



The 9th International Conference on Ambient Systems, Networks and Technologies (ANT 2018)

Changes in Driving Behavior Across Age Cohorts in an Arab Culture: the Case of State of Qatar

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Abstract

In this investigation, we aimed to examine the structure of the Driving Behavior Questionnaire (DBQ) across age cohorts spanning 14 to 55 years in the State of Qatar. In addition, we aimed to examine variations in driving behavior across age cohorts. Participants were divided by age (in years) into five groups: not yet old enough to drive (under age), 18 to 25; 26 to 35; 36 to 45, and 46 to 55. The DBQ was administered to a sample of 1126 drivers, 50.30% of whom were female. Results are contrary to previous studies: factor analysis showed three pure factors rather than the four factors previously identified. Results also indicate that Qatari drivers share in their approach to driving even though there is great cultural diversity as well as varied language skills and educational levels. Significantly fewer driving aberrations were reported by female participants compared to those who were male. Furthermore, young men (<25 years old) with low levels of education and those who use 4-wheel-drive vehicles had the worst driving errors, violations, and lapses.

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Peer-review under responsibility of the Conference Program Chairs.

Keywords: Driving Behavior; Age cohorts; Arab Gulf; State of Qatar; Road safety

1. Introduction

Traffic safety is a primary challenge facing the world: more than 1.25 million fatalities were reported in 2013 by the World Health Organization ¹. Most Middle Eastern countries, particularly those in the Gulf Cooperative Council

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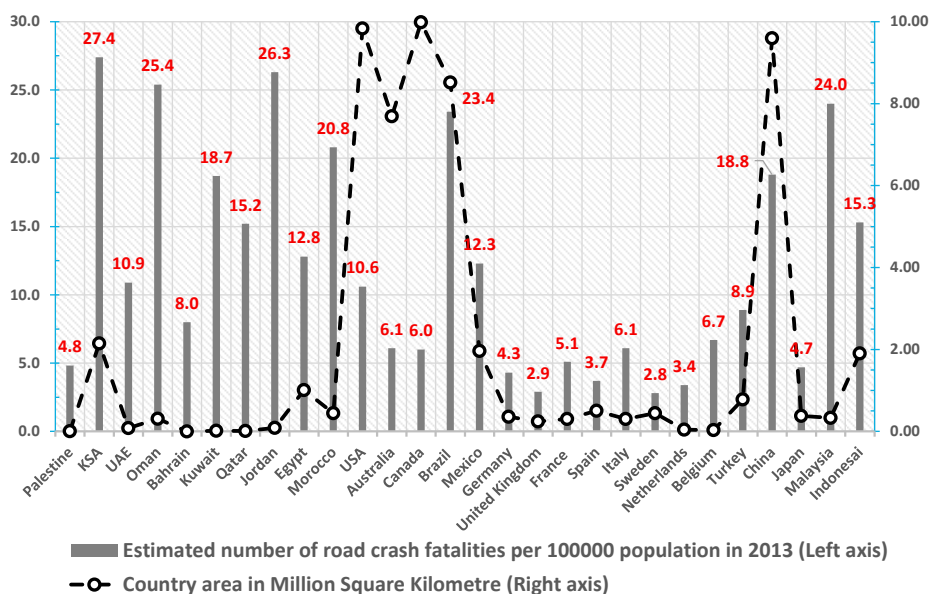


Fig. 1 Road traffic crash fatalities per 100,000 in populations in 2013

(GCC) such as Saudi Arabia, Bahrain, Kuwait, Qatar, United Arab Emirates, and Oman, have crash and fatality rates that rank among the highest in the world. A comparison of the 2015 road crash fatality rates for various countries², as shown in Fig. 1, indicates that the Saudi Arabia and Oman are among the countries with the highest fatality rates worldwide, highlighting the high risk of crashes experienced by KSA residents. Country size is also shown in Fig. 1 to allow comparisons based on total length of road network.

To overcome traffic safety problems, relevant authorities have made several attempts to mitigate risky behaviors on the road by introducing new or updating existing traffic regulations and enforcement, but this turned out to be draconian. The State of Qatar has given considerable attention to road safety in recent years, leading to substantial improvements in car crash rates in that country. In January 2013, the National Traffic Safety Committee in Qatar launched a National Road Safety Strategy 2013-2022 initiative consisting of a series of road safety action plans to prevent motor vehicle crashes.

