scenarios and situations faced by motorcyclists in Malaysia. Fifty-nine (59) items were grouped under eight subscales, namely unsafe or inappropriate actions (14 items), rude or sluggish actions (9 items), road conditions and design (11 items), police enforcers' presence (5 items), illegal actions on the road (6 items), hazards on the road (5 items), rainy conditions (5 items) and obstructions on the road (4 items).

Some similarities are present between this research and that done by Deffenbacher et al. (1994). Examples are "police presence", "illegal driving", "traffic obstruction" and "hostile gestures". Additional subscales found in this research and which are not found in the previous study are "rainy conditions", "road conditions and design" and "hazards on the road". The rationale for including these subscales is due to the significant presence of these conditions in Malaysia, which are probably less present in more advanced countries. A Five-Point scale system (1 = not angry, 5 = very angry) is utilized for a rating in this study, whereby participants were requested to rate how angry they would become in relation to the various situations which are likely to provoke anger while riding.

2.3 Procedure

This study was based on self-reported questionnaires and prepared in the Malay language. Letters of consent were obtained from the companies or organizations concerned. Once we got the approval from the companies or organizations, the research teams made arrangements with them and set up an appointment for data collection. Participants gathered at a hall or meeting room prepared by the employers to enable the participants to fill up the questionnaires. Instructions were given to them on how to answer the questionnaires and respondents had the opportunity to seek clarification if needed. Consent to participate was sought from each respondent prior to the commencement of the data collection. The whole process took about 20 minutes.

2.4 Study Analysis

values. The 5-point Likert scales ranging from "Strongly not angry", "Not angry", "Uncertain", "Angry", and "Strongly angry" were used in this assessment. The mean above 2.5 is considered 'Angry' and the mean scale below 2.5 is considered as 'Not Angry'. The accuracy of the measurements for the study instrument is measured by the reliability test (Cronbach's alpha). The lower the error rate of an instrument, the higher the reliability of the instrument where the reliability test rating ranging from 0.0 to 0.49 is weak, 0.5 to 0.69 is moderate, and 0.7 to 1.0 is considered strong (Kumar, 2019).

The analysis of moment structures (AMOS) software is used to analyse the model next. In order to confirm the theory built in this study which was based on several component factors, this model analysis was used. The Confirmatory Factor Analysis (CFA) method was used to test the theory of the first-order analysis in Figure 2 and the second-order analysis in Figure 3. For the first order, CFA used a combination of data from the components of factors namely unsafe or inappropriate actions, rainy conditions, rude or sluggish actions, police enforcers presence, road conditions and design, illegal actions on the road, hazards on the road and obstructions on the road.

The first order (FO) of this stage is to ensure that the basic components of discriminant validity are achieved. Standardized Estimate (factor loading) for each item should be 0.40 or higher to be retained. If an item fails to meet a minimal criterion of 0.40 or lower (Hair et al., 2006), items would be categorized as failure to meet the minimum criteria. In order to ensure the reliability of internal consistency and CR, each factor should be 0.70 or higher (Hair et al. 2006), hence the Composite Reliability (CR) were used. As the values on Average Variance Extracted (AVE) presents as a strict measure of convergent validity, the value AVE must be at least 0.50 (Chin, 1998). Nevertheless, if AVE does not meet the threshold of 0.50, the reliability test can rely on CR due to the more accurate measurement of reliability (Malhotra & Dash, 2011). Discriminant validity is usually examined by comparing the square root of AVE with the correlation between the focal construct and all other constructs. The loading of each indicator is higher for its respective construct than for any other construct (Chin, 1998). Discriminant validity between constructs is acceptably high when the square root of AVE for each construct exceeds the correlation between that and all other constructs.

