



Self-reported dimensions of aberrant behaviours among drivers in Pakistan



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ABSTRACT

This paper has explored aberrant behaviours of drivers in Pakistan with the help of extended violation scale of the modified Manchester Driver Behaviour Questionnaire. Principal component analysis with promax rotation reveals that the drivers in the country have four discrete behavioural dimensions including aggressive driving, unlawful driving, risky driving, and egoistic driving. Further, univariate descriptive indicate that the study's drivers engage in risky overtaking and close following more than drunk driving or speeding. The results also demonstrate that the behaviour of drivers is attributable to their personal characteristics and being young, affluent or separated/divorced can negatively influence it.

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1. Introduction

Road Traffic Accidents (RTA) are attributed to many factors including road, vehicle and humans. These factors combine in a way that leads to a road user failing to cope in a particular situation (Casbard et al., 2003). Road safety 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 contributor in road accidents (e.g. Christ, Panosch, & Bukasa, 2004; GRSP, 2011). Among human factors, driver behaviour: what driver chooses to do has much greater influence on safety than driver's performance: what driver can do (Evans, 1996). It is said that the problem of traffic crashes is more due to the drivers doing things that they know they ought not to do, than of drivers not knowing what to do (Evans, 1991).

The literature demonstrates that among different types of aberrant behaviours, Road Traffic Violations (RTVs) are the most crucial that cause definite risk to other road users (e.g. see Evans, 1991; Parker, Reason, Manstead, & Stradling, 1995; Stradling & Meadows, 2000). A violation is defined as the deliberate infringement of some regulated or socially accepted code of behaviour (Parker et al., 1995) such as speeding, drink driving and non-use of seat belts. One of the self-reported studies of aberrant driving behaviours demonstrates that drivers who have high violation score are more involved in accidents in the past and are more likely to be involved again in future. It is 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), and therefore are called 'crash magnets' (Stradling & Meadows, 2000). Thus, violations are the behaviours that drivers must be dissuaded from committing (Parker, 2004).

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Although, the seriousness of the consequences of violations on the status of road safety is evident, for developing countries RTVs are not scientifically studied (UNECE, 2008). It is argued that the size of this problem is increasing in such countries due to rapid motorization and individual driving behaviours such as excessive speed (Bener, Razzak, Crundall, & Allen, 2014). In developed world, number of injuries and deaths due to RTAs are generally reduced due to extensive research and technological innovation, a vivid safety culture, and successful law enforcement. However, there is lack of impressive body of studies demonstrating causes and effects of accidents relating to developing countries (Downing, 1991). Moreover, findings of road safety research of developed countries may not be transferable to developing countries. As profiles of both worlds differ widely in terms of culture, resources, road and traffic conditions, socio-economic levels and behaviours, attitudes and knowledge of road users. Consequently, effectiveness of transferring some developed country solutions to developing countries is uncertain. Their appropriateness needs to be considered in relation to problems and conditions prevailing in individual countries (Baguley & Jacobs, 2000). Therefore, considering how little is known about effectiveness of local safety measures, particularly generality of results for different countries and traffic cultures, it is suggested that main contribution of researchers from a country with a relatively high safety standard can be to provide tools to assess and evaluate such safety measures (Almqvist & Hydén, 1994).

In case of Pakistan much less is known about driver behaviour, although they are held responsible for majority of RTAs. Road user error is identified as main cause in at least 70% of road accidents (Jacobs & Sayer, 1984). 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 motorized than the UK (WHO, 2009). Due to paucity of research work and empirical evidences, much is not known about the distinct types and frequency of RTVs executed by the country's drivers on roads. Consequently, it also remains difficult to understand underlying factors which provoke these behaviours. Usually, deliberate infringement of traffic laws, physically or mentally incapacitated driving under the influence of alcohol and other intoxicating drugs, driving without license and impoliteness, rude gestures and cursing are considered as the most frequently occurring aberrant behaviours (Dogar, 2008). For Lahore, the second most populated city of Pakistan and fortieth of the world, 2010s statistics reveal that 332 people lost their lives while 27,264 got injured in less than a year due to careless driving, speeding or wrong-turns. The National Injury Survey of Pakistan (NISIP) reports that most injuries in the country occur to persons aged between 16 and 45 years (Ghaffar, Hyder, & Masud, 2004). These accidents are disproportionately affecting poorer class of Pakistani society and have pushed 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 gravity of the situation, this study is carried out to understand pre-crash phenomenon while focusing on human side of RTAs. As intentional RTVs are considered as the most risky type of aberrant behaviours (e.g. see Parker et al., 1995; Stradling & Meadows, 2000), it is decided to determine distinct types and frequency of intentional violations executed by Pakistani drivers on roads. One approach of studying such behaviours focuses at subjective assessment using Driver Behaviour Questionnaire (DBQ). Originally, the questionnaire is developed using Reason's theory of error and violation (Reason, Manstead, Stradling, Baxter, & Campbell, 1990). It is a 50-item questionnaire which measures aberrant driving behaviours in three subscales: slips and lapses, mistakes and violations. The review of literature demonstrates that the questionnaire is one of the most widely used and reliable measures of behaviours. It is applied in number of countries including Finland, UK, Greece, Iran, The Netherlands, Turkey, Spain and China (e.g. Lawton, Parker, Manstead, & Stradling, 1997; Özkan, Lajunen, Chliaoutakis, Parker, & Summala, 2006).

