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Self-reported dimensions of aberrant behaviours among drivers in Pakistan

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Consent

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ABSTRACT

This paper has explored aberrant behaviours of drivers in Pakistan with the help of modified Manchester Driver Behaviour Questionnaire (DBQ). Principal component analysis with promax rotation reveals that the drivers have four discrete behavioural dimensions including intimidating behaviours, being above the rules, risk-prone infringements, and assertiveness. Further, univariate descriptives indicate that Pakistani drivers tend to engage in risky overtaking and close following more than drunk driving or speeding. The results also demonstrate that the behaviours of drivers in Pakistan are attributable to their personal characteristics and being young, affluent or separated/divorced can negatively influence them.

Keywords: Pakistan, Driving Behaviour, DBQ, Developing Countries,

1 INTRODUCTION

Road traffic accidents (RTA) are attributed to many factors including road, vehicle and human factors. These contributory factors combine in a way that leads to a road user failing to cope in a particular situation (Casbard and Accidents 2003). Professional literature generally agrees that human factors are one of the most dominant factors in understanding the chain of events leading to an accident and indicates driver malfunctioning as the prime contributory factor in road accidents (e.g. Christ *et al.* 2004; GRSP 2011). Among human factors, as reported by Evans (1996), driver behaviour (what the driver chooses to do) has much greater influence on safety than driver's performance (what the driver can do). For developing countries, such as Pakistan, road user error is identified as main cause in at least 70% of the road accidents (Jacobs *et al.* 1981; Jacobs and Sayer 1984). The literature demonstrates

that among different types of aberrant behaviours, violations are the most crucial component in accidents that cause definite risk to other road users. A *violation* is defined as the deliberate infringement of some regulated or socially accepted code of behaviour (Parker *et al.* 1995). It is also termed as infringement of traffic rules (Biecheler-Fretel and Moget-Monseur 1984) or as actual traffic offence conviction in some studies (Peck *et al.* 1971). Stradling and Meadows (2000), in their self-reported study of aberrant driving behaviours found that drivers who had high violation score were more involved in accidents in the past and were more likely to be involved again in future. They said high violators are not only more likely to run into others or to run off the road (active accidents), but to put themselves in situations where others run into them (passive accidents). They called violating drivers as '*crash magnets'* who are more likely to be involved in both active and passive types of crashes. The acts such as speeding, drink driving and non-use of seat belts are considered to be particularly dangerous set of violations in a number of studies (e.g. Reason 1990; Parker *et al.* 1995; Stradling and Meadows 2000). Parker (2004) further propagates that violations are the behaviours that drivers must be dissuaded from committing.

Although, the seriousness of the consequences of violations on the status of road safety is evident and numerous studies and organizational practices around the world have developed extensive information on road crashes, their frequency and rate, and contributing factors. For developing countries, as reported by UNECE (2008, p. 98), *road traffic violations (RTVs),* the dangerous situations that precede a crash—which may result in a crash or near-miss unsafe condition and contribute to poor road user culture— are not scientifically studied. For instance, in Pakistan, the world's sixth most populous country with an estimated population of over 170 million (Government of Pakistan 2011), much less is known about drivers' behaviour.

Although, the fatality rate on the country's road network remains among the highest in the world at around 5565 fatalities per year (over 30 accidents per 10,000 registered vehicles). This is considerably above the countries with the lowest number of fatalities such as the UK (3298 reported fatalities per year); despite the fact that Pakistan is six times less motorised than the UK (WHO 2009, pp. 162-215). Although, drivers are majorly held responsible for RTAs in the country however; due to paucity of research work and empirical evidences, it remains difficult to understand the underlying factors which provoke deviant driving styles. The lack of such understanding is attributable to the difficulty of designing and implementing behaviour changing interventions in Pakistan; as over the years, it has been established that changes in driver behaviour offer the largest opportunities for harm reduction. This also exacerbates the difficulties in achieving sustainable results through on-going road safety campaigns and projects at local levels. Usually, the deliberate infringement of traffic laws, physically or mentally incapacitated drivers under the influence of alcohol and other intoxicating drugs, driving without license and impoliteness, rude gestures and cursing are considered to be the most frequently occurring aberrant behaviours in the country (Dogar 2008). For Lahore, the second most populated city of Pakistan and fortieth of the world (World's Largest Cities 2011), 2010s statistics revealed that 332 people lost their lives while 27,264 were injured in less than a year due to careless driving, speeding or wrong-turns. The National Injury Survey of Pakistan (NISP) reports that most injuries in the country occurred to persons aged between 16 and 45 years (Ghaffar *et al.* 2004, p. 213). RTA also disproportionately affects the poorer class of Pakistani society and pushes many families further into poverty by the loss of their breadwinners. The economic losses for the country are estimated at over 2% of gross domestic product (ADB 2007).

