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TESTING THE DRIVING BEHAVIOUR QUESTIONNAIRE (DBQ) ON MALAYSIAN DRIVERS

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ABSTRACT

This study measured aberrant driving behaviour using the Driver Behaviour Questionnaire (DBQ), one of the most widely used driving measurement instruments, and tested its factorial validity and reliability among Malaysia drivers. Principal component analysis (PCA) revealed a three-factor structure comprising of violations, errors, and lapses. This three-factor structure accounted for 59.75 per cent of total variance. Descriptive analysis found that five of the most frequently occurring behaviours (between occasionally '2' and quite often '3') came from 'violations', one from 'errors', and another five most frequents were from 'lapses'. Both violations and errors are potentially dangerous and have been reported to predict involvement in active accidents, although violations have been mainly related to crash involvement.

Keywords: Driver behaviour questionnaire, violations, errors, lapses

1. INTRODUCTION

Road traffic accidents are one of the leading causes of death globally, and an estimated 1.5 million people are killed each year and as many as 50 million more suffered serious injuries (WHO, 2017). It is currently taking an eight position and is expected to be at the fifth place by 2030. In Malaysia, more than 500,000 road accidents took place in 2016 alone, taking toll of 7152 deaths. There is a serious economic consequence due to this disaster, and the total costs associated with these accidents were very high. It was reported that road traffic accidents caused an equivalent loss of 1.5 per cent to the country's gross domestic products (GDP) (The Star, 2016). For example, in 2016 road accidents incurred an estimated cost of RM9.21 billion, an increase of RM581 million compared with 2015 (The Star, 2017).

Road traffic accident is the collision of vehicles which results in injury, property damage and death. It happens when a road vehicle such as a motorcar, lorry, bus or motorcycle collides with other vehicles, pedestrians, animals, road debris or other geographical and architectural obstacles (Kohli et al., 2015). There are three elements that may be involved in these accidents; driver (human), road vehicle, and traffic environment. However, human factor was found to have caused more than 90 per cent of the accidents, and that unsafe driving behaviour played a key role to those accidents (Reindeau, 2012). Unsafe driving is a behaviour that puts the driver and other road users at risk such as excessive speeding, weaving in and out of lanes, and driving through red lights or stop signs. Given the significance of this type of driving behaviour, it is not surprising that large volumes of

literature had focused on examining the relationship of this behaviour with various human facets especially in the psychological and social aspects, and that changes in the drivers' behaviour is one of the keys to road traffic safety measures (Chen, 2010; Rifaat, 2012; Nordfjaein et al., 2012; Reindeau, 2012). This also prompted Reason et al. (1990) to develop a survey instrument, Driver Behavior Questionnaire (DBQ) in measuring the driver behaviour and vehicle users.

Driver Behaviour Questionnaire (DBQ) is one of the most frequently used tool in researches on driving behaviour. There are different versions of DBQ, from ones covering on 10 basic questions (Rowland et al, 2009) to ones consisting of over 100 items (Kontogiannis et al., 2002). In DBQ, participants are asked to indicate how often certain traffic situations happen to them. De Winter and Dodov (2010) conducted a meta-analysis with a data set of 45 thousand drivers and found that behaviours reported by drivers can be treated as predictors of traffic accidents. The standard version of DBQ developed by Reason et al., (1990) classified three types of aberrant behaviour; violations, errors, and lapses. Violations refer to 'deliberate violations from those practices believed necessary to main the safe operation of a potentially hazardous system'. It can be aggressive or ordinary. Aggressive violations involve overtly aggressive acts whereas ordinary violations are deliberate deviations from safe driving without a specifically aggressive aim. Errors are defined as 'the failure of planned actions to achieve their intended consequences', while lapses are attention and memory failures which can cause embarrassment but are unlikely to have an impact of driving safety. However, both violations and errors are potentially dangerous and might lead to a collision.

Although the DBQ has gained wide acceptance and studies have been conducted in various countries worldwide (Martinussen, 2013), there is still lack of sufficient publications on psychometric evaluation of this instrument in Malaysia. Therefore the aim of this paper is to present the basic assessment of DBQ by reporting the descriptive findings, reliability as well as developing the factor model of the instrument.