This research also attempts to explore influence of personal characteristics on aberrant behaviours. It is hypothesized that drivers' behaviours are attributable to their personal characteristics. For example, the literature argues that road safety is a social problem and personal factors play a vital role in guiding and shaping of drivers behaviours. Particularly, research work in psychological sciences demonstrates 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 (Iversen & Rundmo, 2004). It is noted that high rate of RTVs is significantly associated with those drivers who are young, male and have high annual mileage i.e. exposure (Hennessy & Wiesenthal, 2005). Therefore, this paper investigates the influences of personal characteristics on road traffic violation behaviour of sample of drivers from Pakistan.

2. Aims

The principle aims of this paper are to contribute to an understanding of road safety profile of Pakistan by determining types of aberrant behaviours exercised by drivers in the country, and to explore influence of personal characteristics on these behaviours.

3. Materials and method

3.1. Participants

In total, 438 participants are recruited for the study from different densely populated locations of the city of Lahore using a quota sampling procedure. Six major groups attempted to be covered are professional drivers, business and leisure com-

muters, young drivers, housewives and elderly people (55+ years). The age structure is decided such as to target four different types of age groups including under age drivers (<19 years) as juvenile accidents are very common in the city (see [PakistanToday, 2010](#); [The Nation, 2011](#)), young-adults (19–34), middle-aged adults (35–55) and elderly drivers (55 plus years). Instead of 60 years, threshold of 55 plus years is decided for elderly people category due to poor health conditions and relatively early ageing in the country. For each category, a quota of 80 drivers is assigned, except for housewives and elderly people (40 each) due to their comparatively less presence on roads (see [PakistanToday, 2011](#); [The Express Tribune, 2012](#)). The required sample is achieved by adopting an on-street intercept technique (for details see [The Health Communication Unit, 1999](#)) where target groups of drivers e.g. business and leisure commuters are approached at business and shopping centers, students in universities, professional drivers at public transport stands, and housewives and elderly people in residential areas.

3.2. Extended violation scale of the DBQ

As mentioned above, the DBQ is widely used instrument to measure behaviour of drivers. For the present study, the modified version of 12 violation-items based DBQ ([Lawton et al., 1997](#)) is used. The questionnaire is further adapted based on the insight of an earlier qualitative study, carried out on road safety issues of Pakistan. The study is exploratory in nature and used semi-structured interviews technique. It recruited government officials, academics and drivers from general population and asked them about their opinions related to deviant driving styles in the country. It is found that there is no legal or cultural recognition of some of the inappropriate driving behaviours as offences or obstacles. For example, horn blowing, use of mobile phone, overloading, tailgating or driving an unregistered vehicle. The study findings helped to recognize which deviant behaviours in the country should be studied further empirically. The study also identified various country specific socio-physiological factors which are likely to influence these behaviours including an absence of civic sense and safety culture among the masses as well as less promotion and encouragement of improving behaviour toward road safety in society (for details, refer [Batool, Carsten, & Jopson, 2011](#)).

Thus, with the incorporation of local, Pakistan's specific factors, a 29-item questionnaire called as 'extended violation scale of the DBQ' is developed. Behaviours listed in the questionnaire can be divided into Highway Code violations (HCVs) and Aggressive Violations (AVs), mainly tapping behaviours related to speeding, close-following, drink and drug driving, overtaking, driving distraction, use of seatbelt/helmet and vehicle fitness. Participants are asked to indicate how frequently they engaged in performing these behaviours by rating on a six point scale with endpoints *never* (0) and *nearly all the time* (6). High scores on any item indicates high aberrant behaviours. Information related to personal characteristics of participants such as age, gender, and income is also collected. The questionnaire records some other driving related information as well including number of years driving license is been held, weekly mileage, frequency of accidents and near misses in last six months. A pilot study is conducted with twenty participants including students (ten), teachers (five) and bus drivers (five) from University of Engineering & Technology Lahore, Pakistan. The study helped to identify problems likely to generate either due to procedure adopted for data collection or language of the questionnaire. Feedback received is then applied to the extended violation scale of the DBQ in order to make it suitable for general population. Corrections and additions in the questionnaire are made in consultation with researcher's PhD supervisor from Institute for Transport Studies, University of Leeds, UK.