Finally, we need at least a value of 3 for the parsimonious fit or CMIN (Chi-square/degree of freedom). Nevertheless, too great a sample has the tendency to increase the CMIN/DF value, but the value cannot be more than the value of 5. CMIN/DF is a measure of absolute fit. Comparative Fit Index (CFI) is a measure of relative fit and the value should be greater than 0.80 (Gignac, 2009). Root Mean Square Error of Approximation (RMSEA) is a parsimony adjusted measure of fit and it should be less than 0.080 (Hu & Bentler, 1998). In order to identify the component or factor from the first order that contributes to the motorcyclists' anger as in the second order, a second order (SO) is utilized. The component or factor more dominant can be measured by SO. The benefits of fixed models such as CMIN/DF, CFI and RMSEA can also be checked against SO.

3. Results

3.1 Respondents' Demographic Profiles

Based on Table 1, 86.5% were male respondents and 13.5% were females. In terms of marital status, 69.3% were married, 28.5% were single, while 2.2% were divorced or were widowed. The majority of respondents (95.3%) rode motorcycles with not more than 250 cc, 2.9% rode motorcycles with more than 500 cc, while 1.7% used motorcycles between 250 cc to 500 cc. Most of the respondents had high education (51.1%), while 47.7% of the respondents had received middle education, followed by 1.5% with lower education. In terms of employment, most of the respondents were from the public sector (69.8%) and 30.2% were from the private sector.

Table 1: Demography

Item	Frequency	Percent
Gender		
Male	352	86.5
Female	55	13.5
Marital status		
Single	116	28.5
Married	282	69.3
Divorced/Widow	9	2.2
Type of motorcycle		
Not more than 250 cc	388	95.3
250 to 500 cc	7	1.7
More than 500 cc	12	2.9
Education level		
Low (primary)	6	1.5
Middle (secondary)	193	47.4
High (tertiary)	208	51.1
Employment		
Private sector	123	30.2
Public sector	284	69.8

3.2 The Mean Analysis

Table 2 shows the mean analysis for the factor anger, where 14 items from unsafe/inappropriate actions, 9 items from rude/sluggish actions, 11 items from road conditions and design, 5 items from police enforcers' presence, 6 items from illegal actions on the road, 5 items from hazards on the road, 5 items from rainy conditions and 4 items from obstructions on the road. All the items showed a value means of above 2.5 (Table 2). This means that respondents were angry with the environment or road conditions while riding on the road.

3.3 First Order (FO)

Table 2 shows analysis loading (Standardized Estimate) through pooled-data (CFA). All items indicate a value loading of 0.40. Hence, none of the items will be abolished. Meanwhile, Table 3 shows the analysis assesses for the validity and reliability of the construct. The analysis outcome for reliability under CA towards the factor (construct) shows that the reliability value fulfills the items accepted such as rainy conditions (0.874), unsafe or inappropriate actions (0.926), rude or sluggish actions (0.904), road conditions and design (0.910), police enforcers' presence (0.896), illegal actions on the road (0.835), hazards on the road (0.777) and obstructions on the road (0.719).

The analysis CR shows that the value fulfills the requirement. The values are rainy conditions (0.877), unsafe or inappropriate actions (0.928), rude or sluggish actions (0.905), road conditions and design (0.910), police enforcers' presence (0.901), illegal actions on the road (0.842), hazards on the road (0.784) and obstructions on the road (0.721). The AVE shows only rainy conditions (0.592), rude or sluggish actions (0.515) and police enforcers' presence (0.649) which is more than 0.50. However, other components can be accepted because a reliability test can rely on CR due to the more accurate measurement of reliability (Malhotra & Dash 2011). Reliability analysis and validation used in this study showed good discriminant and convergent validities.

Based on Table 4, the modification indices (MI) were done to achieve the suitability indices that can be accepted. MI will show two redundant items or statements that carry the same meaning with the respondents' perspectives. There are three categories of model suitability and the level of acceptance. Firstly, the parsimonious fit or CMIN (Chi-square/degree of freedom) achieves 2.102, the RMSEA value needs to be lower than 0.080 (0.052), RMR is 0.066, GFI is 0.755, CFI is 0.865, TFI is 0.783, NFI is 0.784 and IFI is 0.874.

