ORIGINAL ARTICLE

THE CROSS CULTURAL STUDY ON DRIVING BEHAVIOUR OF MALAYSIAN AGEING AUTOMOBILE DRIVERS

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ABSTRACT

This study focuses on the application of the Malaysian Driving Behaviour Questionnaire(DBQ). The aim of this study is to investigate and analyse the significant driving behaviour of the ageing Malaysian automobile drivers. The sets of questionnaire was completed by a total number of 102 ageing drivers consists of 58 males (56.86%) and 44 females (43.14%). The age of respondents ranges from 50 to 75 years (M = 57.21) and (SD = 5.60). The DBQ contains 12 items of demographic questions and 41 items measuring driving behaviour in traffic. The driving behaviours were classified into four factors which are driving distractions, violations, errors and lapses. The most significant correlation coefficient is between age and distractions ($r = 0.456$, $p<0.01$), then followed by lapses, violations and errors. Meanwhile, the correlation between age and error shows the least correlation among all factors ($r = 0.229$, $p<0.05$). This proves that with slightly occurring signs of visual, hearing and cognitive deterioration, the drivers focused and committed with their driving task to overcome the distractions. In addition, ageing drivers were obedient and alert to ensure their safety throughout their driving task.

***Keywords**: Driving behaviour, distractions, violations, errors, lapses*

INTRODUCTION

Malaysia is a developing country with a vast number of citizens. As stated by the Department of Statistics Malaysia, total Malaysian population comprises of about approximately 29.95 million citizens, with 18% of ageing citizens aged over 50 years old[1]. From the total figure, Selangor state comprises of 19% of the total number being the highest percentage of the Malaysian population. The number of 5.79 million citizens includes 23% of Selangor ageing citizens[1].It is clearly seen that this rapid growing population has brought significant socio-economic and demographic transformations caused by the increasing survival of populations to longer life.Hence, as the elderly population increases, number of ageing drivers is predicted to be risen in the upcoming years. This is due to their active lifestyle and daily activity.
Nowadays, many of the elderly decided to continue working after their retirement rather thanstaying at home. Theextension of their working tenure requires workingelderly to drive to their workplace. However they are retirees whostill preferto driveaspartof their daily routine.

Consequently, the share of older drivers in the driver population will grow based on the increment of licensing rates among the ageing population.

Even though majority of the ageing drivers are good drivers but sometimes a driver's health or physical limitations can affect their safe operation of an automobile. The physical and physiological deterioration, as a part of ageing process can affect a driver's ability to sense, decide and act which are all critical skills needed for a safe driving. Furthermore, as one grows older, the biological abilities such as vision, hearing, cognitive and psychomotorability are expected to decrease[2].

The degradation of their abilities could influence the results of daily activities performance especially while driving. As one ages, visual procession ability decreases, glare problem increases, and the increasing difficulty to capture the object motion. The coordination and movements of the arms, hand and neck will also become inflexible. With regards to on-road performance, older drivers need more information processingtime as their cognitive ability is on thedecline. Previous studies also found that age-related decline in vision, cognitive, perceptual, and physical abilitiesare Most of the traffic crashes result from driver malfunctioning rather than from a technical failure of the vehicle themselves. Thus, previous researches emphasizes on the relationship between the human factor and driving behaviour. One of the most theoretical taxonomy of aberrant driving behaviours has been developed in the United Kingdom. Previous researcher distinguishes between two empirically different classes of behaviour, namely errors and violations[3]. Errors were defined as the failure of planned actions to achieve their intended consequences, while violations were defined as the deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system.Aggressive violations contain interpersonally aggressive components whereas

ordinary violations are deliberate deviations from safe driving without a specifically aggressive aim[3].Moreover, the taxonomy evolved over time. Upon revision a third factor was established, which was labelled as lapses. This factor includes attention and memory failures, which may cause embarrassment but are likely to have an impact driving safety. Since errors and violations were resulted from different psychological processes, they should be treated differently[6].

Apparently, in the Driving Behaviour Questionnaire (DBQ) literature, mainly violations and obviously not errors and lapses have been related to crash involvement. It was observed that among ageing drivers, however, relatively high error and lapse scores have been reported to predict involvement in an active accident, while passive accident involvement has been associated with high scores on the lapse factors[4].