Considering the gravity of the situation, the present study had been carried out to understand the pre-crash phenomenon while focusing on human side of accidents. With the help of Driver Behaviour Questionnaire (DBQ), it had subjectively investigated the aberrant behaviours of drivers in the country within the context of road traffic violations. Originally, the questionnaire was developed by Reason *et al.* (1990) using Reason's theory of error and violation (for details, see Reason 1990). It is a 50-item questionnaire which measures aberrant driving behaviours in three subscales: slips and lapses, mistakes and violations (Reason *et al.* 1990). The review of literature demonstrates that the questionnaire is one of the most widely used and reliable measures of behaviours (e.g. Lawton *et al.* 1997; Lajunen *et al.* 2004; Eugenia *et al.* 2006; Özkan *et al.* 2006). It has been applied in number of countries including Finland, UK, Greece, Iran, The Netherlands, Turkey (Özkan *et al.* 2006), Spain (Eugenia *et al.* 2006), and China (Xie and Parker 2002). For the present study, the modified version of violation-items based DBQ, devised by Lawton *et al.* (1997) was used with the inclusion of Pakistan’s specific behavioural items.

Subsequently, the study also attempted to look at the causal link between personal characteristics and aberrant behaviours. It was hypothesised that drivers’ behaviours were attributable to their personal characteristics. As, according to Reason (1990), occurrence of unsafe acts is preconditioned to three categories: conditions of other road users, environmental factors and personnel factors. The literature argues that road safety is a social problem and personal factors play a vital role in guiding and shaping of drivers behaviours. Research work in psychological sciences has found its close association with individuals’ socio-economic and demographic characteristics. The variables such as age, gender and exposure are all known to be correlated with accident involvement (e.g. Rothengatter 1997; Ward and Lancaster 2003; Iversen and

Rundmo 2004). It has been noted that high rate of road traffic violations is significantly associated with those drivers who are young, male and have high annual mileage i.e. exposure (e.g. Parker *et al.* 1995; Hennessy and Wiesenthal 2005). Therefore, this paper also explores the influences of personal characteristics (socio-economic and demographic characteristics) on law violating behaviour of drivers in Pakistan.

2 AIMS

To summarise, the principle aims of this study were (1) to contribute to an understanding of road safety profile of Pakistan by determining the types of aberrant behaviours exercised by drivers in the country, and (2) to explore influence of personal characteristics on drivers' behaviours.

3 METHOD

3.1 Study Design

In order to recruit participants for the study, a quota sampling procedure had been adopted. In quota sampling, the population is stratified according to particular categories relevant to the research; a number to be selected from each stratum is decided, reflecting the relative proportion of each group to the whole population, and field workers are sent into the streets to fulfil their quota (McQueen and Knussen 2006). A pre-test study exercise was also carried out to assess the efficacy and design of the questionnaire. The testing on a sample of twenty drivers helped; (1) to identify potential problems stemming from the planned data collection procedure, and (2) to couch DBQ questions in a language understandable and relevant to the potential participants. The feedback received was then applied on the final version of the questionnaire to make it suitable for the general population. The study was conducted

in Urdu language[1] and recruited drivers from different densely populated locations of Lahore, Pakistan.

3.2 Participants

In total, 438 participants took part in the study. The major groups covered in the survey were professional drivers[2], business and leisure commuters, youngsters (aged ≤ 19 years), housewives and elderly people (aged 55+). The categorisation was meant (1) to fairly represent the diverse driving population of Lahore, and (2) to examine the extent of behavioural differences within substrata of the society without restricting it with respect to socio-demographic composition. The required sample was achieved by adopting an on-street intercept technique where target groups of drivers were approached at business and shopping centres, universities, public transport stations and in residential areas. The refusal rate was not quantified but overall it was noted to be high among businessmen and very low among public transport drivers.

3.3 The extended DBQ

As mentioned above, the 12-item violations based modified version of the DBQ (taken from Lawton *et al.* 1997) was used to measure behaviours of drivers in Pakistan. The questionnaire was further adapted based on the insight of an earlier qualitative study, carried out on road safety issues of Pakistan (for details refer, Batool *et al.* 2011). With the incorporation of local, Pakistan's specific factors, a 29-item extended version of DBQ was developed. The questions could logically be divided into Highway Code violations and aggressive violations, mainly tapping behaviours related to speeding, close-following, drink and drug driving, overtaking, driving distraction, use of seatbelt/helmet, vehicle fitness. Participants were asked to indicate how frequently they got engaged in performing behaviours mentioned in the

questionnaire by rating on a six point scale with endpoints *never* (0) and *nearly all the time* (6). The higher scores on any item indicated high aberrant behaviours.

3.4 Socio-demographic measures

The questionnaire also collected information related to socio-economic and demographic characteristics of participants such as: age, gender, and income. It also recorded some other driving related information of the participants including number of years driving license had been held, weekly mileage, frequency of accidents and near misses in last six months.

