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Validation of the Driver Behavior Questionnaire in a Representative Sample of Iranian Drivers

Parishad, N.[1], Aghabayk, K.[2*], Rezaei, R.[3], Samerei, A.[4] and Mohammadi, A.[4]

[1] M.Sc. Student, School of Civil Engineering, College of Engineering, University of Tehran, Tehran, Iran.
[2] Assistant Professor, School of Civil Engineering, College of Engineering, University of Tehran, Tehran, Iran.
[3] M.Sc. Student, School of Civil Engineering, College of Engineering, Islamic Azad University, Estahban Branch, Fars, Iran.
[4] Ph.D. Student, School of Civil Engineering, College of Engineering, University of Tehran, Tehran, Iran.

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ABSTRACT: The Driver Behaviour Questionnaire (DBQ) is widely used around the world to investigate driving behaviours. However, it has several different versions extracted from the 50-items Manchester driver behaviour questionnaire for variety of societies. This study aims to calibrate the DBQ for the Iranian driver population and explore their aberrant driver behaviour. In total, 524 participants (325 men and 199 women) between the ages of 18 and 79 years from different cities of Iran with more than one million populations were engaged in this study (Tehran, Mashhad, Esfahan, Qom, Tabriz, Karaj, Ahvaz, Shiraz). Principal Component Analysis (PCA) with varimax rotation extracts four-factor that describes the aberrant driver behaviours: violations, dangerous errors, lapses, and aggressive behaviours. A short version of DBQ with 20 items is also developed on the same four factors using high factor loading of each of the axis categories. This DBQ can serve as an instrument of driver self-assessment and can use with other self-reporting measures. For reliability assessment, the Cronbach's alpha test (α) is conducted for both long and short version of the questionnaire. Finally, regression analysis predicts the factor scores using demographic and some general questions.

Keywords: Aggressive Behavior, Dangerous Error, Driver Behavior Questionnaire (DBQ), Iranian Sample, Lapse, Violation.

INTRODUCTION

Traffic safety is one of the most important after cardiovascular diseases, motor vehicle accidents are the second leading cause of death in Iran (Mirhashemi et al., 2017; Saadat et al., 2015). According to the World Health Organization (WHO) report, the average accident fatality rate in Iran is 32.1 people per 100 000 populations, which is higher than twice compared to the global average. However, in countries with the same people, such as Germany and Turkey, the accident fatality rate is about 4.3 and 8.9, respectively

* Corresponding author E-mail: kayvan.aghabayk@ut.ac.ir

(WHO, 2015). Forensic medicine organization and traffic police of Iran (2013-2014) reported that 17994 people were killed in the road traffic include 77% male and 23% female. Drivers and passengers of 4-wheeled cars and light vehicles have 17% and 24% of this share respectively. These figures and also previously conducted studies (Rezaei et al., 2014), are good reasons for pay more attention to safety assessment and investigating practical factors in the incident of an accident in Iran.

The human, vehicle, and roadway/environment factors are the most effective factors, which contribute to an accident. Human factors with 57% net contribution and 93% collective contribution are the most significant factor in the occurrence of a crash (Shinar, 2017). These factors include age, experience, driver performance and more significantly driver behaviour. Further, drivers' behaviours are related to their habits (Evans, 2012).

The Manchester driver behaviour questionnaire (DBQ) developed by Reason et al. (1990) is the most common measuring instrument for a driver behaviour assessment. This 50-item questionnaire is based on two general categories of aberrant driver behaviours, including errors and violations. Errors which defined as 'the failure of planned actions to achieve their intended consequences' involve two distinct categories of straying (lapses and slips) and mistakes. Violations also defined as 'deliberate deviation from those practices believed necessary to maintain the safe operation of a potentially hazardous system' includes two deliberate violations and unintended violations categories. Parker et al. (1995) conducted another survey using a short version of DBQ and reported consistent results with the previous study. He also concluded that the questionnaire is reliable over time.