4. Analyses

To begin, a univariate descriptive analysis is performed to identify socio-economic and demographic characteristics of the study's sample. [Table 1](#) shows composition of the sample which helps to assess the representativeness of different groups in it. Further descriptive (Means and Standard Deviations) are calculated for 29-violation items of the questionnaire in [Table 2](#).

Table 1
Demographic and socio-economic characteristics of the sample population of drivers.

Variables	Sample (%)	Variables	Sample (%)
1. Age		3. Education	
<19	12.4	Up to Intermediate	60.8
19–34	64.5	Graduates	20.6
35–55	17.5	Postgraduates	12.4
55+	2.8		
2. Income group		4. Marital status	
Lower-income	37.6	Single	56.1
Middle-income	22.7	Married	40
Higher-income	22	Separated/divorced	1.9
5. Driving test passed		6. Driving license holder	
Yes	50	Yes	50
No	48	No	48

Table 2
Means and standard deviations for DBQ violation items.

Violation items sorted in descending mean score order (type, item number)	PAK mean (ranking)
How often do you sound your horn to indicate your annoyance to another driver? (AV, 8)	2.35 (1)
How often do you overtake a slow driver on the inside? (HCV, 4)	2.32 (2)
How often do you speed, blow horn or overtake to get ahead of female drivers? (AV, 13) ^a	2.04 (3)
How often do you manage to drive a vehicle with poor maintenance conditions? (HCV, 29) ^a	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)
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)
How often you do not stop at the stop line? (HCV, 18) ^a	1.83 (7)
How often do you use a hand held mobile phone when you are driving? (HCV, 28) ^a	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)
How often do you disregard the speed limit on a residential road? (HCV, 11)	1.76 (10)
How often do you cross a junction knowing that the traffic lights have already turned against you? (HCV, 6)	1.75 (11)
How often do you use high beam lights during driving at night time in built-up areas? (HCV, 22) ^a	1.69 (12)
How often do you ignore continuous white lines while changing a lane on road? (HCV, 17) ^a	1.69 (12)
How often do you use your status profile or personal connections to get rid of fines, penalties? (HCV, 23) ^a	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)
How often you do not stop at the call of traffic police wardens? (HCV, 24) ^a	1.63 (15)
How often do you park your vehicle in a no parking zone? (HCV, 27) ^a	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)
How often do you drive against one-way traffic? (HCV, 26) ^a	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)
How often do you carry goods/articles in your vehicle more than its capacity? (HCV, 21) ^a	1.38 (20)
How often do you disregard the speed limit on a motorway? (HCV, 12)	1.37 (21)
How often do you drive with tinted windows glass? (HCV, 25) ^a	1.36 (22)
How often do you drive when you suspect you might be over the legal blood alcohol limit? (HCV, 2)	.81 (23)

Note:

^a Newly included items related to Pakistan.

4.1. Principal component analysis with promax rotation

In order to examine behavioural dimensions of sample population, the DBQ data is subjected to Principal Component analysis (PCA). Before running the analysis, the data is screened by applying different quality checks. 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 is checked on two parameters; Kaiser-Meyer Olkin measure of sampling adequacy (KMO) and Bartlett's Test of Sphericity (BTS). The overall KMO ratio of 0.928 and BTS result of 2953.855 ($p < 0.000$) indicated a sampling adequacy to proceed with the analysis. The data is then subjected to factor analyzed. The analysis generated five-factors with eigenvalue greater than 1 and noted high inter-correlation between the first four factors (>0.30). This favors non-orthogonal rotation to simplify factors structure for interpretation. Thus, the analysis is re-run with promax rotation. The scree plot suggested three-factor solution reasonable for the data set. While, based on common rule of thumb of each factor having at least three variables that load highly on it (Norušis, 2008), four-factor solution is deemed appropriate to retain. Collectively, these factors explain 51.28% of the total variance. Cronbach's alpha (α) reliability coefficients for the factors also exhibit excellent internal consistency (>0.70). Table 3 summarizes results of factor analysis. Pearson's bi-variate correlation coefficients (r) for extracted factors are also computed in Table 4. The table also calculates correlation between the extracted behavioural factors, near misses, accidents and other driving related variables.

