Factors Affecting Indonesian Motorcycle Rider Behaviour

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Abstract. Number of motorcycles were growing rapidly in Indonesian large cities. This is to cope with severe congestion due to lack of satisfactory public transport system and uncotrolled land use. Most urban accidents involve motorcycle(s). A research conducted in Pangkal Pinang, Pontianak and Manado [1] found that accident history affect six motorcycle rider behaviours factors stated by [2], i.e. speed violations, safety violations, traffic violations, traffic errors, control errors and stunts. These factors orginally used in Persian Motorcycle Rider Behaviour (MRBQ). When these factors were used in Pangkal Pinang, Pontianak and Manado (in which Indonesian MRBQ was used to measure motorcycle rider behaviour) they were not totally fit. Although Indonesian MRBQ was an adaptation of Persian MRBQ , items in each MRBQs were not the same due to different motorcycle rider behaviour caracteristics, different traffic laws and different cultures. This present paper aimed to identify suitable factors for Indonesian MRBQ using 604 respondents data from the three cities.

Introduction

In Indonesian large cities, congestion is worsening. The congestion is due to unsatisfactory public transport provision and failure to control citiy and suronding area land use. As a result private motorized vehicles are dominating the city transport (mainly motorcycles in the last decade). Motorcycle is perceived as a transport mode that can guarantee punctual arival time in any trip destination. In one hand this is due it is flexibility due to its size. On the other hand motorcycle is more likely to involve in an accident due to its unprotected feature and the required skill to ride it safely. Considering increasing number of motorcycles operated in Indonesian cities, research on motorcycle rider risky behaviour become important.

In order to develop policy to manage Indonesian motorcycle rider behaviour, the authors have developed Indonesian mototorcycle behaviour questionnaire (MRBQ). In the initial state it has been used in a research in three cities (Pontianak, Pangkal Pinang and Manado). In this paper, the data from those three cities were used to evaluate factors affecting motorcycle rider behaviour.

Objective

The objective of this paper is to extract factors affecting Indonesian motorcycle rider behaviour using principal component analysis.

Literature Review

Violations are defined as deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system. Errors are defined as the failure of

planned actions to achieve their intended consequences. Errors were further classified into slips and lapses (the unwitting deviation of action from intention, i.e. the behaviour is not what was intended) versus mistakes (the departure of planned actions from some satisfactory path towards a desired goal, i.e. the intention to behave in a certain way was not appropriate) [3]. These definitions were originally stated when Driver Behaviour Questionnaire (DBQ) was developed.

Considering the different characteristics of motorcyclist behaviour compare to car driver, in the development of MRBQ in England, [4] used 24 items reflecting four subscales, i.e. traffic errors, speeding, stunt and control error. In later MRBQ study [5] extracted 43 items into 5 subscales, i.e. traffic errors, speed violations, stunts, control errors and safety equipment. In Persian MRBQ [6], the first four subscales were the same with English MRBQ, i.e. traffic errors, speed violations, stunts and control errors but safety equipment was not included as protective clothings were not common in Iran. Instead, in Persian MRBQ 2 other subscales added, i.e. safety violations and traffic violations. In Australian MRBQ [7], there were 4 subsclaes, i.e. errors (no distinction between traffic and control erros), speed violations, stunts and protective gear. Instead of developing Chinese MRBQ, Cheng et al (2010) developed CMRDV (Chinese Motorcycle Rider Driving Violation) items. It only consists of two subscales, i.e. aggressive violations and ordinary violations

Methodology

Data collection was conducted in three of five original cities in the research proposal. As the funding granted by the Directorate General of Higher Education was ony about 65% of the proposed budget, some modification was made as indicated in Table 1.

Tabel 1. Modification of Number of Cities and Number of Respondents

Research Proposal		Research Implementation	
Cities	Number of Respondents	Cities	Number of Respondents
Pontianak	120	Pontianak	203
Manado	120	Manado	200
Medan	120	Pangkal Pinang	201
Surabaya	120		
Ambon	120		
Total	600		604

Knowledge on riders in Java island can be represented by two preliminary surveys by the research team in Jakarta (Putranto and Anjaya, 2014) and (Putranto et al, 2014). Even the questionnaires used in 3 cities was based on questionnaire improvement process after surveys in Jakarta (combination of *favourable* and *unfavourable* statements in the questionnaire to avoid social desirability). Likert scale from 1 (never) to 5 (always) was used.