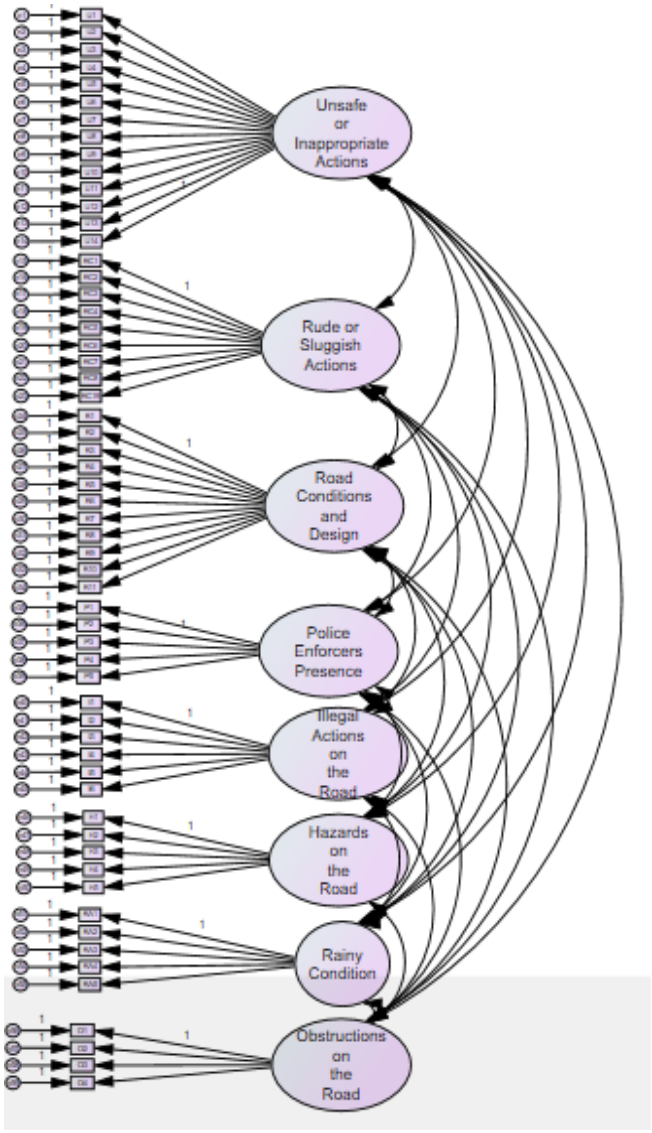

Figure 1: First order

Table 2: Mean and loading analysis of the item factor anger

Factor/Item		Loading FO	Mean	Standard deviation
Factor 1: Unsafe/Inappropriate actions (Mean: 4.26)				
1.	Someone changes lane when too close	0.804	4.220	0.861
2.	Someone changes lane suddenly without signaling	0.729	4.540	0.771
3.	Driver swerves left/right without signaling	0.693	4.570	0.736
4.	Someone driving in the opposite lane without lowering his high beam at night	0.724	4.290	0.848
5.	Someone driving at the back of your motorbike using high beam at night	0.671	4.160	0.883
6.	A vehicle in front not giving you way although you have turned on your signal	0.736	4.200	0.923
7.	Someone driving too close to your motorbike	0.692	4.030	0.902
8.	A vehicle in front stops suddenly	0.673	4.440	0.843
9.	Someone increases his speed when you are trying to overtake	0.707	4.040	0.919

Continued on next page.