4.2. Analysis of significant differences

In order to assess influence of personal characteristics on behaviours of drivers, the mean DBQ scores of different groups are computed. To determine whether the differences in violation scores are significant, analysis techniques such as Two-Independent-samples *T*-Test (*t*-test), analysis of variance (ANOVA) and Kruskal-Wallis test are applied. Table 5 summarizes the results and provides multiple comparisons between socio-demographic characteristics of the sample and their related scores on behavioural factor scores. Lastly, Fig. 1 is further developed to visually illustrate influence of socio-demographic variables on behavioural dimensions of drivers.

5. Results

5.1. Sample characteristics

Results of univariate descriptive analysis in Table 1 reveals socio-demographic composition of the study's sample. The sample is appeared to be a good mix of population with a reasonable representation of drivers from varying socio-

Table 3

Dimensions of sample population of Pakistani drivers aberrant behaviours.

	Factor loading	% variation	α
<i>Factor 1: Aggressive driving (B1-AGGRESSIVE)</i>			
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	35.5%	.85
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) ^a	.712		
<i>Factor 2: Unlawful driving (B2-UNLAWFUL)</i>			
How often do you cross a junction knowing that traffic lights have already turned against you? (HCV,6)	.367	6.55%	.78
How often do you use high beam lights during driving at night time in built-up areas? (HCV, 22) ^a	.362		
How often do you use your status profile or personal connection to get rid of fines, penalties? (HCV, 23) ^a	.503		
How often do you drive against one-way traffic? (HCV, 26) ^a	.627		
How often do you park your vehicle in a no parking zone? (HCV, 27) ^a	.585		
How often do you use a hand held mobile phone when you are driving? (HCV, 28) ^a	.635		
How often do you manage to drive a vehicle with poor maintenance conditions? (HCV, 29) ^a	.779		
<i>Factor 3: Risky driving (B3-RISKY)</i>			
How often do you drive with tinted window glass? (HCV, 25) ^a	.649	4.76%	.76
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) ^a	.471		
How often do you not stop at the call of traffic police wardens? (HCV, 24) ^a	.457		
<i>Factor 4: Egoistic driving (B4-EGOISTIC)</i>			
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	4.46%	.72
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) ^a	.637		
How often do you not stop at the stop line? (HCV, 18) ^a	.817		
Total variance explained (before rotation)		51.27%	

Note: Extraction method: Principal Component Analysis; Rotation method: Promax with Kaiser Normalization (rotation converged in 11 iterations).

^a Indicates newly included items in the DBQ.**Table 4**

Pearson's Bivariate Correlations between behavioural factors and other driving related variables.

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

Note:

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

demographic backgrounds. On some indicators the sample characteristics appear to be somewhat similar or comparable to the general characteristics of urban population of Pakistan. For example, the sample is predominantly composed of the young age group drivers (up to 34 years) just like the national population (76.9% versus 64% respectively) (see [Government of Pakistan, 2010b](#)). Similarly, the types of vehicles driven by the sample population is also comparable to general statistics e.g. car drivers (40% versus 37%) (NTRC & JICA, 2006), motorcyclists (40.7% versus 50%) (NTRC & JICA, 2006), and professional drivers (19.2% versus 16%) (see [Imran, 2009](#)). However, females are under-represented in the sample in comparison to general statistics (13.6% versus 49%). This under-representativeness can be linked with less number of female drivers in the country. Furthermore, 17.7% of the drivers do not reveal their income-level. While, the middle-income and

Table 5
Mean scores and significant differences in behaviours of different socio-demographic groups.

		Mean DBQ score (p-value)	Mean B1 score (p-value)	Mean B2 score (p-value)	Mean B3 score (p-value)	Mean B4 score (p-value)
1. Age	≤19	72 (.03)	16 (NS)	16 (.05)	8 (.05)	13 (NS)
	19–34	59	14	13	6	11
	35–55	57	12	13	6	11
	≥55	51	16	11	5	10
2. Income	Lower-income	56 (.03)	14 (.01)	13 (NS)	6 (NS)	10 (.00)
	Middle-income	58	16	12	6	11
	Higher-income	64	17	14	6	12
3. Gender	Male	60 (NS)	16 (NS)	13 (NS)	6 (NS)	11 (NS)
	Female	65	18	15	7	13
4. Marital status	Single	63 (.00)	17 (.00)	14 (.00)	8 (.01)	12 (.00)
	Married	55	14	12	6	10
	Separated	147	40	38	19	27
	Divorced	86	22	18	10	16
5. Driving test	Yes	56 (.01)	15 (.00)	12 (.00)	6 (.00)	11 (.11)
	No	65	18	15	7	12
6. License holder	Yes	57 (.04)	15 (.03)	12 (.02)	6 (.05)	11 (.26)
	No	64	17	15	7	12