Indonesian MRBQ consisted of 38 statements that originally grouped into six subscales, i.e. speed violations (SV), safety violations (SAV), control errors (CE), traffic erros (TE), stunts (S) and traffic violations (TV) as used in Persian MRBQ. However, as found in Putranto and Anjaya (2014) the result of factor analysis using principal componenet analysis might show different conclusion. This present paper was intended to confirm the suitability of using six subscales (factors) in Persian MRBQ in Indonesian MRBQ. 38 statement items were extracted using principal component analysis and rotated using varimax with Kaizer Normalization. IBM SPSS Statistics 22 was used to help analysis.

The followings are list of 38 statement items (beginning the two or three digits letter factor code and one or twho digits statement item number):

- TE1-Fail to notice that pedestrians are crossing when turning into a side street from a main road
- TE2-Not notice someone stepping out from behind a parked vehicle until it is nearly too late
- TE3-Pull out on to a main road in front of a vehicle that you had not noticed
- TE4-Fail to notice or anticipate that another vehicle might pull out in front of you
- TE5-Turn left on main road, you pay attention main traffic that you nearly hit the vehicle in front
- TE6-Distracted, you realise that the vehicle in front has slowed and you have to brake hard
- TE7-Attempt to overtake someone that you had not noticed to be signalling a left turn
- TE8-You find it difficult to stop in time when a traffic light has turned against you
- TE9-Ride so close to the vehicle in front that it would be difficult to stop in an emergency
- TE10-Run wide when going round a corner
- SV11-Ride so fast into a corner that you feel like you might lose control
- SV12-Exceed the speed limit on a country/rural road
- SV13-Disregard the speed limit late at night or in the early hours of the morning
- SV14-Exceed the speed limit on a motorway
- SV15-Exceed the speed limit on a residential road
- SV16-Race away from traffic lights with the intention of beating the driver/rider next to you
- SV17-Ride between two lanes of fast moving traffic
- SV18-Get involved in unofficial 'races' with other riders or drivers
- SV19-Ride so fast into a corner that you scare yourself
- S20-Attempt to do, or actually do, a wheelie
- S21-Intentionally do a wheel spin
- CE22-Find that you have difficulty controlling the bike when riding at speed
- CE23-Skid on a wet road or manhole cover
- CE24-Driver deliberately annoys you or puts you at risk
- SV25-Ride when taking drugs or medications which might have effects on your riding
- TV26-Cross junction when traffic light is red
- TV27-Riding in opposite direction of road way
- TV28-Riding in sidewalk
- TV29-Call with mobile phone while riding
- TV30-Smoking while riding
- SAV31-Using helmet without chin straps or not fastening it.
- CE32-Carry a large carriage with motorcycle
- SAV33-Carry more than one passenger with your motorcycle
- S34-Have a crash with a parked vehicle and make damage to it, but escape from crash scene
- SAV35-Riding with an impaired motorcycle
- SAV36-Riding without helmet
- SAV37-Carry a passenger who have not worn helmet
- CE38-Delay in noticing to in front car when opening door suddenly and control your motorcycle difficulty

It should be noted that statement items no. 4, 9, 13, 14, 18, 26 and 30 were presented in unfavourable manner.

Characteristics of Respondents

The gender ratio the sample in each city was about 55:45 in Pangkal Pinang, 65:35 in Pontianak and 73:27 in Manado respectively. The overal gender ratio in three cities was 64:36.

Respondents ini Pangkal Pinang were between 14 and 60 years old (mean 23.1 years old). Although respondents under licensing age (younger than 17 years old) were only five persons, in real life there was social presure to ride motorcycle in very early age. Respondents in Pontianak

were between 18 and 55 years old (mean 24.7 years old). Respondents in Manado were between 16 and 67 years old (mean 26.6 years old). Respondents under licensing age were 3 persons. The overall respondents mean age in 3 cities was 24.8 years old.