Table 2 – *Continued from previous page.*

Factor/Item	Loading FO	Mean	Standard deviation
Factor 1: Unsafe/Inappropriate actions (Mean: 4.26)			
10. Someone changes lane when too close	0.804	4.220	0.861
11. Someone changes lane suddenly without signaling	0.729	4.540	0.771
12. Driver swerves left/right without signaling	0.693	4.570	0.736
13. Someone driving in the opposite lane without lowering his high beam at night	0.724	4.290	0.848
14. Someone driving at the back of your motorbike using high beam at night	0.671	4.160	0.883
15. A vehicle in front not giving you way although you have turned on your signal	0.736	4.200	0.923
16. Someone driving too close to your motorbike	0.692	4.030	0.902
17. A vehicle in front stops suddenly	0.673	4.440	0.843
18. Someone increases his speed when you are trying to overtake	0.707	4.040	0.919
19. A vehicle using the emergency lane/road shoulder during heavy traffic	0.666	4.500	0.821
20. A heavy vehicle being driven fast beside your motorbike	0.683	4.110	0.985
21. Someone showing an offensive sign at you	0.636	4.340	0.994
22. A pedestrian coming into your path suddenly	0.653	4.210	0.922
23. Someone enters/exits from your path	0.635	4.020	0.972
Factor 2: Rude/Sluggish actions (Mean: 3.47)			
1. Someone giving you an unhappy look	0.783	3.640	1.173
2. Someone honking at you	0.701	3.500	1.096
3. Someone stepping on the gas pedal vigorously while waiting at the traffic light	0.715	3.470	1.157
4. Someone flashing the high beam in your direction	0.688	3.360	1.205
5. Someone shouting at you	0.681	3.990	1.054
6. Someone taking too long to go into the parking bay	0.771	3.400	1.096
7. Someone ahead of you driving too slowly	0.741	3.530	1.118
8. A pedestrian crossing too slowly while you are waiting at a pedestrian crossing	0.644	2.760	1.202
9. A driver in front taking his sweet time to move when the light turns green	0.725	3.610	1.115
Factor 3: Road conditions and design (Mean: 3.79)			
1. A tree branch blocking your view in the motorcycle lane/road shoulder	0.766	3.740	1.031
2. A drain/manhole without a cover too close to the motorcycle lane/road shoulder	0.728	4.040	1.034
3. Crossing a sandy patch/object in the motorcycle lane/road shoulder	0.725	3.780	1.035
4. Hitting a pot-hole/puddle on the road	0.646	3.980	1.034
5. Crossing slippery road paint	0.743	3.690	1.057
6. Road surfacing is much higher than land/shoulder level	0.692	3.660	1.061
7. Road works or diversion without proper signage	0.661	3.980	1.024
8. Traffic light is not functioning	0.680	3.760	1.061
9. Confusing road signage	0.631	3.890	0.993
10. Motorcycle lane/road shoulder not provided	0.650	3.470	1.047
11. Signage/obstruction too close to the motorcycle lane/road shoulder	0.693	3.760	0.984

Continued on next column.