The Malaysian Driving Behaviour Questionnaire (DBQ) adapted in this study is the instrument which derived from the theoretical taxonomy mentioned earlier[3].The universal and widely use of the DBQ in research has extended far beyond the borders of its origin which is United Kingdom[5,6,7,8,9]. Since its development, the DBQ has been applied in various researches regarding risky and aggressive driving and also road accidents. Along with the taxonomy development, several versions of the DBQ were created, varying the number of factors as well as the number of items. It can be concluded that various versions of the DBQ, different sampling strategies and different target populations all undermine the ease with which cross-cultural comparisons of the DBQ factor structure can be made. Thus, the aim of this study is to investigate and analyse the significant driving behaviour of the ageing automobile drivers in Malaysia.

METHODS

Participants

The total sample of102respondents from Selangor ageing drivers consists of 58 males (56.86%) and 44 females (43.14%). Their age ranges from 50 to 70 years (M = 57.21 and SD = 5.99). The respondents were ageing Malaysian automobile drivers who volunteered to take part in this study.

Procedure

The participants completed the Malaysian Driving Behaviour Questionnaire (DBQ) andself-reported the most relevant experienced traffic situations during completing the questionnaire.

Measures

i) Demographic and Exposure Measures

Respondents answered 12 items of demographic questions about their age, sex, educational background, driving experience, routine and also general driving knowledge.

ii) Driver Behaviour Questionnaire (DBQ)

In the present study, the extended Driver Behaviour Questionnaire[5,6,7,8,9] was translated into Malaysian national language. A number of 7 items of violations, 8 items of errors, 8 items of lapses were included. In addition, 18 items of distraction elements were embedded in the questionnaire as an alternative to driving behaviour factors. The items were adapted from National Survey on Distracted Driving Attitudes and Behaviours (2012) which was established by National Highway Traffic Safety Administration of Washington DC[10].

Respondents were asked to indicate how often they themselves possessed those behaviours while driving. Responses were recorded on a five pointLikert scale from *Never* to *Nearly all the time*.

RESULTS AND DISCUSSION

The main findings of this study were categorized into demographics and driving behaviour. The demographic characteristics of the respondents were statistically summarized in Table 1.The total sample of n = 102consists of 58 males (56.86%) and 44 females (43.14%). The age of respondents ranges from 50 to 70 years (M = 57.21) and (SD = 5.99), while their mean of driving experience were (M = 18.30) years with (SD = 4.49). There were 12 items of demographic characteristic investigated in this DBQ.

Table 1 - Demographic characteristics of the drivers grouped by age

Demographic Items		Age group (Years)			
		50-54	55-59	60-64	65-69
Highest education level	Primary school	0	0	0	0
	Secondary school	7	4	9	0
	Certificate	0	0	6	0
	Diploma	7	0	8	2
	Bachelor degree	2	1	4	4
	Master	9	0	0	20
	PhD	9	10	0	0
Years of driving experience	Less than 1	1	0	0	0
	6-10	3	0	0	0
	11-15	12	0	1	0
	16-20	8	0	6	2
	21 and above	10	15	20	24
Employment	Working	29	14	5	24
	Pensioner	1	1	22	2
	Others	4	0	0	0
Driver category	Personal driver	33	15	27	26
	Occupational driver	1	0	0	0
Driving frequency	Everyday	30	15	4	26
	Almost everyday	2	0	22	0
	Few days a week	0	0	1	0
	Few days a month	2	0	0	0
Most frequent driving destination	Workplace	27	14	5	24
	Mosque	1	0	14	0
	To buy groceries	5	1	8	0
	Leisure	0	0	0	2
	Long distance	1	0	0	0
Vehicle type	Compact car	8	1	0	0
	Sedan	21	4	22	26
	Multi-Purpose Vehicle	4	5	5	0
	Sport Utility Vehicle	0	5	0	0
	Pickup truck	1	0	0	0
Wear seatbelt while driving	All the time	26	13	5	26
	Almost	5	2	8	0
	Sometimes	3	0	14	0
Accident involvement	Yes	15	5	0	6
	Nearly	8	6	1	14
	No	11	4	26	6
If yes, the cause of accident	Distracted	2	5	1	0
	Fatigue	4	1	0	0
	Weather conditions	3	0	0	0
	Others	14	5	0	20

The driving behaviours were investigated in 41 items of the DBQ. Means and standard deviation for all items of the original scale were listed in Table 2(a) and Table 2(b). The most frequently reported item was errors, where the drivers claimed that they often check rear view mirror before pulling out and changing lanes, etc. (M = 4.66). While at the other end of the scale, the least frequently reported item was distractions, which is answering phone call by squeezing the phone between ear and shoulder(M = 1.54).