Moreover, it has figured out that slip and lapses posing no threat to other road users. Two years later, Lawton (1997) developed a new factor named aggressive violations by adding some new items to the questionnaire. The aggressive violation defined as indicating hostility to other road users such as "swearing at other drivers" and "flashing light at other drivers when annoyed". Özkan and Lajunen (2005) developed an instrument for measuring a new behavioural factor. This factor labelled as positive behaviour, and it also concluded that the factor was negatively correlated with errors, violations, and aggressive behaviours.

Drivers' behaviours could be varied across different countries and cultures. Therefore, the DBQ data have been collected in several countries such as France (Gueho et al., 2014), Denmark (Martinussen et al., 2013), Greece (Kontogiannis et al., 2002), Australia (Stephens, Fitzharris, 2016), Sweden (Åberg and Rimmö, 1998), New Zealand (Varmazyar et al., 2014; Sullman et al., 2000) and China (Zhang et al., 2013; Xie and Parker, 2002). Moreover, due to the high number of crashes in Middle-East countries compare to European and American countries, several studies have been conducted in Qatar and the United Arab Emirates (UAE) (Bener et al., 2013; Bener et al., 2008), Turkey (Bener et al., 2016; Özkan and Lajunen, 2005) and recently Islamic Republic of Iran (Tavakoli Kashani et al., 2016). However, the previous study conducted in Iran only focused on Tehran; although the reports highlighted the importance of other metropolises (Bazzaz et al., 2015). Furthermore, all of the previous studies in Iran used the short version of DBQ (Nordfjærn et al., 2015).

Since there are significant differences between driving behaviours in Iran and European countries, this study uses the 50-item Driver behaviour questionnaire (DBQ) developed by Reason et al. (1990). The required data were collected from Iran's

metropolises (population of more than one million). The study presents the calibrated version of DBQ, which includes four factors (violation, error, lapse and aggressive behaviour). A shortened version of the questionnaire is also presented, which is reliable and time-efficient. This short version can be used easier with combination to other self-reporting measures. Finally, the paper discusses how the scores of the aforementioned factors are influenced by demographic parameters such as age, gender and driving experience.

METHOD

Measures

The survey instrument uses in this study divided into three sections. The first section includes demographic questions such as age, gender, income, crash history, and finally, the driving exposure time.

The DBQ constitutes the second section of the instrument. The full version questionnaire includes unintended violations (3 items e.g. check your speedometer and discover that you are unknowingly travelling faster than the legal limit), deliberate violations (17 items, e.g. become impatient with a slow driver in the outer lane and overtake on the inside), mistakes (9 items, e.g. drive as fast along country roads at night on dipped lights as on full beam), and slips and lapses (21 items, e.g. attempt to drive away from traffic lights in third gear). The participants were asked to answer the questions using the 6-point Likert scale (1: very infrequently or never, 2: quite infrequently, 3: infrequently, 4: frequently, 5: quite frequently, 6: very often or always).

Just like of the questionnaire developed by Reason et al. (1990), the third part of this instrument consists of five more general self-assessment questions. Participants were asked to answer to how good a driver they were, how error-prone they were as drivers, how law-abiding they were as drivers and the extent to which their mood adversely affected their driving on a three-point scale.

Statistical Analysis

Principal Component Analysis (PCA) with Varimax rotation conducted using SPSS version 25.0 to shorten and calibrate DBQ questionnaire for Iran. Furthermore, Cronbach's alpha reliability test was also calculated on each extracted factor to examine the internal consistency of each factor. Finally, by using regression analysis, the impact of demographic variables and also the third section of the questionnaire will be assessed.

DATA DESCRIPTION

The population of various Iran's cities was determined by the last population and housing census figures in 2015-2016. Cities with a population of more than one million people were considered as metropolises of Iran including Tehran, Mashhad, Karaj, Isfahan, Shiraz, Qom, Ahvaz, and Tabriz. Data collected in such a way that the proportion of the sample in each city to the total sample was almost the same as the proportion of the city's population to the entire community. The details of data collection presented in Table 1.