4 ANALYSES

4.1 Sample characteristics

The univariate descriptive analysis revealed the socio-demographic composition of the study's sample. It was predominantly composed of young age group drivers (up to 34 years); 76.9%, and had car drivers 40%, motorcyclists 40.7%, and professional drivers 19.2%. Females were under-representative in the sample (13.6%) which could be due to an overall less number of female drivers in the country. Middle-income and high-income groups drivers were almost in equal proportion in the sample (22.7% and 22% respectively), and those from low-income group were in slightly higher percentage (37.6%). The study also recorded information about participants' marital status and noted that more than half of the sample was single (56%), 40 % was married and 1.9% was separated or divorced. On average, participants held a driving license for 8.43 years and had a weekly annual mileage of 363.47km. The average near-misses and accidents for the drivers was 2.72 and 1.98 respectively. Whereas, only half of the sample population had passed the driving test and equally was holding a valid driver's license.

4.2 Principal Component Analysis with Promax Rotation

In order to examine the behavioural dimensions of the sample population, the DBQ data was subjected to Principal Component analysis (PCA). PCA, also known as component analysis, is a method in which linear combinations of the observed variables are formed, known as components or factors (Norušis 2008, p. 398). The reasons of adopting PCA for factor extraction are (1) its ability to summarise most of the original information (variance) in a minimum number of factors for prediction purposes (Hair *et al.* 2006), and (2) it makes no assumptions concerning an underlying causal structure that is responsible for co-variation in the data (Hatcher 2003). As the underlying dimensions of behavioural items were unknown in the present case, the PCA was considered to be the best suited approach. However, before running the analysis, the behavioural data was screened by applying different quality checks. The data validation helped to identify invalid or duplicate cases, incorrectly entered data and outliers, and reduced the sample size from 438 to 428. After screening, the suitability of running PCA on the data was checked on two parameters; Kaiser-Meyer Olkin measure of sampling adequacy (KMO) and Bartlett's Test of Sphericity (BTS)[3]. The overall KMO ratio of 0.928 came up for attitudinal data which indicated a sampling adequacy to proceed with the analysis. Likewise, BTS result was also significant for the data (2953.855, $p<.000$). Thus, after successfully meeting prerequisites, the data was subjected to factor analysed. The analysis generated five-factors with eigenvalue greater than 1 and noted high inter-correlation between the first four factors (> 0.30). This favoured non-orthogonal (oblimin) rotation which was needed to simplify factors structure for interpretation. Factor rotation is a procedure in which factor axes are rotated so that variables have large correlations with a small numbers of factors. It tries to make large loadings

larger and small loadings smaller to make the factors easier to interpret (Norušis 2008, p. 410). Thus, the analysis was re-run with promax rotation (a type of oblimin rotation).The scree plot suggested three-factor solution reasonable for the data set. Whilst, based on common rule of thumb of each factor having at least three variables that load highly on it (Norušis 2008), four-factor solution deemed appropriate to retain. Collectively, these factors explained 51.28% of the total variance. Cronabach's alpha (α) reliability coefficients for the factors exhibited excellent internal consistency (>.70). Table 2 summarises the results of factor analysis. Pearson's bi-variate correlation coefficients (r) for extracted factors and driving related variables including near-misses and accidents were also computed (Table 3).

4.3 Analysis of significant differences

In order to assess the influence of personal characteristics on behaviours of drivers in Pakistan, the mean DBQ scores of different groups were computed. To determine whether the differences in violation scores were significant, analysis techniques such as Two-Independent-samples T-Test (t-test), analysis of variance (ANOVA) and Kruskal-Wallis test had been applied (for the details on analyses, refer Norušis 2008, pp. 127-462).

5. RESULTS

The means (M) and ranking of the violations for drivers in Pakistan are given in following table 1 in descending order. The table also shows violation scores and ranking for the UK driver (taken from Lawton et al. 1997) to make an overall comparison between the two populations.

238 Table 1: Means and standard deviations for DBQ violation items

Violation items sorted in descending Mean score order (type, item number)	PAK Mean (ranking)	UK** Mean (ranking)
How often do you sound your horn to indicate your annoyance to another driver? (AV, 8)	2.35 (1)	2.42 (5)
How often do you overtake a slow driver on the inside? (HCV, 4)	2.32 (2)	2.02 (7)
How often do you speed, blow horn or overtake to get ahead of female drivers? (AV, 13)*	2.04 (3)	-
How often do you manage to drive a vehicle with poor maintenance conditions? (HCV, 29)*	1.94 (4)	-
How often do you pull out of a junction so far that the driver with right of way has to stop and let you out? (AV, 5)	1.93 (5)	2.09 (6)
How often do you stay in a lane that you know will be closed ahead until the last minute before forcing your way into the other lane? (AV, 3)	1.85 (6)	1.89 (8)
How often you do not stop at the stop line? (HCV, 18)*	1.83 (7)	-
How often do you use a hand held mobile phone when you are driving? (HCV, 28)*	1.78 (8)	-
How often do you drive so close to the car in front that it would be difficult to stop in an emergency? (HCV, 7)	1.77 (9)	2.09 (6)
How often do you disregard the speed limit on a residential road? (HCV, 11)	1.76 (10)	3.31 (2)
How often do you cross a junction knowing that the traffic lights have already turned against you? (HCV, 6)	1.75 (11)	2.09 (6)
How often do you use high beam lights during driving at night time in built-up areas? (HCV, 22)*	1.69 (12)	-
How often do you ignore continuous white lines while changing a lane on road? (HCV, 17)*	1.69 (12)	-
How often do you use your status profile or personal connections to get rid of fines, penalties? (HCV, 23)*	1.67 (13)	-
How often do you become angered by a certain type of driver and indicate your hostility by whatever means you can? (AV, 10)	1.64 (14)	2.89 (3)
How often you do not stop at the call of traffic police wardens? (HCV, 24)*	1.63 (15)	-
How often do you park your vehicle in a no parking zone? (HCV, 27)*	1.52 (16)	-
How often do you become angered by another driver and give chase with the intention of giving him/her a piece of your mind? (AV, 1)	1.50 (17)	1.31 (10)
How often do you drive against one-way traffic? (HCV, 26)*	1.46 (18)	-
How often do you race away from traffic lights with the intention of beating the driver next to you? (AV, 9)	1.44(19)	2.43 (4)
How often do you carry goods/articles in your vehicle more than its capacity? (HCV, 21)*	1.38 (20)	-
How often do you disregard the speed limit on a motorway? (HCV, 12)	1.37 (21)	3.41 (1)
How often do you drive with tinted windows glass? (HCV, 25)*	1.36 (22)	-
How often do you drive when you suspect you might be over the legal blood alcohol limit? (HCV, 2)	.81 (23)	1.32 (9)