higher-income drivers are appeared to be almost in an equal proportion in the sample (22.7% and 22% respectively), those with a lower-income are more (37.6%) (Government of Pakistan, 2010a).

Further, nearly two-thirds of the drivers attained education up to intermediate (60.8%), around 21% are graduates and 12.4% are postgraduates. It is important to note that literacy in the country rose from 45 to 54% between 2002 and 2006, and net primary enrolment rates increased from 42 to 52%. Only 30% of Pakistan's children receive secondary education and only 19% attend upper secondary schools (see The World Bank, 2012). The study also records information about participants' marital status and household structure. The statistics are found generally comparable to the general population e.g. unmarried (56% versus 45.31%), married (40% versus 50.55%), separated/divorced (1.9% versus 4.10%).

The study also measures general indicators of drivers' behaviours. Mean near misses and accidents calculated for the study's driver in last six months are 2.72 and 1.98 respectively. On average, participants held a driving license for 8.43 years and have 363.47kms weekly mileage. Further, the data reveals that half of the drivers never passed driving test or held driving license.

5.2. Behavioural profiling of the sample

The means (M) and ranking of the violations for drivers are given in Table 2 in descending order. Sounding horn to indicate annoyance, overtaking slow driver from inside and speeding, sounding horn and/or overtaking to get ahead of female drivers are emerged as the three most frequently committed RTVs. Table 3 shows that first behavioural factor accounts for 35.5% of the total variation. It consists of a mix of items related to AVs and HCVs such that five out of eight items are directly tapping speeding and chasing behaviours of drivers. Therefore, factor is labeled as measuring 'aggressive driving' behaviour of the drivers. Second factor accounts 6.55% of the variation with seven items, all tapping behaviours related to breaking rules and regulations and is labeled as 'unlawful driving'. Third factor is composed of four 'risky driving' behaviours and explains 4.76% of the variation. The last factor explains 4.46% of the total variation and its four out of five items measure line/lane changing behaviours of drivers to compete for space on road. Therefore, it is labeled as 'egoistic driving'.

6. Discussion

6.1. Behavioural dimensions of drivers

Seven most committed RTVs as ranked in Table 2 reveals that sample population of Pakistani drivers' frequently sound horn and engage in risky overtaking quite frequently to get ahead of slow and/or female drivers. They drive poorly maintained vehicles, likely to force their way out and often disregard stop lines. Based on these findings, it can be inferred that the sample of drivers in the study are less disciplined. This statement is in agreement with an earlier study on drivers' behaviours which observed relatively high proportions of drivers in Pakistan crossing continuous 'no-overtaking' lines; 15% and not stopping at stop signs even when traffic is near; 52% (Downing, 1991). Researchers link this poor behaviour by drivers to their lack of knowledge about road safety rules and regulations. The statistic of sample population reported in this research also support this argument as more than half of the sample participants are found to be driving without passing driving test or obtaining driving licenses (Table 1). The finding leads to believe that people may be buying one when needed or take the