Due to low respondents mean age, only about 18% respondents in Pangkal Pinang, about 23% respondents in Pontianak and about 35% respondents in Manado were married. Overall in three cities only about 25% respondents were married.

Only about 4% respondents in Pangkal Pinang were originated from outside Bangka Belitung Province. In Pontianak, only about 5% respondents were originated from outside West Borneo Province. Meanwhile 21% respondents in Manado were originated from outside North Sulawesi Province. Overall in three cities about 10% respondents were originated from outside each province.

About 73% respondents in Pangkal Pinang, stayed outside Pangkal Pinang. Meanwhile only about 3% respondents in Pontianak stayed outside Pontianak and only 27% respondents in Manado stayed outside Manado. Overall in three cities about 34 % responden stayed outside the capital of the province.

Due to low respondents mean age, most of their monthly expenditures were $\leq$ one million rupiah ($\leq$ US$ 80). This was shown by 65% of respondents in three cities. In details, it was 69 % in Pangkal Pinang, 73% in Pontianak and 56% in Manado repectively.

Overall in three cities, more than 75% respondents have never been involved in at least a traffic accident in the last one year. In details, it was 83% both in Pangkal Pinang and Pontianak and 62% in Manado.

Results and Discussions

The value of KMO (Kaiser-Meyer-Olkin) measure of sampling adequacy was 0.849 (> 0.7). This shows number of sample was sufficient for factor analysis. Thirty eight statement items were extracted using principal component analysis and rotated using varimax with Kaiser normalisation. Minimum eigen value was set to be one and number of extracted factors were eleven. Using this approach the total variance explained was only 56.378%

Table 2 shows the rotated component matrix. Factor 1 with the highest variance explained (8.012%) consists of mostly speed violations related items. Even two items with the lowest loading factors were speeds related. Therefore this factor was labelled as speed violations. Although this factor had the highest variance explained but this factor also consisted of largest number of items (eight) and therefore the variance explained was distributed among those many items (causing lower loading factors). As a result the highest loading factor was only 0.659 (Exceed the speed limit on a residential road).

Factor 2 with the second highest variance explained (5.901%) consists of three safety violations related items. Therefore this factor was labelled as safety violations. As there were only three items within this factor, the highest loading factor was quite high, i.e. 0.791(riding without helmet).

Factor 3 with the third highest variance explained (5.777%) consists of mostly traffic errors related items. Therefore this factor was labelled as traffic errors. One of the items within this factor, i.e. CE22 (find that you have difficulty controlling the bike when riding at speed) was within control error factor in previous research (Motevalian et al, 2011). It can be argued that the difference between traffic errors and control errors was very marginal and therefore it sometimes mixed up. The highest loading factor was only 0.716 (not notice someone stepping out from behind a parked vehicle until it is nearly too late).

Factor 4 with the fourth highest variance explained (5.295%) consists of two speed violations related items. Compare to factor 1, the items within factor 4 were slightly different, i.e. more related to violation concerning high speed of motorcycles. Therefore this factor was labelled as high speed violations. Both items, i.e. disregard the speed limit late at night or in the early hours of the morning and exceed the speed limit on a motorway had similarly high loading factors (0.794 and 0.796 respectively).

Factor 5 with the fifth highest variance explained (5.14%) consists mostly of three stunts related items. Even item with the lowest loading factor (ride when taking drugs or medications which might have effects on your riding) was stuts related. Therefore this factor was labelled as stunts. The highest loading factor was 0.804 (intentionally do a wheel spin).

Table 2. Rotated Component Matrix

	Component										
	1	2	3	4	5	6	7	8	9	10	11
SV15	0.659	Speed Violations									
SV12	0.604										
SV16	0.578										
SV17	0.576										
SV19	0.553										
SV11	0.483										
TE6	0.431										
TE10	0.391										
SAV36		0.791	Safety Violation								
SAV37		0.749									
SAV31		0.561									
TE2			0.716	Traffic Errors							
TE1			0.680								
TE3			0.470								
CE22			0.434								
TE5			0.408								
SV14				0.796	High Speed Violations						
SV13				0.794							
S21					0.804	Stunts					
S20					0.756						
SV25					0.384						
CE23						0.659	Control Errors				
CE38						0.489					
CE24						0.440					
TE9							0.669	Stopping Errors/ Violations			
TE8							0.519				
S34							0.435				
TV26							0.422				
TV27								0.752	Traffic Violations		
TV28								0.749			
CE32	Motorcycle Capacity Violations								0.706		
SAV33									0.614		
SAV35									0.396		
TV30	Factor 10									0.730	
SV18										0.673	
TE4										-0.418	
TE7	Factor 11										0.718
TV29											0.608