239 Note: AV =aggressive violations; HCV=Highway Code violations; * = newly included items related
240 to Pakistan, ** the results for the UK drivers has been taken from Lawton *et al.* (1997).

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Table 2: Dimensions of Pakistani drivers' aberrant behaviours

	Factor loading	% variation	α
Factor 1: Intimidating other road users (B1-INTIMIDATING)		35.5%	.85
How often do you become angered by another driver and give chase with the intention of giving him/her a piece of your mind? (AV, 1)	.517		
How often do you overtake a slow driver on the inside? (HCV, 4)	.728		
How often do you drive so close to the car in front that it would be difficult to stop in emergency? (HCV, 7)	.560		
How often do you race away from lights with the intention of beating the driver next to you? (AV, 9)	.580		
How often do you become angered by a certain type of driver and indicate your hostility by whatever means you can (AV, 10)	.684		
How often do you disregard speed limit on residential road? (HCV, 11)	.772		
How often do you disregard speed limit on a motorway? (HCV, 12)	.467		
How often do you speed, blow horn or overtake to get ahead of female drivers? (AV, 13)*	.712		
Factor 2: Being above the rules (B2-ABOVE RULES)		6.55%	.78
How often do you cross a junction knowing that traffic lights have already turned against you? (HCV,6)	.367		
How often do you use high beam lights during driving at night time in built-up areas? (HCV, 22)*	.362		
How often do you use your status profile or personal connection to get rid of fines, penalties? (HCV, 23)*	.503		
How often do you drive against one-way traffic? (HCV, 26)*	.627		
How often do you park your vehicle in a no parking zone? (HCV, 27)*	.585		
How often do you use a hand held mobile phone when you are driving? (HCV, 28)*	.635		
How often do you manage to drive a vehicle with poor maintenance conditions? (HCV, 29)*	.779		
Factor 3: Risk-prone infringement (B3-INFRINGMENTS)		4.76%	.76
How often do you drive with tinted window glass? (HCV, 25)*	.649		
How often do you drive when you suspect you might be over the legal blood alcohol limit? (HCV, 2)	.757		
How often do you carry goods/articles in your vehicle more than its capacity? (HCV, 21)*	.471		
How often do you not stop at the call of traffic police wardens? (HCV, 24)*	.457		
Factor 4: Assertion: this is my space (B4-ASSERTION)		4.46%	.72
How often do you stay in a lane that you know will be closed ahead until the last minute before forcing your way into the other lane? (AV, 3)	.472		
How often do you pull out of a junction so far that the driver with right of way has to stop and let you out? (AV, 5)	.455		
How often do you sound your horn to indicate your annoyance to another driver (AV, 8)	.424		
How often do you ignore continuous white lines while changing a lane on road? (HCV, 17)*	.637		
How often do you not stop at the stop line? (HCV, 18)*	.817		
Total variance explained (*before rotation*)		**51.27%**	

Note: Extraction method: Principal Component Analysis; Rotation method: Promax with Kaiser Normalisation (rotation converged in 11 iterations).
* indicates newly included items in the DBQ.

Table 2 provides summary of extracted behavioural factors. It shows that first behavioural factor accounted for 35.5% of the total variation (α=.853). It consists of a mix of items related to aggressive and Highway Code violations such that five out of eight items are directly tapping speeding and chasing behaviours of drivers. Therefore, factor is labelled as measuring '*intimidating*' behaviour of the drivers. Second behavioural factor accounted 6.55% of the variation (α=.78) with seven items, all tapping behaviours related to breaking rules and regulations. Therefore, it is labelled as '*being above the rules*'. Third factor composed of four '*risk-prone infringements*' and explained 4.76% of the variation (α=.76). It includes items such as drink driving and overloading. The last factor explained 4.46% of the total variation (α=.72) and its four out of five items measure line/lane changing behaviours of drivers to compete for space on road. Therefore, it is labelled as '*assertion-this is my space'*. In following table 3, the relationships between behavioural factors, near-misses, accidents, and exposure to driving are shown and in table 4 multiple comparisons of the groups on their total DBQ scores is provided.