Table 1. Population and number of participants of each Iran's metropolises (percentages)

City	Population	Sample
Tehran	8 693 706 (41)	185 (37)
Mashhad	3 001 184 (15)	68 (14)
Esfahan	1 961 260 (9)	45 (9)
Karaj	1 592 492 (8)	42 (8)
Shiraz	1 565 572 (8)	39 (8)
Tabriz	1 558 693 (7)	45 (9)
Qom	1 201 158 (6)	29 (6)
Ahvaz	1 184 788 (6)	47 (9)
Total	20 758 853 (100)	500 (100)

Numbers in parentheses represents percentage

Totally 524 drivers participated in investigating aberrant driver behaviour. Out

of 524 participants, 500 participants' responses were used for analysis. Data gathering was tried to be in such a way that age and gender distribution close to the actual situation of society. The age distribution ranged from 18 to 79 years, with a mean of 35.54 years (S.D. = 11.484). Also, males accounted for 61.4% of the sample and females 38.6%. Most of the participants (88.4%) drive less than 4 hours per day while about half of them (42.08%) drive between one and two hours per day. Furthermore, data reported 278 car accidents in three past years ago, including 244 PDO and 34 FI cases. Table 2 shows details of demographic variables in entire Iran's metropolises.

RESULTS

Table 3 shows means (M) and standard deviation (S.D.) of 50 items DBQ, ranked in descending order by the mean value. The most frequently reported behaviour (mean response ≥ 3.2) are slips and violations such as "only half-an-eye on the road." or "overtake on the inside". Also, the least frequency behaviours (mean responses ≤ 1.2) are "try driving off without switching on." and "attempt driving off in third" which is logical due to the progress of the cars.

The Factor Structure

The last four items of Table 3 dropped out from analysis because it was reported only very rarely (mean value ≤ 1.5). Moreover, due to the development of automobile technology, some of these items are obsolete (such as attempt to drive away from traffic lights in third gear). Therefore, the analysis conducted with 46 items. Kaiser criterion of eigenvalue over 1.0, the Cattell scree plot, and parallel analysis are three criteria used to determine the number of factors. Moreover, given that the data should be interpretable, the principal component analysis conducted with four factors which accounted for 43.17% of the total variance.

Table 2. Socio-demographic characteristics of drivers surveyed in various metropolises of Iran

Variables	Tehran	Mashhad	Esfahan	Shiraz	Ahvaz	Tabriz	Qom	Karaj	Total
Gender									
Male	112(60.5)	41(60.3)	29(64.4)	21(53.8)	28(59.6)	30(66.7)	21(72.4)	25(59.5)	307(61.4)
Female	73(39.5)	27(39.7)	16(35.6)	18(46.2)	19(40.4)	15(33.3)	8(27.6)	17(40.5)	193(38.6)
Income									
Poor	79(42.7)	21(30.9)	19(42.2)	19(48.7)	22(46.8)	30(66.7)	13(44.8)	14(33.3)	217(43.4)
Middle and lower	76(41.1)	30(44.1)	17(37.8)	15(38.5)	19(40.4)	14(31.1)	15(51.7)	23(54.8)	209(41.8)
Middle and higher	21(11.4)	13(19.1)	8(17.8)	1(2.6)	6(12.8)	1(2.2)	1(3.4)	5(11.2)	56(11.2)
Rich	9(4.9)	4(5.9)	1(2.2)	4(10.3)	0(0)	0(0)	0(0)	0(0)	18(3.6)
Accident involvement									
Yes	62(33.5)	27(39.7)	10(22.2)	16(41)	13(27.7)	21(46.7)	8(27.6)	13(31)	170(34)
No	123(66.5)	41(60.3)	35(77.8)	23(59)	34(72.3)	24(53.3)	21(72.4)	29(69)	330(66)
Number of PDO	86(35.24)	36(14.75)	12(4.92)	22(9.02)	15(6.15)	35(14.34)	16(6.56)	22(9.02)	244(100)
Number of FI	6(17.65)	12(35.29)	0(0)	4(11.76)	0(0)	6(17.65)	5(14.71)	1(2.94)	34(100)
Driving time									
Less than 1 hour	65(35.1)	15(22.1)	21(46.7)	7(17.9)	12(25.5)	13(28.9)	11(37.9)	9(21.4)	153(30.6)
1-2 hours	64(34.6)	26(38.2)	14(31.1)	17(43.6)	18(38.3)	14(31.1)	11(37.9)	22(52.4)	186(37.2)
2-4 hours	38(20.5)	18(26.5)	6(13.3)	12(30.8)	11(23.4)	9(20)	2(6.9)	7(16.7)	103(20.6)
More than 4 hours	18(9.7)	9(13.2)	4(8.9)	3(7.7)	6(12.8)	9(20)	5(17.2)	4(9.5)	58(11.6)