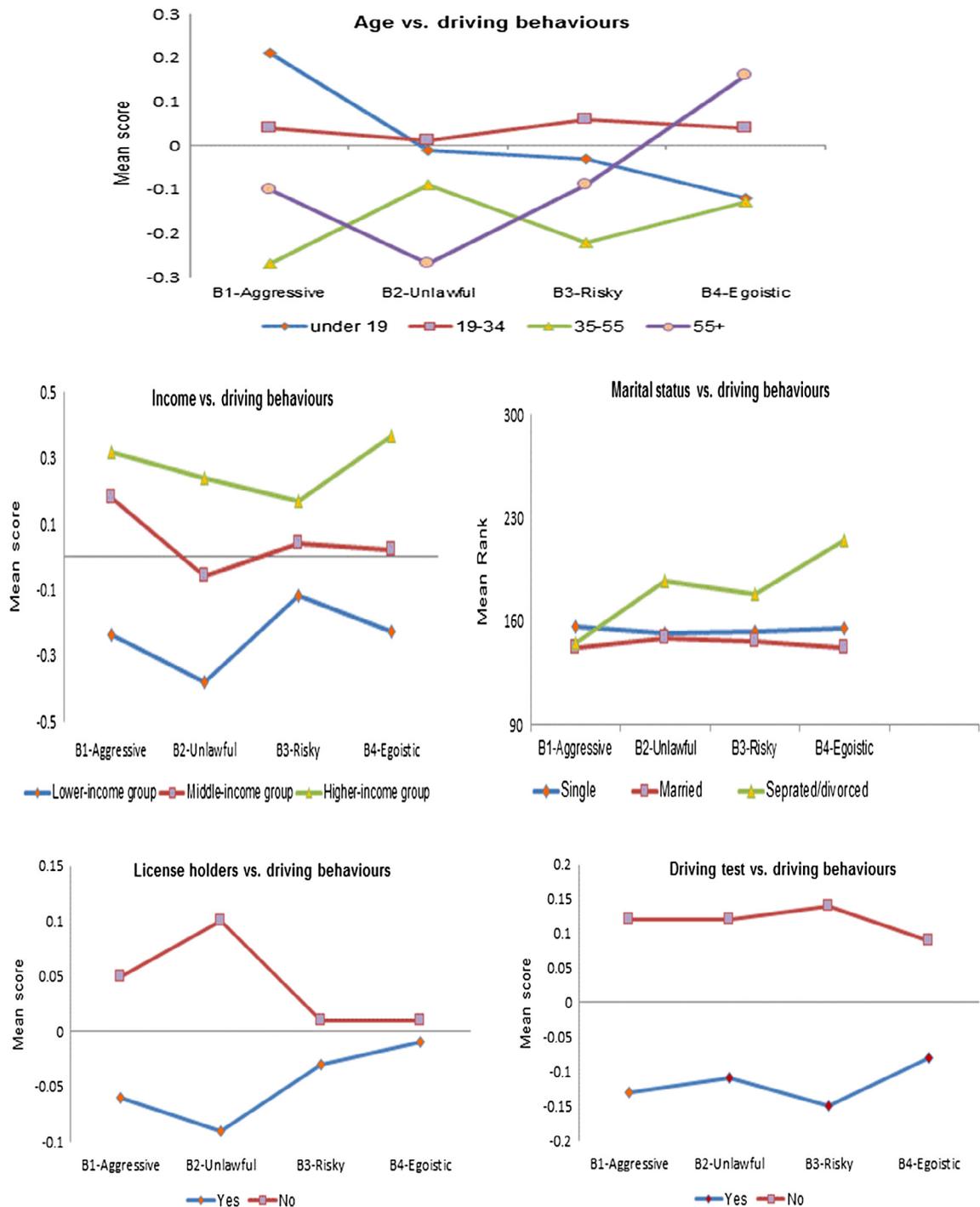


Fig. 1. Aberrant driving behaviours w.r.t. age, income-level, marital status, driving test and license holding.

test after being pulled over by the police or some such. It is important to mention that due to poor licensing system it is possible to acquire license in the country without passing driving test (e.g. see: [The Express Tribune, 2013](#); [The Nation, 2016](#)). This issue is always remained public concern. The use of power and influence and bribing the police are mainly considered responsible for this ([Batool et al., 2011](#)) which is already been listed as thirteenth most committed violation in [Table 2](#). However, poor behaviour of drivers is also attributed to their general attitude toward road safety matters, and emphasize is required to be made on measures such as stringent enforcement along with running of educational campaigns. For instance, Highway patrolling is found to be quite effective when it is introduced in Pakistan in the early 1980s as it discouraged over-

taking and targeted road safety parking, both of which are known to contribute significantly to RTAs in the country (ADB, 1996). The use of mobile phone while driving is also found quite high for the sample's drivers (ranked as eighth most committed RTV in Table 2). Despite the fact, that evidences indicate that drivers who use hand-held phones face a risk of crash four times higher than risk faced by other drivers (Peden et al., 2004).

In contrast, low violation scores for speeding on motorways and drink driving is found by the study. It should be noted that Pakistan is predominantly a Muslim country and the use of drugs or consumption of alcohol is illegal and 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 (Batool et al., 2011). Therefore, possibility of drink and drug driving for the country's drivers cannot be ruled-out. 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.