Table 3: Correlations between behavioural factors and other driving related variables

Variables	B1	B2	B3	B4	DBQ	NM	AC	DT	DM
B1-INTIMIDATING	-	.55**	.50**	.53**	.85**	.25**	.16**	-.15**	-.05
B2-ABOVE RULES		-	.44**	.38**	.76**	.17**	.13*	-.10	-.02
B3-IINFRINGEMENTS			-	.35**	.71**	.08	.08	-.10	-.14**
B4-ASSERTION				-	.69**	.12*	.00	-.08	-.04
Total DBQ score					-	.23**	.15**	-.07	-.09*
NM. Near misses						-	.59**	-.00	.19**
AC. Accidents							-	-.02	.27**
DT. Driving time								-	.15**
DM. Driving mileage									-

Note: Correlation is significant at the * 0.05 level (1-tailed) and at the **0.01 level (1-tailed).

Table 4: Mean scores and significant differences in behaviours of different socio-demographic groups

		Mean DBQ score	Differences between the groups $t/F/X^2$ (df, N), p-value
1. Age	≤ 19	72.04	F (2, 422) = 2.38, p = .03
	19-34	59.41	
	≥ 35	54.23	
2. Income	Lower-income	55.88	F (2, 424) = 2.793, p =.04
	Middle-income	58.00	
	Higher-income	63.99	
3. Gender	Male	60.09	NS
	Female	65.36	
4. Education	Up to intermediate	55.82	NS
	Graduates	61.35	
	Postgraduates	68	
5. Marital status	Single	62.71	X^2 (3, 419) = 10.19, p =.01
	Married	55.36	
	Separated	147.33	
	divorced	86.00	
6. Driving test	Yes	56.19	t (414) = -2.46, p = .01
	No	65.19	
7. License holder	Yes	56.99	t (418) = -1.99, p = .04
	No	64.22	

6. DISCUSSION

6.1 Behavioral dimensions of drivers in Pakistan

The analysis identified four distinct driving dimensions of the sample population including intimidating behaviours (B1), being above the rules (B2), commission of risk-prone infringements (B3), and assertiveness for the space on-roads (B4). Factor structure also confirms the theoretical distinction between aggressive violations (AV) and Highway Code violations (HCV). Lawton *et al.* (1997) has distinguished these two classes of violations using the DBQ and identified behaviours like speeding and running red light falls under the first category whereas sounding one's horn or giving chase to another driver when angered are the type of interpersonal aggressive violations. Straddling and Meadows (2000) further explored the relation between getting angry and these two types of violations. They

demonstrated that the drivers with high rate of scoring in HCV are more likely to get angered when their progress is impeded. However, interpersonally aggressive drivers act on their anger by showing hostility or giving chase or sounding horns. For the present study, B2 and B3 are solely comprised of HCVs whereas, B4 predominantly composed of AV items. However, B1 contains a mix of HCVs and AVs and up to an extent has replicated the Lawton *et al.* (1997) first factor. It is also important to note that HCVs have high loadings on the factors in comparison to AVs and thus, entails the need to be treated exclusively to improve safety on-roads. Furthermore, examination of correlation matrix (table 3) reveals strong positive association among the factors, implicating that the commission of one is most likely to lead to the other. Such that B1, tapping intimidating behaviours of drivers, is the strongest aberrant dimension which significantly result into near misses and accidents. The finding is in agreement with the general road safety literature which states that drivers who commit one type of violations are more likely to commit other types (Stradling and Meadows 2000).

To be specific, Univariate descriptive reveals that Pakistani drivers tend to sound horn (M=2.35) and engage in risky overtaking (M=2.32) quite frequently. They are likely to force their way out (M=1.85) and often disregard stop lines (M=1.83). It can be drawn that drivers in the country are less disciplined. Concomitantly, an earlier study on drivers' behaviours observed relatively high proportions of drivers in Pakistan crossing continuous `no-overtaking` lines *(15* %) and not stopping at stop signs even when traffic was-near (52%) (Downing 1985, cited in Jacobs and Baguley 1995, p. 8). Researchers linked this poor behaviour by drivers in developing countries to their lack of knowledge about road safety rules and regulations or their general attitude towards road safety matters, and emphasise on measures such as stringent enforcement along with running of educational campaigns. For instance, Highway patrolling was found to be quite effective when it was introduced in Pakistan in the early 1980s as it discouraged overtaking and targeted road safety parking,