Table 3. Means and standard deviations of the DBQ answers in the metropolises of Iran

DBQ	M	S.D.
Drive with only 'half-an-eye' on the road while looking at a map, changing a cassette or radio channel, etc.	3.40	1.599
Become impatient with a slow driver in the outer lane and overtake on the inside	3.21	1.538
Check your speedometer and discover that you are unknowingly travelling faster than the legal limit	2.98	1.489
Miss your exit on a motorway and have to make a lengthy detour	2.59	1.144
Overtake a slow-moving vehicle on the inside lane or hard shoulder of a motorway	2.57	1.438
Plan your route badly, so that you meet traffic congestion you could have avoided	2.53	1.084
Drive as fast along country roads at night on dipped lights as on full beam	2.47	1.402
Drive especially close or 'flash' the car in front as a signal for that driver to go faster or get out of your way	2.43	1.389
Deliberately disregard the speed limits late at night or very early in the morning	2.43	1.479
Distracted or preoccupied, realize belatedly that the vehicle ahead has slowed, and have to slam on the brakes to avoid a collision	2.37	1.064
'Wake up' to realize that you have no clear recollection of the road along which you have just travelled.	2.31	1.243
Take a chance and cross on lights that have turned red.	2.31	1.405
Forget where you left your car in a multi-level car park	2.29	1.244
Intending to drive to destination A, you 'wake up' to find yourself in route to B, where the latter is the more usual journey	2.11	1.164
Stuck behind a slow-moving vehicle on a two-lane highway, you are driven by frustration to try to overtake in risky circumstances	2.11	1.269
Hit something when reversing that you had not previously seen	2.07	1.051
Park on a double-yellow line and risk a fine	2.06	1.173
Deliberately drive the wrong way down a deserted one-way street	2.06	1.273
Have an aversion to a particular class of road user, and indicate your hostility by whatever means you can	2.04	1.201
Forget which gear you are currently in and have to check with your hand	2.04	1.079
Lock yourself out of your car with the keys still inside	2.02	1.588
Overtake a single line of stationary or slow-moving vehicles, only to discover that they were queueing to get through a one lane gap or roadwork lights	1.99	1.235
On turning left, nearly hit a cyclist who has come up on your inside	1.98	0.966
Fail to read the signs correctly, and exit from a roundabout on the wrong road	1.95	0.986
Lost in thought or distracted, you fail to notice someone waiting at a zebra crossing, or a pelican crossing light that has just turned red	1.95	0.988
Get into the wrong lane at a roundabout or approaching a road junction	1.91	0.982
Fail to notice someone stepping out from behind a bus or parked vehicle until it is nearly too late	1.91	0.998
Get involved in unofficial 'races' with other drivers	1.88	1.271
Misjudge your gap in a car park and nearly (or actually) hit adjoining vehicle	1.86	1.002
Fail to notice pedestrians crossing when turning into a side street from a main road	1.82	.956
Lost in thought, you forget that your lights are on full beam until 'flashed' by other motorists	1.80	1.064
Cut the corner on a right-hand turn and have to swerve violently to avoid an oncoming vehicle	1.77	1.027
In a queue of vehicles turning left on to a main road, pay such close attention to the traffic approaching from the right that you nearly hit the car in front	1.77	0.934
Intend to switch on the windscreen wipers, but switch on the lights instead, or vice versa	1.76	0.954
Disregard red lights when driving late at night along empty roads	1.76	1.153
Ignore 'give way' signs, and narrowly avoid colliding with traffic having right of way	1.75	1.114
Misjudge speed of oncoming vehicle when overtaking	1.74	0.935
Angered by another driver's behavior, you give chase with the intention of giving him/her a piece of your mind.	1.72	1.171
Fail to give way when a bus is signaling its intention to pull out	1.72	1.140
Race' oncoming vehicles for a one-car gap on a narrow or obstructed road	1.72	1.101
Fail to check your mirror before pulling out, changing lanes, turning, etc.	1.71	1.039
Turn left on to a main road into the path of an oncoming vehicle that you hadn't seen, or whose speed you had misjudged	1.71	0.803
Attempt to overtake a vehicle that you hadn't noticed was signaling its intention to turn right	1.69	0.835
Drive back from a party, restaurant, or pub, even though you realize that you may be over the legal blood-alcohol limit	1.64	1.191
Misjudge your crossing interval when turning right and narrowly miss collision	1.60	0.794
Try to overtake without first checking your mirror, and then get hooted at by the car behind which has already begun its overtaking maneuver	1.56	0.820
Forget when your road tax/insurance expires and discover that you are driving illegally	1.49	0.946
Brake too quickly on a slippery road and/or steer the wrong way in a skid	1.44	0.802
Attempt to drive away without first having switched on the ignition	1.37	0.816
Attempt to drive away from traffic lights in third gear	1.18	0.571