Factor 6 with the sixth highest variance explained (5.006%) consists of three control errors related items. Therefore this factor was labelled as control errors. As the variance explained had already decreased, the highest loading factor was only 0.659 (skid on a wet road or manhole cover) although there were only three items in this factor.

Factor 7 with the seventh highest variance explained (4.754%) consists of four errors and violations related to stopping behaviour. Therefore this factor was labelled as stopping errors and violations. The highest loading factor was 0.669 (ride so close to the vehicle in front that it would be difficult to stop in an emergency).

Factor 8 with the eighth highest variance explained (4.393%) consists of two traffic violations related items. Therefore this factor was labelled as traffic violations. Both items, i.e. riding in opposite direction of road way and riding in sidewalk had similarly high loading factors (0.752 and 0.749 respectively).

Factor 9 with the ninth highest variance explained (4.316%) consists of motorcycle carrying capacity violations related items. Therefore this factor was labelled as motorcycle carrying capacity violations factor. The highest loading factor was 0.706 (carry a large carriage with motorcycle).

The last four items were belong to two factors with the least variance explained. However, the similarities of items within each factor were difficult to understand. There was one item with negative loading factor.

Finally the factors extracted in this paper were compared to the factors extracted in [6]. All six factors extracted in [6] were also extracted in this present paper. However there were additional five factors in this present paper. Three of them can be identified as high speed violations, stopping errors/ violations and motorcycle carrying capacity violations. The remaining two factors were difficult to be categorized.

Conclusions and Recommendation

Based on the result of factor analysis of the data from Pangkal Pinang, Pontianak and Manado it is conluded that the number of extracted factors were eleven, total variance explained was only 56.378%., and compared to [6], in this paper there were three additional factors identified. To get the more proportional picture of Indonesian motorcycle rider behaviour the age distribution of the respondents should reflect Indonesian general motorcycle rider population.

References

[1] L.S. Putranto, Rostiana, Pengaruh faktor sosial ekonomi dan riwayat kecelakaan terhadap perilaku pengemudi sepeda motor indonesia, Proceeding of 1st Andalas Civil Engineering Conference, Padang, 2014.

[2] L.S. Putranto I.S. Anjaya. Initial development of indonesian motorcycle rider behaviour questionnaire, Proceeding of 9th Asia Pacific Conference on Transportation and the Environment, Colombo, 2014.

[3] J. Reason, A. Manstead, S. Stradling, J. Baxter, K. Campbell, K. Errors and violations on the road: a real distinction?, Ergonomics 33 (1990), 1315-1332.

[4] B. Sexton, C. Baughan, M. Elliott, G.Maycock, The accident risk of motorcyclists, TRL Report TRL607 (2004), Transport Research Laboratory, Crowthorne.

[5] M.A. Elliot, C.J. Baughan, B.F. Sexton, Errors and violations in relation to motorcyclists' crash risk. Accident Analysis and Prevention 39 (2007), 491-499.

[6] S.A. Motevalian, M. Asadi-Lari, H. Rahimi, M. Eftekhar, Validation of Persian Version of Motorcycle Rider Behavior Questionnaires. 55th AAAM Annual Conference Annals of Advances in Automotive Medicine October 3-5, 2011.

[7] C. Skashita, T. Senserrick, S. Lo, S. Boufous, L. De Rome, R. Ivers. The Motorcycle Rider Behavior Questionniare: Psychometric properties and application amongst novice riders in Australia. Transportation Research Part F 22 (2014), 126-139.

[8] A.S. Cheng, T.C. Ng, Development of a Chinese Motorcycle Rider Driving Violation Questionnaire, Accident Analysis and Prevention 42 (2010), 1250-1256.