6.2. Applicability and utility of the extended violation scale of the DBQ

In Table 3, high percentages of variations explained by the extracted factors including internal consistency (>0.50) support the use of the DBQ as a measure of behaviours, in agreement with previous research work (e.g. by Gras et al. (2006)). However, it is important to mention that reliability is only assessed in terms of internal consistency and that further testing is warranted. With respect to the inclusion of new seventeen Pakistan's related violation items, twelve successfully come together and mainly constitute behavioural factors B2 and B3. The extracted factors indicate two distinct dimensions of the sample drivers and strengthen the initial idea of testing and empirically quantifying the country's specific behaviours. Also the mean scores of all twelve items are high with two of the items made in the list of top five mostly committed behaviours (items no. 13 and 29). Therefore, this paper propagates the utilization of extended violation scale of the DBQ in future research in Pakistan and emphasize the need of doing country specific research in agreement with other local researchers (Imran & Low, 2005). At the same time, this paper also confirms the theoretical distinction between AVs and HCVs (made by Lawton et al. (1997)). The reason is for the present study, B2 and B3 are solely comprised of HCVs whereas, B4 predominantly composed of AV items. Only B1 contains a mix of HCVs and AVs. Also in comparison to AVs, HCVs have high loadings are found on HCVs factors and entails the need to be treated exclusively to improve safety on roads.

In line with DBQ-based road safety literature (e.g. Parker et al., 1995; Stradling & Meadows, 2000) which demonstrates that high-violation score drivers being found to be more involved in accidents in the past and more likely to be involved again in future. This study also confirms the association between self-reported behavioural dimensions and involvement in accidents and near misses and found significant and positive correlations (Table 4). Thus, the finding reaffirms that violations are the behaviours that drivers must be dissuaded from committing. Also significant values of Pearson's Bivariate Correlations are calculated for all behavioural factors indicating that committing of one leads to another. Particularly, high 'aggressive driving behaviour (B1)' is found to be related to high DBQ score, and consequently results into near-misses and accidents.

6.3. Influence of personal characteristics

In order to confirm one of the set objectives of this paper, Table 5 investigates the influence of socio-demographic characteristics on driving behaviour and assessed whether the variation in drivers' behaviours is attributable to their personal characteristics. The results reveal that other than gender all socio-demographic groups based on age, income and marital status behave statistically different.

6.3.1. Age

Starting from age, significant mean differences are noted in scores of the extended violation scale of the DBQ such that young drivers (two groups of drivers including <19 and 19–34 are collectively termed as *young drivers*) emerged as the most dangerous, and mature drivers as the safest (Table 5). Fig. 1 further elicits influence of age on different behavioural factors and indicates high aggressive and low egoistic behaviours of underage drivers in contrast to elderly drivers. The reasons of involvement of young driver in traffic offences and accidents can be linked to lack of experience, risk taking behaviour and risk exposure. It is said that young drivers have extra motives such as showing off their driving skills in traffic (Naatanen & Summala, 1976). 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). While middle-age drivers, although low but consistently commit all types of deviant behaviours and mature drivers report to refrain from them.

6.3.2. Gender

Although no significant differences are noted, the total DBQ violation scale score for female drivers is more than male drivers. While, conventional literature demonstrates that men commit more violations and women make more errors (Reason et al., 1990; Stradling & Meadows, 2000). The finding suggests that male and female drivers of the study, more or less exhibits similar behaviours on roads and thus, contradicts 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. Tannert, 2009). However, a caution should be made before generalizing this finding, as the study's sample constitute of fewer women.

6.3.3. Income

Table 5 indicates significant mean differences between the scores of different income-groups. Fig. 1 further indicates that a high-income group driver is highly egoistic whereas middle-income group driver is most likely to be aggressive toward other road users. Thus it can be inferred that low-income group drivers commit least aberrant behaviours on roads in comparison to middle and high-income groups' drivers. An earlier study also propounds the same agreement while stating that affluent drivers are more likely to abuse the system (Batool et al., 2011). This is in agreement with road safety literature that usually concludes that higher income, in general, leads to less law abiding driving behaviour (e.g. see Golias & Karlaftis, 2001).

6.3.4. Marital status

Significant differences are noted across mean scores of all four behavioural dimensions with respect to marital status in Table 5. It can be inferred that in the study a separated/divorced driver reports notably more dangerous behaviour than a single driver. While, a married driver is comparatively safe as further can be seen in Fig. 1. 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 Shinar, Schechtman, & Compton, 2001).

6.3.5. Driving test and license

In Table 5 significant differences are also noted in behaviours of drivers who have passed driving test and acquired driving licenses than those who have not. As expected, drivers who have passed driving test and hold driving license have reported safe driving behaviours in comparison to those who have never passed it. As discussed earlier, poor licensing and penalties system in Pakistan is considered as a major contributor to unsafe driving practices (see Batool et al., 2011).