The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.916, Bartlett's test of sphericity was significant (< 0.001), and the determinant of the correlation matrix was 2.593E-5. A cut-off point of 0.40 was used for item loading values. Thirteen items were removed from analysis due to loaded on none of the factors or cross-loaded on two or more factors. Finally, Table 4 presented the result of the analysis.

The first factor explained 16.17% of the variance. This factor includes ten violations and two mistakes items such as "deliberately disregard the speed limits late at night or very early in the morning (0.73), get involved in unofficial 'races' with other drivers (0.70), overtake a slow-moving vehicle on the inside lane or hard shoulder of a motorway (0.68)". These items seem to predict "violations"; thus, this factor labelled as "violations". The second factor explained that 13.02% of the variance and include twelve items: four mistakes, seven slips, and one unintentional violation. Most of these items seem to show serious errors such as "misjudge your crossing interval when turning right and narrowly miss collision" with factor loading: 0.66, and "fail to notice pedestrians crossing when turning into a side street from a main road" with factor loading: 0.64. Therefore, the second factor labelled as "dangerous errors". The third factor takes 8.37% of the variance. The total items in this factor are slips, and all of them express silly errors and lapses such as "miss your exit on a motorway and have to make a lengthy detour" with factor loading: 0.66 and "forget where you left your car in a multi-level car park" with factor loading: 0.64. Therefore, the third factor labelled as "lapses". The fourth factor shares 5.61% of the variance. This factor includes two violations item: "have an aversion to a particular class of road user, and indicate your hostility by whatever means you can" with factor loading: 0.74 and "angered by another driver's behaviour, you give chase with the intention of giving him/her a piece of your mind" with factor loading: 0.58. Both of these items shows aggressiveness and hostility behaviours. Hence this factor labelled as "aggressive behaviour".