Table 2(a) - Means and standard deviations of all DBQ items

No	Items	Mean	Standard Deviation
	A. Distractions		
a1	I was very focused on my driving and ignore what is happening in the outside environment.	3.71	1.10
a2	I do not use a mobile phone to make or receive calls, texting and other applications.	2.69	1.32
a3	I chat and interact with passengers and children are in the vehicle.	3.76	1.35
a4	I do not like to eat and drink while driving.	2.62	1.39
a5	I do not switch on the radio, CD or cassette by myself while driving.	2.70	1.34
a6	I dress up, wear makeup, combing hair and glasses while driving.	1.63	0.76
a7	I do not read books, newspapers, iPad or other documents while driving.	2.63	1.88
	I receive phone calls while driving by :		
a8	Hold using my hands.	2.74	1.18
a9	Use hands free.	1.93	1.09
a10	Squeeze the phone between my ear and shoulder.	1.54	0.93
a11	Using loudspeaker in mobile phone.	2.49	1.33
a12	No difference.	2.52	1.21
a13	Drive slowly.	2.78	1.29
a14	Lane changing more frequently.	2.18	1.31
a15	Increasing the distance from the leading vehicle.	3.48	1.29
a16	More often signalled when to turn (turn signal)	3.62	1.32
a17	Tend to brake suddenly.	2.41	1.18
a18	Look back or side mirror more frequently.	3.72	1.18
	B. Violations		
	How often do you		
b1	Obey the speed limit in a residential area road.	4.22	0.99
b2	Sound your horn to indicate your annoyance to another road user.	4.09	1.03
b3	Become angered by a certain type of a driver and indicate your hostility by whatever means you can.	2.30	0.97
b4	Do not use the left-hand path to overtake slow drivers.	3.29	1.47
b5	Pull out of a junction so far that the driver with right of way has to stop and let you out.	4.02	1.23
b6	While turning, you tend to stay on the main lane and finally overtake another vehicle to enter the intersection.	3.13	1.43
b7	Make a distance from the leading vehicle so it is not difficult to stop when in an emergency.	3.88	1.20

Table 2(b) - Means and standard deviations of all DBQ items

No	Items	Mean	Standard Deviation
	C. Errors		
	How often do you		
c1	Check your rear view mirror before pulling out, changing lanes, etc.	4.66	0.67
c2	Check your rear view mirror before pulling out and U turn etc.	4.65	0.74
c3	Fail to notice that the pedestrians are crossing when turning into a side street from a main road.	1.84	0.64
c4	On turning right nearly hit a cyclist who has come up from opposite side.	1.65	0.91
c5	On turning left nearly hit a cyclist who has come up from the same side.	1.86	0.83
c6	Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front of you.	2.22	1.18
c7	Attempt to overtake someone that you had not noticed to be signalling a right turn.	1.84	1.02
c8	Underestimate the speed of an oncoming vehicle when overtaking.	1.59	0.94
	D. Lapses		
	How often do you		
d1	Realize that you have no clear recollection of the road along which you have just been travelling.	2.08	0.85
d2	Switch one thing, such as the headlights, when you meant to switch on something else, such as the wipers.	2.05	0.91
d3	Press the brake pedal on a regular basis because concerned over the rate of up to hit the vehicle in front.	2.52	1.09
d4	Intending to drive to destination A, you “wake up” to find yourself on the road to destination B.	2.09	0.74
d5	Hit something when reversing that you had not previously seen.	2.08	0.82
d6	Get into the wrong lane approaching a roundabout or a junction.	2.44	1.04
d7	Misread the signs and exit from a roundabout on the wrong road.	2.53	0.85
d8	Attempt to drive away from the traffic lights in third gear.	2.85	0.87

The psychometric information about the four scales is shown in Table 3. This presents the means, standard deviations, skewness, kurtosis and also Cronbach’s alpha coefficients for the four factors of the DBQ scales. It can be clearly seen that violations factor scores the highest mean and standard deviation (M = 3.562 and SD = 0.62) while the least score was lapses (M=2.330 and SD = 0.57).

As stated in Table 3, all results were positively skewed, except for distractions factor which shows negative skewness which scores -0.05 while the only positive kurtosis was errors which scores 2.05. However, based on the skewness and kurtosis values, the whole results were normally distributed.

The four scales had strong internal consistency with Cronbach alpha statistics over 0.70 in all cases except for violations factor which scores 0.535. This indicates that violations items might be moderately related to all other items and to the total internal coherence of the whole four factors of the surveyed driving behaviour data.