both of which were known to contribute significantly to road accidents in the country (ADB 1996). Moreover, the use of mobile phone while driving is also found quite high for the drivers (M = 1.78). It is important to note that over the past 20 years, hand-held mobile telephones have emerged as a road safety problem. Research has shown that the reaction time of drivers increases by 0.5 to 1.5 seconds when they are talking on handheld phones. They have difficulty maintaining the correct positions in their lanes, maintaining appropriate speeds and judging and accepting safe gaps in traffic. Some evidences indicate that drivers who use hand-held phones face a risk of crash four times higher than risk faced by other drivers, imperilling themselves and other road users (Peden *et al.* 2004, p. 34). The study has also noted low violation scores for speeding on motorways (M=1.37) and drink driving (M=.81). It should be noted that Pakistan is predominantly a Muslim country and the use of drugs or consumption of alcohol is illegal, strictly prohibited. However, there are evidences which suggest that drugs and especially alcohol is consumed by various sections of the society, most notably by the affluent and the impoverished (Shafiq *et al.* 2006). To add, Batool *et al.* (2011, p. 44) found the use of drugs and alcohol particularly among commercial drivers. Therefore, possibility of drink and drug driving for the country's drivers cannot be ruled-out and the possible explanation of the low responding on the item can be linked to social desirability bias which causes respondents to understate their negative behaviours (West *et al.* 1993; Hatfield *et al.* 2008).

6.2 Applicability and utility of the extended DBQ

The high percentages of variations explained by the extracted factors including internal consistency (>.50) support the use of DBQ as a reliable measure of behaviours, in agreement with previous research work (e.g. by Eugenia *et al.* 2006; Wåhlberg *et al.* 2011**)**. With respect to the inclusion of new seventeen Pakistan's related violation items, twelve successfully came together and mainly constituted factors two and three (with α >.75). The items successfully

indicate two distinct behavioural dimensions of drivers in Pakistan and thus, the initial idea of testing and empirically quantifying different types of aberrant behaviours specific to the country, gets strength. To add, the mean scores of all twelve items are high with two of the items made in the list of top five mostly committed aberrant behaviours (items no. 13 and 29). Therefore, this study justifies the inclusion of this set of new items and promotes its utilisation in the DBQ related future research in Pakistan.

6.3 Comparison with the UK drivers

The study has also attempted to broadly compare the driving population of Pakistan with the UK by taking its scores on DBQ from Lawton *et al* (1997). The differences has been noted between the populations such that the UK drivers are found to engage more in speeding (on motorways and residential zone), aversion; hostility. In contrary, Pakistani drivers most likely to sound horn, do risky overtaking, also intimidate female drivers with risky overtaking or horn blowing, drive vehicle with poor maintenance and likely to pull out of junction. This suggests that drivers in Pakistan have propensity to exhibit aggressive behaviour more than the UK drivers. However, both the groups are comparable in terms of their least reported aberrant behaviours including drink driving, and chasing with anger. In terms of factor structure, only factor one of this study –intimidating other road users- replicated the Lawton *et al.* (1997) first factor up to an extent by loading four of its items in it (4, 9, 11, 12). However, at the same time, the factor contains items which were loaded on Lawton *et al.* (1997) factors two and three (1, 7, and 10). The rest of the items (2, 3, 5, 6, 8) also failed to come together in the similar order as of in Lawton *et al.* (1997) and split in this study. Therefore, it is concluded that the driving behaviours in Pakistan (a developing country) are not very similar to the UK (the developed country). This ascertains the need of doing country specific research to develop better understanding of local behaviours. Although, the lessons can be learnt from experiences of developed world, this study discourages the current practice

of simply transferring the solutions valid for them. This is the issue on which local researchers are already lamenting and of the view that Pakistan transport development has become both ‘resource dependent’ and ‘‘path dependent’’ upon international agencies which have been providing financial and technical assistance throughout the history of nation’ (Imran and Low 2005, cited in Batool *et al.* 2011). Jacobs and Baguley (1995, p. 8) conclude that the effectiveness of transferring some developed country solutions to developing countries is uncertain and their appropriateness needs to be considered in relation to the problems and conditions prevailing in individual countries.

6.4 Influence of personal characteristics

Having established the behavioural characteristics of the population, the study next assessed the influence of socio-demographic characteristics of drivers on their behaviours and explored whether the variation in drivers’ behaviours was attributable to their personal characteristics. Statistically significant differences are noted on variables such as age, income, marital status unlike factors such as gender and education (table 4).

Gender

Although no significant differences have been noted, the total DBQ score for female drivers was more than male drivers. While, conventional literature demonstrates that men commit more violations and women made more errors (Reason et al. 1990; Stradling and Meadows 2000; de Winter et al. 2007). The finding suggests that male and female drivers more or less exhibits similar behaviours on roads in Pakistan and thus, rejects usual perception of females being safer than male drivers. It also supports recent arguments rising within the domain of road safety that the possibility of female drivers being equally or sometimes more dangerous on-roads than male drivers cannot be ruled out (e.g. Bone and Mowen 2006; Gulliver and Begg 2007; Tannert 2009). For instance, Tannert (2011) reports ‘‘it's true that men do take

more risks than women...however; [women] are partaking in more risky behaviours than ever before. The gap is closing quickly''.