Reliability Coefficients for the DBQ Subscales

For assessment of the internal reliability of each factor, the Cronbach's alpha test (α) was calculated. The alpha value for "violation" (12 items) equals to 0.876, for "dangerous errors" (12 items) equals to 0.847, and for "lapses" (7 items) and "aggressive behaviour" equals to 0.678, 0.657 respectively. The reliability test for the first two factors is in satisfaction interval ($0.7 \leq \alpha \leq 0.9$). However, the alpha value for the lapse and aggressive behaviour is below 0.7, which supported previously conducted studies (Bener et al., 2008). This could be due to too few questions, poor interrelatedness between items or multidimensional constructs.

Short Version

The main objective of this study was to develop an instrument based on self-reporting for investigating the aberrant driver behaviour. The 33-items version may not be very useful for future studies because it may be a bit long for being used with combination to other self-reporting measures. Therefore, as suggested in the previous related studies (Gueho et al., 2014; Deb et al., 2017), a shorter four-factor version based on items with the highest factor loading was suggested. As a result, a 20-items version was extracted with six violations, six errors, and six lapses as well as two aggressive behaviours items.

Another PCA with Varimax rotation was conducted on the short version and explained 51% of the variance. All of the items only loaded on one axis and have the strongest loading on the expected axis. Table 5

presented the results of the conducted reliability test on each axis. It should be noted that for the sake of poor reliability on aggressive behaviour axis, the aggressive behaviour items must be extended based on the conducted study by Lawton (1997) for future studies.

Table 4. Results of the exploratory factor analysis with Varimax rotation for metropolises of Iran

Items	F.1	F.2	F.3	F.4
Deliberately disregard the speed limits late at night or very early in the morning	0.73			
Get involved in unofficial 'races' with other drivers	0.70			
Overtake a slow-moving vehicle on the inside lane or hard shoulder of a motorway	0.68			
Become impatient with a slow driver in the outer lane and overtake on the inside	0.67			
Race' oncoming vehicles for a one-car gap on a narrow or obstructed road	0.65			
Overtake a single line of stationary or slow-moving vehicles, only to discover that they were queueing to get through a one lane gap or roadwork lights	0.62			
Deliberately drive the wrong way down a deserted one-way street	0.61			
Take a chance and cross on lights that have turned red	0.61			
Drive as fast along country roads at night on dipped lights as on full beam	0.60			
Drive especially close or 'flash' the car in front as a signal for that driver to go faster or get out of your way	0.58			
Stuck behind a slow-moving vehicle on a two-lane highway, you are driven by frustration to try to overtake in risky circumstances	0.55			
Fail to giveway when a bus is signaling its intention to pull out	0.48			
Misjudge your crossing interval when turning right and narrowly miss collision		0.66		
Fail to notice pedestrians crossing when turning into a side street from a main road		0.64		
Misjudge speed of oncoming vehicle when overtaking		0.62		
Fail to notice someone stepping out from behind a bus or parked vehicle until it is nearly too late		0.60		
Hit something when reversing that you had not previously seen		0.58		
In a queue of vehicles turning left on to a main road, pay such close attention to the traffic approaching from the right that you nearly hit the car in front		0.55		
Attempt to overtake a vehicle that you hadn't noticed was signaling its intention to turn right		0.51		
Lost in thought or distracted, you fail to notice someone waiting at a zebra crossing, or a pelican crossing light that has just turned red		0.49		
Fail to read the signs correctly, and exit from a roundabout on the wrong road		0.49		
Misjudge your gap in a car park and nearly (or actually) hit adjoining vehicle		0.46		
On turning left, nearly hit a cyclist who has come up on your inside		0.45		
Get into the wrong lane at a roundabout or approaching a road junction		0.44		
Miss your exit on a motorway and have to make a lengthy detour			0.66	
Forget where you left your car in a multi-level car park			0.60	
Intending to drive to destination A, you 'wake up' to find yourself en route to B, where the latter is the more usual journey			0.54	
Distracted or preoccupied, realize belatedly that the vehicle ahead has slowed, and have to slam on the brakes to avoid a collision			0.50	
Wake up' to realize that you have no clear recollection of the road along which you have just travelled			0.50	
Intend to switch on the windscreen wipers, but switch on the lights instead, or vice versa			0.49	
Forget which gear you are currently in and have to check with your hand			0.42	
Have an aversion to a particular class of road user, and indicate your hostility by whatever means you can				0.74
Angered by another driver's behavior, you give chase with the intention of giving him/her a piece of your mind				0.58