Table 4 presents the inter-correlation matrix among the drivers’ age and the DBQ scales of four factors of driving behaviour namely driving distractions, violations, errors and lapses. As tabulated, a number of significant correlations emerged. It shows that the most significant correlation coefficient is between age and distractions ($r = 0.456$, $p<0.01$), then followed by lapses, violations and errors.

Table 3 - Means, standard deviations, skewness, kurtosis and Cronbach's alpha coefficients for the DBQ scales

Scale	Mean	Standard Deviation	Skewness	Kurtosis	Cronbach's alpha
Distractions	2.730	0.59	-0.05	-0.29	0.785
Violations	3.562	0.62	0.13	-0.25	0.535
Errors	2.538	0.52	1.38	2.05	0.730
Lapses	2.330	0.57	0.74	-0.31	0.785

Table 4 - Correlationsamong age and the four factors of driving behaviour

	Age	Distractions	Violations	Errors	Lapses
Age	1.000	-0.456**	0.348**	0.229*	-0.388**
Distractions	0.456**	1.000	0.086	0.067	0.345**
Violations	0.348**	0.086	1.000	0.172	-0.308**
Errors	0.229*	0.067	0.172	1.000	0.281**
Lapses	0.388**	0.345**	-0.308**	0.281**	1.000

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Furthermore, as stated clearly in Table 4, the correlation coefficient between age and distraction is positively correlated, indicating that ageing drivers tend to be more easily get distracted proportionately with the increasing age. There are 18 items of the distractions factors were surveyed. It was self-reported by the drivers that the main distraction is receiving phone call while driving. As a result, they tend to drive slowly while on calls ($r = 0.576$, $p<0.01$). Majority of the ageing drivers answered their phone calls by using loudspeaker from their mobile phone ($r= 0.455$, $p<0.01$). Consequently, they prefer to focus on driving and avoid lane changing ($r= 0.019$) which is not significant at ($p<0.05$). This strengthen the finding in previous research indicated that general or specific lack of attention increased with age of the driver[11]. With the slightly occurring signs of visual, hearing and cognitive deterioration, the drivers focused and committed with their driving task to overcome the distractions.

Meanwhile, the correlation between age and error shows the least correlation among all factors ($r= 0.229$, $p<0.05$). There are two out of eight items in errors were significantly correlated. The most significant correlation was for item c6, 'Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front of you' ($r = 0.393$, $p<0.01$). While the least correlation coefficient was c3, 'On turning right nearly hit a cyclist who has come up from opposite side' ($r= 0.090$) which is not significant at ($p<0.05$). This shows that the ageing drivers were obedient and alert to ensure their safety throughout their driving task.

Previously it was stated in past research that driving is not really a single activity, but rather the concatenation of several different cognitive, perceptual, motor, and other processes. Particular personality traits might influence some but not all of those processes, and therefore might influence some aspects of risky driving, but not all[12].Moreover, Santos et al.[13] found that in older adults, the time spent in moderate-to-vigorous physical activity was positively associated with functional fitness, independently of sedentary behaviour, gender, age and accelerometer register time.

Hence, development of policies and programs that target driving safety in older adults may play a role in driving behaviour among ageing driver, and that reduction of risk-taking while driving could contribute to improved safety on the road

CONCLUSION

The cross-cultural version of the Driving Behaviour Questionnaire is a valid and reliable tool for assessing the driving behaviour of the ageing drivers in Malaysia. Four factors of driving behaviour are driving distractions, violations, errors and lapses. The most significant correlation coefficient is between age and distractions ($r = 0.456$, $p<0.01$), then followed by lapses, violations and errors. The main distraction is receiving phone call while driving. They tend to drive slowly while on calls ($r = 0.576$, $p<0.01$) and answered their phone calls by using loudspeaker from their mobile phone ($r= 0.455$, $p<0.01$). Due to their occurring sign of visual, hearing and cognitive deterioration, the ageing drivers focused and committed with their driving task to overcome the distractions. Meanwhile, the correlation between age and error shows the least correlation among all

factors ($r = 0.229$, $p<0.05$). This shows that the ageing drivers were obedient and alert to ensure their performance and safety throughout their driving task.

ABBREVIATIONS

DBQ-Driving Behaviour Questionnaire, M-Mean, SD-Standard Deviation

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COMPETING INTERESTS

There is no conflict of interest.

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