Age

The study has noted significant mean differences in DBQ scores of different age groups such that youngsters emerged to be the most dangerous and mature drivers to be the safest. The finding is in agreement with the general literature. For instance, research carried out by Laapotti et al. (2001) also conclude that number of accident and offences are highest among the young males and their accident took place more often at night. The reasons of involvement of young driver in traffic offences and accidents are considered to be inexperience, risk taking behaviour and risk exposure. It is also said that young drivers have extra motives such as showing off their driving skills in traffic (Naatanen and Summala 1976) which leads them to commit violations. In low-income countries, on the basis of expected demographic evolution, it is suggested that young road users will continue to be the predominant group involved in road crashes (Peden et al. 2004). Figure 1 further elicits influence of age on different behavioural factors and indicates that youngsters (≤19) have high intimidating and low assertive behaviours in contrast to and elderly drivers (≥55). While middle-age drivers (19-34), although, low but consistently reported tendency to commit all types of deviant behaviours and mature drivers (35-55) reported to refrain from them.

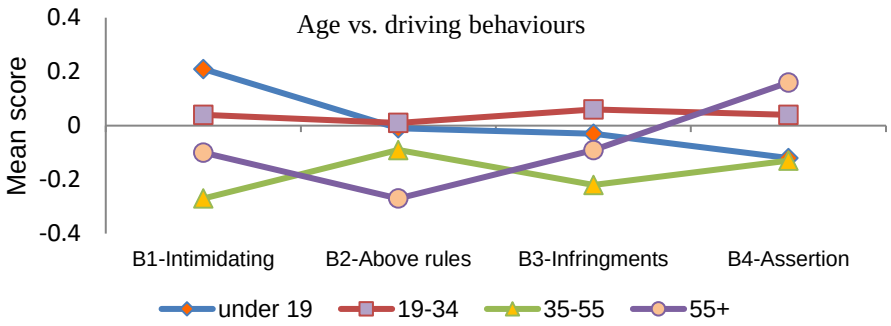

Figure 1: Aberrant driving behaviours of different age groups

Income

ANOVA indicates significant mean differences between the scores of different income-groups such that low-income group drivers emerged to be the safest in comparison to middle and high-income group. Figure 2 indicates that a high-income group driver is highly assertive whereas middle-income group driver is most likely to intimidate other road users. Road safety literature also suggests that income-level influences drivers' behaviours. For instance, one of the international comparative studies on self-reported driving behaviour has analysed the association between level of income and attitudes towards road safety and found that higher income, in general, leads to less law abiding driving behaviour (Golias and Karlaftis 2001). Similar evidence was noted in other studies where high violating car drivers were from higher-income household (Stradling et al. 1999; Stradling and Meadows 2000).

Relationship status

Another interesting relationship has been observed between marital status and aberrant behaviours. The Kruskal-Wallis test demonstrates that a separated/divorced driver is notably more dangerous than a single driver whilst, a married driver is comparatively safe as can be seen in Figure 3. The effect of marital status on drivers' behaviours is already well-documented which most of the times indicates single drivers more prone to risk-taking attitudes and behaviours (e.g. refer David 1990; Laapotti *et al.* 2001; Shinar *et al.* 2001). This

study further extends the literature and suggests that seprated/divorced drivers can be more dangerous, specifically in Pakistan.

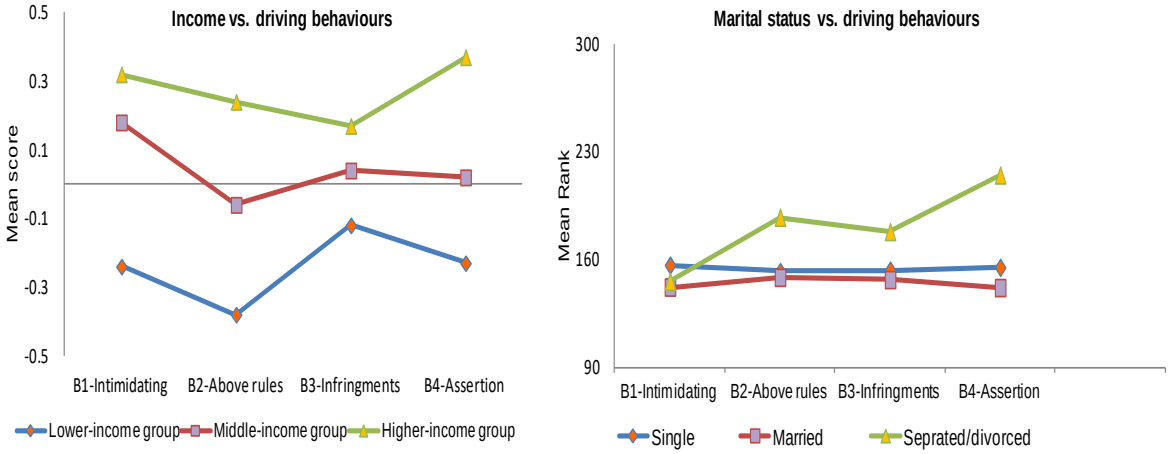

Figure 2: Aberrant driving behaviours of different income-groups and marital status

Driving test and license

The discussion also noted the link between passing of driving test and aberrant behaviours so as with license holding. As expected, drivers who have passed driving test and hold driving license are safer than those who have never passed the test. It is important to note that the poor licensing and penalties system in Pakistan is considered as a major contributor to unsafe driving practices. Despite remaining a public concern over the years, it is believed that the issue is still seemingly neglected by the policy-makers. To add, the system is reported to be constantly abused through the use of power and influence and petty bribes (Batool *et al.* 2011, p. 41).