F.1: Violations (12 items); F.2: Errors (12 items); F.3: Lapses (7 items); F.4: Aggressive behaviors (2 items)

The 20-items version questionnaire is presented in the Appendix. However, the long version (33-item) of the DBQ was used in this paper in order to ensure a comprehensive understanding of driver behaviour.

Table 5. Alpha reliability coefficients of the DBQ scales for the short version

Axis	Cronbach alpha
Violation (Six items)	0.824
Error (Six items)	0.778
Lapse (Six items)	0.645
Aggressive (Two items)	0.657

Factor Score Predictor

Multiple regression analysis using stepwise method was conducted to investigate the impact of various demographic variables and general questions on each extracted factor.

The result of the implemented regression on "violation" is presented in Table 6. The negative beta coefficient for age (β = -0.195) shows that young drivers tend to deliberate deviation from rules more than older. The most critical positive coefficients in the regression are "how law-abiding they were as drivers" (β = 0.359) and "how a driver's mood effect on their driving" (β = 0.193) respectively. These results indicate that the drivers, who admitted, are more likely to violate the rules and their moods have more impact on their driving behaviour have more violation scores. Furthermore, the drivers who reported that they had an accident in the past three years have more violation score. The driving time coefficient shows a positive correlation (β = 0.164) to the violation score. This might be due to the driver's exhaustion caused by long-term driving. An interesting item is a positive correlation between the monthly revenues of drivers and violation scores (β = 0.122). It means that drivers with higher incomes have more violation behaviours. This may be the result of their pseudo-self-assurance obtained from their wealth or better car insurance. Finally, the coefficient of gender shows that males have more violation score than females.

Table 6. Predictors of factor 1 (violation)

Item	Standardized coefficients Beta	P value
How good	0.080*	0.030
Lawful	0.356**	< 0.001
Mood	0.190**	< 0.001
Age	-0.188**	< 0.001
Gender	0.085*	0.025
Income	0.125*	0.002
Driving time	0.157**	< 0.001
Accident	0.095*	0.011

* Significant at the 0.05 level; ** Significant at the 0.01 level.

The regression analysis implemented on the “error” shows that the drivers who feel that they are good drivers are less likely to make dangerous mistakes (β = -0.162). Further, the drivers who do not respect the law, are exposed to errors and mistakes while driving (β = 0.199). Moreover, drivers who admitted are more likely to make errors, and the mood is more effective on their driving behaviour have more error score. These results are summarized in Table 7.

Table 7. Predictors of factor 2 (error)

Item	Standardized coefficients Beta	P value
How good	-0.162**	< 0.001
Error prone	0.123*	0.005
Lawful	0.199**	< 0.001
Mood	0.170**	< 0.001

* Significant at the 0.05 level; ** Significant at the 0.01 level.

About the Lapse factor analysis, the analysis shows that the drivers who feel that they are good drivers and do not have any particular driving problems will have less ambiguity and forgetfulness while driving and they make a less unintentional error (β = -0.243). On the other hand, drivers who reported have more mistakes while driving (β = 0.123), and their mood is more effective in their driving behaviour (β = 0.170), have more lapse score. Furthermore, older drivers

have more lapse score than a young driver. Table 8 has summarized the result of lapse factor.