2. METHOD

Driver Behaviour Questionnaire was used to measure aberrant driver behaviours in this study. This DBQ questionnaire includes 10 items of violations, 7 items of errors, and 8 items of lapses. Participants were asked to indicate how often they commit each of the behaviour based on five point Likert-type scale, where 1=hardly ever, 2=occasionally, 3=quite often, 4= frequently, and 5= nearly all the time. The questionnaire was distributed to the motorists using the highways via the intercept survey method. This technique utilised a roadside hand-out method by stopping or selecting participants in a strategic survey sites, and in this case the R & R in the Klang Valley areas. The questionnaire together with a cover letter and a stamped return envelope was given to participants for them to reply anonymously. A total of 348 completed questionnaires were returned with a response rate of 18.1 per cent. However, only 311 questionnaires were found useable after deleting 37 cases which were detected as outliers. Factor analysis using principal component analysis (PCA) with varimax rotation was performed together with frequency analysis with the SPSS version 21.0.

3. RESULTS

The PCA analysis performed revealed a three-factor structure while the scree plot also indicated a three-factor structure. The three-factor structure was found to be most interpretable and accounted for 59.75 per cent of total variance. The first factor with 10 items was defined as 'violations' and accounted for 22.73 percent of variance, the second factor consisting 7 items and named 'errors' explained 19.41 percent of variance, and the third factor 'lapses' explained 17.61 percent of variance with 8 items. Factor loadings of the three-structure can be seen in Table 1.

Table 1: Three factor solution of the DBQ items

No.	Item	F1	F2	F3
8	I become angered by another driver and give chase	.802		
3	I disregard the speed limit on a residential road	.771		
7	I get involved with 'races' with other drivers	.760		
5	I have an aversion to a particular type of a driver and indicate my hostility by whatever means I can	.706		
10	I stay in a highway lane that I know will be closed until the last minute before forcing my way into the other lane	.705		
2	I cross a junction knowing that the traffic lights have already turned red	.699		
4	I disregard the speed limits on a highway	.699		
1	I drive especially close to the car in front as a signal to its driver to go faster or get out of the way	.695		
9	I sound my horn to indicate my annoyance to another driver	.612		
6	I become impatient with a slow driver in the right lane and overtake on the left lane	.493		
12	I miss 'give way' sign and narrowly avoid colliding with traffic having right of way		.767	
11	I attempt to overtake someone that I had noticed to be signalling a left/right turn		.745	
16	I underestimate the speed of an incoming vehicle when overtaking		.735	
13	I fail to notice that pedestrians are crossing when turning into a side street from a main road		.692	
14	Queuing to turn right/left onto a main road, I pay such a close attention to the mainstream traffic that I nearly hit the car in front		.665	
15	I fail to check my rear view before pulling out or changing lanes		.654	
17	I apply sudden brakes on a slippery road or steer wrong way in a skid		.648	
24	Intending to drive to destination A, I 'wake up' finding myself in destination B because the latter is my more usual destination			.762
25	I realise that I have no clear recollection of the road along which I have been travelling			.757
23	I switch on one thing such as headlights when I meant to switch on something else such as wipers			.749
20	I forget where I left my car in the car park			.726
18	I get into the wrong lane when approaching a roundabout or a junction			.604
19	I misread the traffic signs and exit from the roundabout on the wrong road			.598
21	I hit something when reversing that I had not			.556

	previously seen			
22	I attempt to drive away from the traffic lights			.415
	Variance Explained	22.73	19.41	17.61

F1=Violations, F2=Errors, F3=Lapses

The PCA revealed a three-factor structure containing two factors explained by both error and lapse items and a single factor containing violations. Although this analysis supported the three-factor structure of the original DBQ (Reason et al., 1990), there were studies which found a four-factor structure. The main distinction was found in the 'violations' category which was classified further into aggressive and ordinary violations (Martinussen, 2013). Cronbach alpha's reliability coefficients were also calculated for the three constructs; violations, errors, and lapses, and all were found to be above the threshold level of 0.70 (Hair et al., 2010) with violations (α = .844), errors (α =.7810, and lapses (α =.764).