Table 2 – *Continued from previous column.*

Factor/Item	Loading FO	Mean	Standard deviation
Factor 4: Police enforcers presence (Mean: 2.78)			
1. Road block by traffic police/road enforcers	0.841	2.710	1.333
2. Traffic police/road enforcers ordering you to stop your vehicle	0.865	2.600	1.259
3. Traffic police/road enforcers driving close to you	0.867	2.540	1.229
4. Traffic police/road enforcers observing you from a hidden position	0.804	2.850	1.317
5. Traffic police/road enforcers ordering you to give way to VIPs	0.624	3.200	1.447
Factor 5: Illegal actions on the road (Mean: 4.25)			
1. Someone making an illegal U-turn	0.745	4.390	0.880
2. Someone using a mobile phone while driving/riding	0.643	4.350	0.855
3. Someone overtaking at a double line	0.689	4.150	0.915
4. Someone driving/riding beyond the speed limit	0.589	3.740	1.072
5. Someone beating the traffic light/stop signage	0.714	4.200	0.945
6. Someone driving/riding against the traffic.	0.733	4.680	0.681
Factor 6: Hazards on the road (Mean: 3.70)			
1. Struck by a torn piece of tyre in front of your vehicle	0.765	3.820	1.100
2. Object falling from a vehicle in front of you	0.674	4.020	1.010
3. Another vehicle squeezing into your lane due to closure/narrowing of road	0.563	4.110	1.001
4. Being hit by a flying stone from the tyre of another vehicle	0.614	3.470	1.157
5. An animal crossing the road suddenly	0.620	3.100	1.155
Factor 7: Rainy condition (Mean: 3.25)			
1. Caught in a traffic jam during rain	0.854	3.080	1.215
2. Compelled to stop at the traffic light during rain	0.821	3.060	1.249
3. No shelter available during rain	0.711	3.360	1.172
4. Compelled to stop at a pedestrian crossing when there is no pedestrian	0.809	2.900	1.274
5. Getting splashed by water from a puddle by a passing vehicle	0.628	3.830	1.024
Factor 8: Obstructions on the road (Mean: 4.00)			
1. Riding behind a vehicle spewing thick smoke	0.645	3.870	1.008
2. Vehicle stopping at road shoulder /emergency lane without signaling	0.651	4.260	0.947
3. Riding behind a lorry carrying extra-long materials	0.629	3.780	1.090
4. Vehicle obstructing road in front during heavy traffic	0.581	4.110	0.899

3.4 Second Order (SO)

The second order model shows that the estimation results are getting better after the modification index is done. CMIN/DF is 2.132, RMSEA is 0.053, RMR is 0.069, GFI is 0.770, CFI is 0.868, TFI is 0.862, NFI is 0.778 and IFI is 0.869. All these values show that the values can be accepted and significantly fit with the study data. The fit indexes/indices' values show the values that can be accepted (Table 4).

Table 5 and Figure 3 show the significant level test for the contributing factors. The analysis outcome shows eight factors that have a very important coefficient with a significant value of 1%

($p < 0.001$). Table 5 and Figure 5 show that road conditions and design (0.898) is the main factor in the cause of anger, followed by obstructions on the road (0.859), unsafe or inappropriate actions (0.842), illegal actions on the road (0.739), hazards on the road (0.726), rainy conditions (0.607) and the factor police enforcers presence shows the lowest coefficient value (0.430).