In Saudi Arabia, studies have found that 76% to 80% of road traffic crashes are attributable to human factors^{2,3}. In a recent systematic review³, results showed that the majority of crashes in Saudi Arabia were caused by teenagers speeding, and the major contributing factor to crash severity was lack of seatbelt use. Furthermore, a cross-sectional survey⁴ showed that in a random sample of 1228 Qatari drivers, 26.6% had been involved in road traffic crashes, most prevalently among drivers aged 25 to 34 years. It was also shown that a prior history of traffic violations was a key indicator of car crash likelihood. Our findings are supported by research conducted in Oman⁵, where Royal Oman Police Force records were used to determine that young drivers aged 17 to 36 years represented 70% of the car crashes in that country.

Population-based research suggests that driver crash-involvement rates are highest among those aged 18 to 19 years, and these rates decrease with increasing age. For drivers aged 16 to 17 years, the driver-based crash rates were highest, and it was lowest among those aged 60 to 69 years. The findings were similar for mileage-based crash rates; however, as driver age increased, so did crash likelihood⁶. For example, drivers aged in their 70s experienced approximately the same number of crashes per mile as drivers in their 30s. Similarly, drivers aged 85 years or more experienced similar mileage-based crash rates as their 20- to 24-year-old counterparts. Injury and death rates for people outside the vehicle were similar for those inside. Drivers aged 85 years or more had the greatest death rates per driver and per mile; however, this is likely because it is difficult for people of advanced age to survive a traumatic experience, a factor not directly attributable to the crash rate. Overall, these findings suggest that driving capabilities, as related to crash rates, evidently differ across age cohorts⁶.

Many studies have highlighted that driver behavior is a predominant influencing factor for more than 90% of car crashes^{7,8}. Some have investigated the influence of traffic errors such as driver distractions^{9,10} and difficulties in recognizing hazards¹¹. Driver distraction, which usually involves a secondary activity such as making a phone call, is considered the primary human factor contributing to crashes^{12,13}. Other studies highlighted that alcohol, fatigue, and medications significantly deteriorate driving performance, possibly leading to traffic crashes¹⁴⁻¹⁷. Growing research interest has focused on driver demographics in particular as key determining factors in car crash involvement.

The personal characteristics and cultural backgrounds of drivers play important roles in forming their attitudes and risk-taking behaviors while driving, contributing significantly to traffic safety. According to the literature, driver characteristics such as age and gender are strongly associated with a tendency toward risky driving behavior. Harre et al.¹⁸ investigated driving behavior differences between young male and female drivers. Data relevant to demographics, driving status, traffic laws, and crash involvement were collected using a self-report, revealing that male drivers are more likely to drive in an unsafe or risky manner, speed, and be involved in a crash. Many other studies have been conducted [¹⁹20-23] to explore correlations between age and sex and driving behaviors such as seatbelt use, speeding, and others. All these studies have identified younger drivers as the more aggressive and risk-taking drivers.

Research investigating human factors has shown conflicting findings. Perhaps this lack of consistency is the result of an artificial division of participants into groups (with vs. without crashes) based on high versus low scores on self-reported measures of driving violations. Most of these studies were conducted based on simulated driving situations, and very few used participants involved in crashes and/or driving violations in real life situations. Furthermore, the stress that a participant experience while being under examination and observation in empirically-designed studies could bias their performance while under investigation.

In general, in Arab Gulf countries, the tendency is to structure driving behavior different compared to Western countries and even Middle Eastern countries¹⁹. For instance, the Emiratis reported more driving violations compared to individuals from Western/Northern Europe on the Driving Behavior Questionnaire (DBQ)^{20,21} and also compared to drivers from South Europe/Middle East²². A previous study by²³ showed that DBQ factors were related to traffic crashes in samples of Emirati drivers. This implicates that Arab Gulf drivers lacked awareness of the differentiation between the various aspects of driver behaviors and their potential magnitudes in affecting traffic safety. Accordingly, the emerging DBQ factors, such as violations, lapses, or errors, were not found in Emirati drivers¹⁹. Furthermore,²⁴ noted that driving could be one of the few publically acceptable ways for men to show masculinity and hostility given that most drivers on Qatari roadways are men. Thus, this could be one explanation for the higher crash rates in Qatar, where male drivers have peers as cohorts²³.

In this study, we aimed to examine the structure of the DBQ and variations in driving behavior across various age cohorts in the State of Qatar in light of demographic characteristics such as sex, seatbelt use, car type, education level, and occupation.