Table 2: Mean Scores for Driving Behaviour

No.	Statement	Mean	SD
	Violations	**2.08**	**.799**
1.	I drive especially close to the car in front as a signal to its driver to go faster or get out of the way	2.25	1.178
2.	I cross a junction knowing that the traffic lights have already turned red	1.76	1.005
3.	I disregard the speed limits on a residential road	1.89	1.022
4.	I disregard the speed limits on a highway	2.24	1.108
5.	I have an aversion to a particular type of a driver and indicate my hostility by whatever means I can	2.17	1.142
6.	I become impatient with a slow driver in the right lane and overtake on the left lane	2.82	1.254
7.	I get involved with 'races' with other drivers	1.74	1.059
8.	I become angered by another driver and give chase	1.84	1.018
9.	I sound my car horn to indicate my annoyance to another driver	2.24	1.149
10.	I stay in a highway lane that I know will be closed until the last minute before forcing my way into the other lane	1.86	.988
	Errors	**1.92**	**.785**
11.	I attempt to overtake someone that I had not noticed to be signalling a left/right turn	1.96	1.032
12.	I miss the 'give way' sign and narrowly avoid colliding with traffic having right of way	1.89	.972
13.	I fail to notice that pedestrians are crossing when turning into a side street from a main road	1.86	.931
14.	Queuing to turn right/left onto a main road, I pay such a close attention to the mainstream traffic that I nearly hit the car in front	2.06	1.030
15.	I fail to check my rear view mirror before pulling out or changing lanes	1.84	.944
16.	I underestimate the speed of an incoming vehicle when overtaking	1.96	.955
17.	I apply sudden brakes on a slippery road or steer wrong way in a skid	1.87	.940
	Lapses	**2.17**	**.748**
18.	I get into the wrong lane when approaching a roundabout or a junction	1.96	.961
19.	I misread the traffic signs and exit from the roundabout on the wrong road	1.95	.926
20.	I forget where I left my car in the park	2.30	1.154
21.	I hit something when reversing that I had not previously seen	1.87	.874
22.	I attempt to drive away from the traffic lights	2.53	1.043
23.	I switch on one thing such as headlights when I meant to switch on something else such as wipers	2.22	1.072
24.	Intending to drive to destination A, I 'wake up' finding myself in destination B because the latter is my more usual destination	2.18	1.025
25.	I realize that I have no clear recollection of the road along which I have	2.38	1.106

	been traveling

The descriptive findings revealed that five (5) of the most frequently occurring behaviours (between occasionally '2' and quite often '3') came from the driving behaviours classified as violations (Reason et al., 1990) (See Table 2). "I become impatient with the slow driver in the right lane and overtake on the left lane" scored a mean of 2.82 (SD=1.254) followed by "I drive especially close to the car in front as a signal to its driver to go faster or get out of the way" (M=2.25, SD=1.178), "I disregard the speed limits on a highway" (M=2.24, SD=1.108), "I sound my horn to indicate my annoyance to another driver" (M=2.24, SD=1.149), and "I have an aversion to a particular type of a driver and indicate my hostility by whatever means I can" (M=2.17, SD=1.142). Only one with relative high score for frequently driving behaviour came from the errors category. Error is the failure of planned actions to achieve their intended consequences (Reason et al, 1990). "Queuing to turn right/left onto the main road, I pay such a close attention to the mainstream traffic that I nearly hit the car in front" came with a mean score of 2.06 and standard deviation (SD) of 1.030. Both violations and errors are potentially dangerous and have been reported to predict involvement in active accidents, though violations have been mainly related to crash involvement (Parker et al, 2000).

Among the 'lapse' category, five (5) most frequently occurring driving behaviours were "I attempt to drive away from the traffic lights" with mean score of 2.53 and standard deviation (SD) of 1.043 followed by "I realize that I have no recollection of the road along which I have been traveling" (M=2.38, SD=1.106), "I forget where I left my car in the park" (M=2.30, SD=1.154), "I switch on one thing such as headlights when I meant to switch on something else such as wipers" (M=2.22, SD=1.072), and "Intending to drive to destination A, I wake up finding myself in destination B because the latter is my more usual destination" (M=2.18, SD=1.025). Lapses are unintended behaviour because of attention and memory failures. These can cause embarrassment but are not associated with active accident involvement (Reason et al., 1990; Parker et al., 2000).

4. CONCLUSIONS

This study tested the Driving Behaviour Questionnaire on Malaysia drivers by means of factor analysis. It revealed the three-factor of driving behaviour as violations, errors, and lapses. These findings are in agreement with previous researchers (Sucha et al, 2014; Reason et al., 1990; Bener et al, 2016) but contradicted with some other studies (Niezgoda et al., 2013; Martinussen, 2013; Lajunen et al., 2004). This confirms the validity and reliability of DBQ which supports further use of the instrument. Meanwhile, descriptive analysis on the driving behaviour revealed high mean scores came from 'violations' which shows Malaysian drivers committed intended acts that are potentially dangerous and that lead to collisions. Road accidents are predictable and preventable, and therefore authorities must double the effort to further raise public awareness on the importance of adopting safety driving behaviour.

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