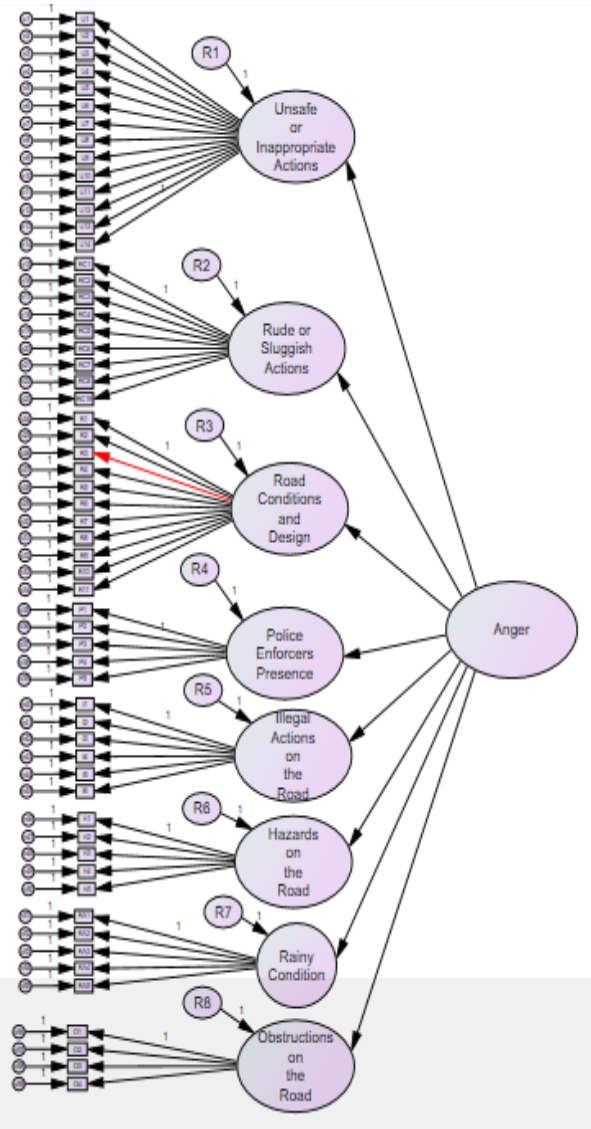

Figure 2: Second order

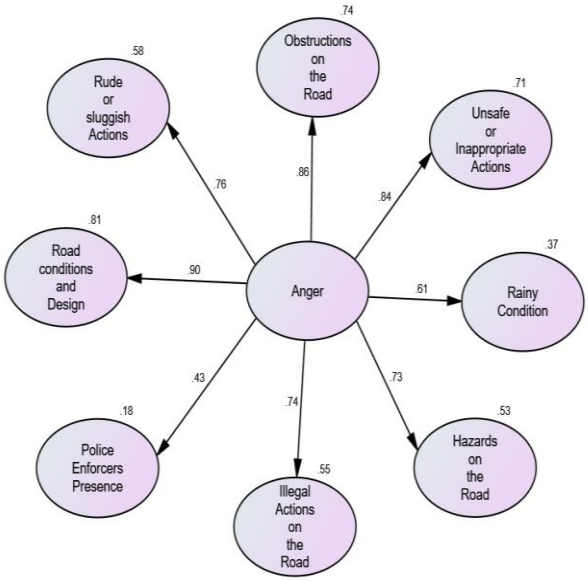

Figure 3: Output of second order

Table 3: CA, CR, AVE and discriminant validity

	CA	CR	AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rainy conditions (1)	0.874	0.877	0.592	**0.769**							
Unsafe/Inappropriate actions (2)	0.926	0.928	0.482	0.506	**0.694**						
Rude/Sluggish actions (3)	0.904	0.905	0.515	0.699	0.686	**0.718**					
Road conditions and design (4)	0.910	0.910	0.481	0.571	0.729	0.684	**0.694**				
Police enforcers' presence (5)	0.896	0.901	0.649	0.713	0.338	0.676	0.416	**0.805**			
Illegal actions on the road (6)	0.835	0.842	0.473	0.372	0.603	0.516	0.699	0.188	**0.688**		
Hazards on the road (7)	0.777	0.784	0.424	0.472	0.534	0.498	0.688	0.391	0.469	**0.651**	
Obstructions on the road (8)	0.719	0.721	0.393	0.460	0.716	0.566	0.727	0.310	0.604	0.724	**0.627**

Notes: CA=Cronbach's Alpha, CR= Composite Reliability, AVE= Average Variance Extracted

Table 4: Goodness-of-fit indices for the measurement and structural model

Index	Cut-off value	Reference	First order modification (FO)	Second order indices FO	Modification (SO)	Indices SO
CMIN/DF	≤5.00	Kline (2011)	2.247	2.102	2.319	2.132
RMSEA	≤0.080	Hu & Bentler (1998)	0.055	0.052	0.057	0.053
RMR	≤0.100	Bentler (1995)	0.067	0.066	0.091	0.069
GFI	≥0.80	Gignac (2009)	0.760	0.775	0.741	0.770
CFI	≥0.80	Gignac (2009)	0.855	0.873	0.846	0.868
TFI	≥0.80	Gignac (2009)	0.848	0.865	0.839	0.862
NLI	≥0.80	Gignac (2009)	0.768	0.784	0.758	0.778
IFI	≥0.80	Gignac (2009)	0.856	0.874	0.847	0.869

Notes: Root Mean Square Error of Approximation (RMSEA), Root Mean Square Residual (RMR), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Comparative Fit Index (NFI), Normed Fit Index (IFI