Table 8. Predictors of factor 3 (Lapse)

Item	Standardized coefficients Beta	P value
How good	-0.234**	< 0.001
Error prone	0.116*	0.008
Mood	0.117*	0.007
Age	0. 093*	0.031

* Significant at the 0.05 level; ** Significant at the 0.01 level.

In the fourth stage of regression analysis, the aggressive behaviour factor is assessed. Whenever a driver is inclined to drive a violation, he or she will behave more aggressively (β = 0.261). As expected, the driver's aggressive behaviour is the reaction of the driver's mood (β = 0.150), and it also seems that males tend to have more aggressive behaviour than females. Table 9 has summarized the result of aggressive behaviour factor.

Table 9. Predictors of factor 4 (aggressive behavior)

Item	Standardized coefficients Beta	P value
Lawful	0.261**	< 0.001
Mood	0.150**	< 0.001
Gender	0.139**	0.001

* Significant at the 0.05 level; ** Significant at the 0.01 level.

CONCLUSIONS

Due to the assumption of cultural differences in various countries, the Manchester driver behaviour questionnaire (DBQ) was calibrated for Iran. The sample was collected from Iran's metropolises with more than one million people (Tehran, Mashhad, Esfahan, Qom, Tabriz, Karaj, Ahvaz and Shiraz). Principal component analysis with Varimax rotation calibrated a 33-items questionnaire for Iran and four-factor were extracted which accounted for 43.17% of the total variance: Violations (16.17%), dangerous errors (13.02%), lapses (8.37%) and aggressive behaviour (5.61%). Furthermore, a shortened version of the questionnaire could be better combined with other self-reporting and could be more useful in relative studies. Therefore, this study suggested a 20-items version in four axes, which is presented in the Appendix section (six violations, six errors, and six lapses, as well as two aggressive behaviours items). The reliability test (Cronbach's alpha) showed almost acceptable results for both versions.

Moreover, drivers answered some demographic questions and five more general self-assessment questions. A regression analysis was conducted to find the relation between factor scores as the dependent variables and the demographic and self-assessment questions as independents. Consequently, the influential parameters for each item were found, discussed and statistically supported. The results can be useful to all researchers investigating driver behaviours and hope to enhance roads safety.

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APPENDIX

Short version of DBQ

V1. Overtake a slow-moving vehicle on the inside lane or hard shoulder of a motorway

V2. Deliberately disregard the speed limits late at night or very early in the morning;

V3. Become impatient with a slow driver

in the outer lane and overtake on the inside;

V4. Get involved in unofficial 'races' with other drivers;

V5. Deliberately drive the wrong way down a deserted one-way street;

V6. Overtake a single line of stationary or slow-moving vehicles, only to discover that they were queueing to get through a one lane gap or roadwork lights;

E1. Misjudge speed of oncoming vehicle when overtaking;

E2. Misjudge your crossing interval when turning right and narrowly miss collision;

E3. Fail to notice someone stepping out from behind a bus or parked vehicle until it is nearly too late;

E4. In a queue of vehicles turning left on to a main road, pay such close attention to the traffic approaching from the right that you nearly hit the car in front;

E5. Fail to notice pedestrians crossing when turning into a side street from a main road;

E6. Hit something when reversing that you had not previously seen;

L1. Miss your exit on a motorway and have to make a lengthy detour;

L2. 'Wake up' to realize that you have no clear recollection of the road along which you have just travelled;

L3. Forget where you left your car in a multi-level car park;

L4. Intending to drive to destination A, you 'wake up' to find yourself en route to B, where the latter is the more usual journey;

L5. Intend to switch on the windscreen wipers, but switch on the lights instead, or vice versa;

L6. Distracted or preoccupied, realize belatedly that the vehicle ahead has slowed, and have to slam on the brakes to avoid a collision;

A1. Angered by another driver's behavior, you give chase with the intention of giving him/her a piece of your mind;

A2. Have an aversion to a particular class of road user, and indicate your hostility by whatever means you can;

V: Violations;

E: Errors;

L: Lapses;

A: Aggressive;