The discussion concludes that drivers' behaviours are influenced by their socio-demographic characteristics such that being young, affluent and separated/divorced negatively affect it and make drivers more dangerous on roads. In contrast being less prosperous, older and married positively influence drivers' behaviours and make them safer on the roads. However, care should be taken before generalizing these finding and more empirical research will definitely help to implicate them for all.

There are a few more limitations which may affect to generalize study's findings. For instance, although, the extended violation scale of the DBQ generated distinct and reliable factors, the measure is adopted for the first time in the country. Therefore, more research work is encouraged to refine and validate it for Pakistan. The data may also be subjected to sampling bias due to the limited number of participants in comparison to the overall population. However, confidence for the data can be drawn, knowing the fact that on some indicators, e.g. age, income, it is comparable to the general statistics of the urban population of Pakistan. Nevertheless, it is recommended for future work to address these potential issues especially given the novelty of such research in the country.

7. Conclusions and policy considerations

The rationale for this research study come from the ever declining road safety performance of Pakistan. The results identify that the sample of drivers recruited in the study are undisciplined and aggressive. They sound horn; engage in improper overtaking; intimidate female drivers; force their way out as well as disregard stop lines and continuous lines. The analysis classify aberrant behaviours of drivers from urban Lahore into four distinct dimensions; aggressive driving, unlawful driving, risky driving, and egoistic driving. The findings highlight *aggressive driving* as the strongest behavioural dimension of the study's drivers. It is further noted that all behavioural factors are strongly correlated to each other such that commission of one leads to the other. Particularly, aggressive behaviour of drivers and their practice of unlawful driving is found significantly correlated to near-misses and RTAs. Also the generation of discrete and statistically robust behavioural factors out of extended violation scale of the DBQ provides support to use the measures after further testing for future research in Pakistan. Driver behaviour is also found attributable to his personal characteristics. The study adds that being young, affluent, and separated/divorced negatively influences driving behaviours. It further suggests that stereotyping men with bad behaviours may not be true in Pakistan's case as the sample of female drivers reported more deviant behaviours.

Together, these results suggest three policy recommendations. *First*, the study encourages conducting more country-specific research. Road safety solutions which are usually *adopted* from the developed world into Pakistan are not likely to succeed unless they are *adapted* to take into account local behaviours. *Second*, it empirically provides the basis to develop countermeasures specific to the most frequently committed aberrant behaviours on roads. Unarguably, an excessive lack of line and lane discipline (including violations of stop lines, overtaking/lane change, lane use, and distance keeping rules) recurrently emerged as a serious cause of concern. Unfortunately there is no data available to quantify economic losses due to these behaviours. However for an idea it can be noted that in the UK, drivers hogging the middle and outside lanes effectively "steal" up to 700 miles of motorway during peak periods (The Telegraph, 2004). This means that the costs for Pakistan can be presumed to be strikingly high especially considering the fact that road traffic operation of the country are notably low and haphazard in comparison to the UK. Hence, physical measures will prove more effective to control these practices than persuasive measures. It is recommended that the government should address the issue as a top priority. They can benefit from experiences of the countries around the world working on the same lines to control poor road use beha-

viour. For instance, in the Indian capital Delhi, traffic regulatory authorities addressed the issue of compliance through the installation of cameras covering different intersections of the city, imposing fines with constant patrolling and through the introduction of effective bus management. *Lastly*, the effect of socio-demographic factors particularly *age* on behaviour of drivers is found to be significant. Considering the exciting demographic composition of population of Pakistan, where out of 180 million, 60 percent of Pakistan's population comprises of youth including 36 million are in the age group of 20–24 years and 58 million are below the age of 15 (IPRI, 2014), this paper initiates the idea of empowering youth in its early ages in order to introduce road safety as a normal, mainstream concept to them for *positive attitudes formation*. It strongly emphasises that the potential role of youth in inculcating road safety values rapidly in the society should not be overlooked or under-utilized. At the same time, the results suggest that single as well as separated/divorced individuals behave more aberrantly than married drivers. According to the psychology literature, the risk of being involved in a road accident increases in people who have been affected by adverse life events such as recent separation or divorce (Gordon, 2004). To address this issue, road safety experts can either liaise with these courts and/or to counselling services working in the country to target this group. It is important that content of such awareness courses, rehabilitation programs educate this group about their vulnerability and at the same time target their emotional distress.

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