Table 5: Regression weights of the second order factor model

		Standardized estimate	Standard error	Critical ratio	P-value
Anger	Rainy conditions	0.607	0.133	9.147	***
	Unsafe/Inappropriate actions	0.842		Reference point	
	Rude/Sluggish actions	0.760	0.132	10.250	***
	Road conditions and design	0.898	0.125	11.000	***
	Police enforcers' presence	0.430	0.128	7.051	***
	Illegal actions on the road	0.739	0.088	10.641	***
	Hazards on the road	0.726	0.123	9.587	***
	Obstructions on the road	0.859	0.112	8.725	***

Notes: ≤ 0.010***, ≤ 0.050** and ≤ 0.1

4. Discussion

This study was conducted in Klang Valley (Central of Peninsular Malaysia) on 407 motorcyclists who were all employed. The study attempts to explore the contributing factors that provoke motorcyclists' anger while riding on the road. Furthermore, the research aims to find out the main factor to provoke riding anger among motorcyclists. The findings showed there were 59 items consisting of 8 subscales that could provoke anger among motorcyclists while riding, namely unsafe/inappropriate actions (14 items), rude/sluggish actions (9 items), road conditions and design (11 items), police enforcers presence (5 items), illegal actions on the road (6 items), hazards on the road (5 items), rainy conditions (5 items) and obstructions on the road (4 items). The results showed that the respondents were angry while riding motorcycles on the road with the Mean value above 2.5 for all 59 items. The Mean for the eight subscales was above 3, except for the subscale police or enforcers' presence (Mean = 2.78). According to Sullman et al. (2014) on driving anger in Malaysia, the highest Mean score was discourtesy (3.61), followed by hostile gestures (3.45), traffic obstructions (3.29), slow driving (3.06). illegal driving (2.75) and the lowest Mean score was for a police presence (2.25).

The second order model outcome shows eight factors that have a very important coefficient with a significant value of 1% ($p < 0.001$). Road conditions and design (0.898) was the main factor in the cause of anger, followed by obstructions on the road (0.859), unsafe or inappropriate actions (0.842), illegal actions on the road (0.739), hazards on the road (0.726), rainy conditions (0.607) and the factor police enforcers' presence shows the lowest coefficient value (0.430). According to Gunson et al. (2019) a study on 170 riders and 239 drivers found that careless or reckless behaviour from other drivers and poor road environment design were significant in provoking anger among riders, whereas rude behaviour by other road users was significant in provoking anger among drivers. The current findings and the finding done by Gunson et al. (2019) show similarity, whereby road conditions and design or road environment design were the factors that provoked anger among motorcyclists while riding on the road. Another study found that female drivers reported more anger than males because of traffic obstruction and hostile gestures, where age was negatively related to discourtesy, traffic obstruction, hostile gestures, slow driving and police presence. (Sullman et al., 2014).

Results from the study by Rowden et al. (2016) found that the scores for the composite driving aggression scale were significantly higher than for the composite riding aggression scale. Participants who were scored at the 85th percentile or above for the aggressive driving and aggressive riding indices had significantly higher scores on thrill-seeking, greater intentions to engage in future risk-taking, and lower safety attitude scores than other participants. In addition, participants with the highest aggressive driving scores also had higher levels of self-reported past traffic offences than other participants. This study examined differences in self-reported aggression as a function of two vehicle types: passenger cars and motorcycles. Results from a study by Wong et al. (2010) conclude three primary personality traits of 683 young motorcyclists aged between 18 and 28, namely sensation seeking, amiability and impatience. While amiable riders represent a group of relatively mature and safe riders, sensation-seeking riders are extremely self-confident, comfortable with unsafe riding and interested in the utility gained from it. The sensation-seeking ones are also highly aware of traffic conditions, which may lower the chances of getting into an accident, but the accident could be extremely severe if it did occur. Impatient riders, having low riding confidence and traffic awareness deficiency, also seek utility from certain risky riding behaviours.