To suumarise, in the light of above discussion, it can be concluded that the commission of violations correlates with variables such as age, income, and marital status.

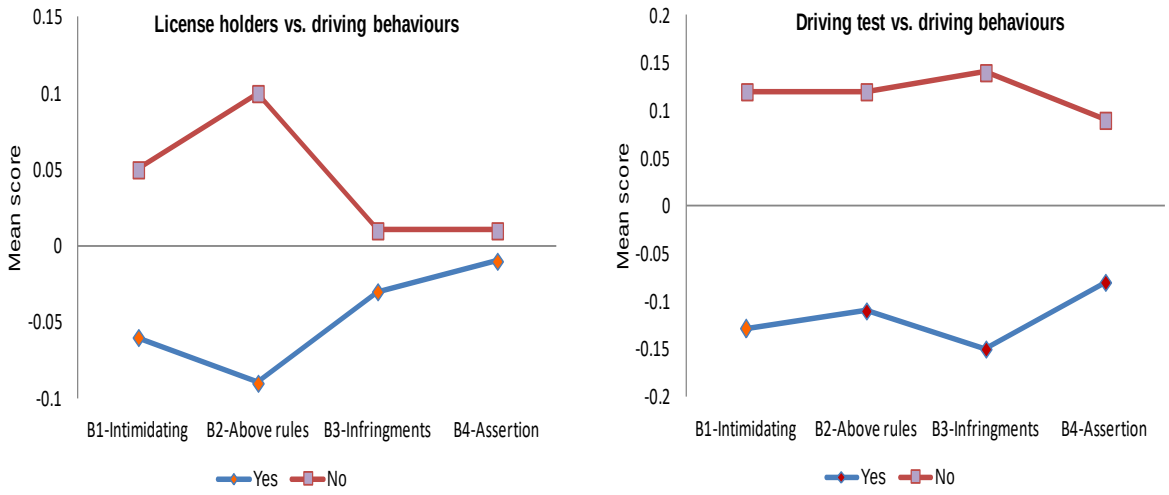

Figure 3: Aberrant driving behaviours *w.r.t* driving test and license holding

7 CONCLUSIONS AND POLICY CONSIDERATIONS

This study has provided multitude of results. It suggests that aberrant behaviours of urban population of Pakistan are classifiable into four dimensions; intimidations of other road users, taking themselves above the rules, commission of risk-prone infringements and assertiveness. It is noted that all behavioural factors are strongly correlated to each other such that commission of one leads to the other. Particularly, intimidating behaviour of drivers and their consideration of themselves above the rules have been observed as the immediate precursors of near-misses and crashes. Driver behaviour is also found attributable to his personal characteristics. The study adds that being young, affluent, and separated/divorced negatively influences driving behaviours in the country. It further suggests that stereotyping men with bad behaviours is not true in Pakistan's case as female drivers reported more deviant behaviours. This study also has analytical implications. The generation of discrete and statistically robust behavioural factors out of extended DBQ provides support to use the measures for future research in Pakistan.

There are few limitations which may affect to generalise study's findings. For instance, although DBQ generated distinct and reliable factors, the measure was adopted first time in

Pakistan. Therefore, more research work is encouraged to refine and validate it for the country. The data may also be opened to sampling bias due to limited number of participants in comparison to overall population of Lahore.

Notes

1. The DBQ was translated and revised in Urdu with the help of bilingual expert.
2. Professional drivers are composed of those who drive qinqi, rickshaw, taxi, van or bus.
3. *Kaiser-Meyer Olkin measure of sampling adequacy (KMO)* is an index that compares the size of the observed correlation coefficients to the sizes of the partial correlation coefficients. Kaiser (1974) declares measures in the 0.90's as marvellous, in the 0.80's as meritorious, in the 0.70's as middling, in the 0.60's as mediocre, in the 0.50's as miserable, and below 0.50 as unacceptable (Norušis 2008, p. 394). *Bartlett's Test of Sphericity (BTS)* is a statistical test for the presence of correlations among the variable. It provides the statistical significance that the correlation matrix has significant correlation among at least some of the variables (Norušis 2008, p. 396).
4. In total, five behavioural variables were omitted in different stages of FA for the given reasons: (1) the variable failed to load significantly on factor (>.30), (2) variable loaded on more than one factor with a difference between the loadings <.50, and/or (3) variable reduced the internal reliability (α value) of the factor.

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