5. Conclusion and Recommendations

This study explored eight subscales that could provoke motorcyclists' anger while riding on the road and found subscale road conditions and design as the main contributing factors to provoke riding anger among motorcyclists. Three parties are involved and are responsible for planning, developing and doing maintenance work for road conditions and design in Malaysia depending on different types of roads. The parties involved include the local council (city roads), Public Works Department (state roads and federal roads), Expressway companies (expressway). The three parties play an important role to ensure that the road conditions and design are well designed and maintained. This study shows poor road conditions and design as the main contributing factor to provoke anger among motorcyclists. The respondents felt angry because poor road conditions and design may cause them to be involved in road crashes or near misses. Future studies should cover demographic factors such as gender, age and riding experience for additional differences in terms of the eight subscales.

Acknowledgements

The study was funded by the Malaysian Institute of Road Safety Research (MIROS) and our reliable and co-operate sponsorship partner Allianz General Insurance (M) Berhad. The authors would like to thank the organizations involved including Perodua, Toyota, Malaysian Agricultural Research and Development Institute (MARDI), Dewan Bandaraya Kuala Lumpur (DBKL), Lembaga Kemajuan Ikan Malaysia, Majlis Perbandaran Kajang (MPKJ), Pejabat Rela Putrajaya and Malaysian Palm Oil Board (MPOB) for their co-operation in completing this research.

References

AAA Foundation for Traffic Safety. (1997). Washington, DC: AAA Foundation for Traffic Safety.

Chin, W.W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research, 295*(2), 295–336.

Clausen, E. I. (2007). *Psychology of anger*. New York: Nova Science Publishers.

Deffenbacher, J. L., Oetting, E. R., & Lynch, R. S. (1994). Development of a driving anger scale. *PubMed*, 74(1), 83-91. Retrieved from https://doi.org/10.2466/pr0.1994.74.1.83

Gignac, G. E. (2009). Partial confirmatory factor analysis: Described and illustrated on the NEO-PI-R. *J Pers Assess, 91*(1), 40-47.

Gunson, H. P., Beanland, V., & Salmon, P. M. (2019). Road-related anger in motorcyclists versus car drivers. *Transportation Research Part F, 62*, 327-338.

Hair, J. F. J., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Upper Saddle River, NJ: Pearson Education, Inc.

Hu, L. T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*(4), 424.

Kumar, R., (2019). *Research methodology: A step-by-step guide for beginners.* Sage Publications Limited.

Malhotra, N. K. & Dash, S. (2011). *Marketing research an applied orientation*. London: Pearson Publishing.

Mesken, J., Hagenzieker, M. P., Rothengatter, T., & De Waard, D. (2007). Frequency, determinants, and consequences of different driver's emotion; An on the road study using self-reports (observed) behaviour, and physiology. *Transportation Research. Part F, 10*, 458-475.

Rowden, P., Watson, B., Haworth, N., Lennon, A., Shaw, L., & Blackman, R. (2016). Motorcycle riders' self-reported aggression when riding compared with car driving. *Transportation Research Part, 36*, 92-103. Retrieved from https://doi.org/10.1016/j.trf. 2015.11.006

Royal Malaysia Police (RMP). (2018). *Malaysian road accident statistic report.* Royal Malaysia Police (RMP).

Spielberger, C. D., Jacobs, G. A., Russell, S., & Crane, R. S. (1983). Assessment of anger: The state-trait anger scale. In Butcher, J. N., & Spielberger, C. D. (Eds.), *Advances in Personality Assessment, 2*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Sullman, M. J. M., Stephens, A. N., & Yong, M. (2014). Driving anger in Malaysia. *Accident Analysis and Prevention, 71*, 1-9.

Wong, J. T., Chung, Y. S., & Huang, S. H. (2010). Determinants behind young motorcyclists' risky riding behavior. *Accident Analysis and Prevention 42* (1), 275-281. Retrieved from https://doi.org/10.1016/j.aap.2009.08.004