2. Methodology

2.1. Participants

Participants were divided by age (in years) into five groups: not yet old enough to drive (under age), 18 to 25, 26 to 35, 36 to 45, and 46 to 55. The DBQ was administered to a sample of 1126 drivers, 50.30% of whom were female. Participants were recruited through the Department of Social Sciences in the College of Arts and Sciences at Qatar University via email communications. Participants were asked to complete an online questionnaire at the website <http://suwet.com>. Descriptive statistics for participant characteristics are shown in Table 1. The vehicle type used was reportedly a four-wheel-drive sport-utility vehicle for 38% of the participants, whereas it was a small sedan for 33.4%. It is alarming that 36.6% of the participants reported they do not use seatbelts while driving. Furthermore, 148 participants (13.1%) were under age (16 or 17 years old). This is not illegal according to a Qatari Traffic Police Department regulation: native Qataris aged 16 or 17 years can request a temporary driving license which can be used only in the presence of one parent in the front seat of the vehicle.

Table 1 Descriptive statistics for characteristics of survey participants

		Age Cohorts					Total (%)
		<18 (%)	18-25(%)	26-35(%)	36-45(%)	46-55(%)	
Gender	Female	124 (11.0)	126(11.2)	130(11.5)	104(9.2)	82(7.3)	566(50.3)
	Male	24(2.1)	112(9.9)	76(6.7)	160(14.2)	188(16.7)	560(49.7)
Education	Illiterate	26 (2.3)	24(2.1)	42(3.7)	36(3.2)	60(5.3)	188(16.7)
	Primary	14 (1.2)	30(2.7)	34(3.0)	66(5.9)	44(3.9)	188(16.7)
	Intermediate	28(2.5)	40(3.6)	34(3.0)	50(4.4)	36(3.2)	188(16.7)
	Secondary	62(5.5)	100(8.9)	62(5.5)	68(6.0)	84(7.5)	376(33.4)
	University	18(1.6)	44(3.9)	34(3.0)	44(3.9)	46(4.1)	186(16.5)
Occupation	Student	22(2.0)	40(3.6)	38(3.4)	44(3.9)	44(3.9)	188(16.7)
	Not working	24(2.1)	34(3.0)	28(2.5)	60(5.3)	42(3.7)	188(16.7)
	Professional	24(2.1)	26(2.3)	24(2.1)	58(5.2)	56(5.0)	188(16.7)
	Business man	22(2.0)	38(3.8)	48(4.3)	28(2.5)	52(4.6)	188(16.7)
	Housewife	32(2.8)	48(4.3)	36(3.2)	36(3.2)	36(3.2)	188(16.7)
	Army/police	24(2.1)	52(4.6)	32(2.8)	38(3.4)	40(3.6)	186(16.5)
Car type	4WD	48(4.3)	110(9.8)	68(6.0)	94(8.3)	108(9.6)	428(38.0)
	Van	38(3.4)	60(5.3)	68(6.0)	72(6.4)	84(7.5)	322(28.6)
	Small car	62(5.5)	68(6.0)	70(6.2)	98(8.7)	78(6.9)	376(33.4)
Seat belt use	Yes	116(10.3)	146(13.0)	122(10.8)	168(14.9)	162(14.4)	714(63.4)
	No	32(2.8)	92(8.2)	84(7.5)	96(8.5)	108(9.6)	412(36.6)
Total		148(13.1)	238(21.1)	206(18.3)	264(23.4)	270(24.0)	1126(100.0)

Table 2 Results of t tests performed to examine sample homogeneity

Age Cohorts	Gender	Age		t test(Sig.)	Driving Experience in months		t test (Sig.)
		Mean	SD		Mean	SD	
<18	Female	15.63	1.06	1.196 (ns.)	13.91	1.95	0.367 (ns.)
	Male	14.00	.02		14.13	1.86	
	Total	15.36	1.14		13.94	1.93	
18-25	Female	21.35	2.02	.096 (ns.)	20.30	5.01	0.543 (ns.)
	Male	21.31	1.99		20.82	5.39	
	Total	21.33	2.01		20.55	5.18	
26-35	Female	29.94	2.67	1.06 (ns.)	37.85	4.80	.224 (ns.)
	Male	30.51	2.58		38.08	5.19	
	Total	30.15	2.64		37.94	4.92	
36-45	Female	40.29	2.79	0.206 (ns.)	141.93	26.34	.002 (ns.)
	Male	40.39	2.69		141.92	24.26	
	Total	40.35	2.72		141.92	25.00	
46-55	Female	50.05	2.59	0.865 (ns.)	364.91	27.39	.570 (ns.)
	Male	50.14	2.69		367.95	29.23	
	Total	50.11	2.65		367.01	28.60	
Total	Female	29.78	12.09		96.16	122.04	
	Male	37.37	12.05		174.01	147.49	
	Total	33.55	12.65		134.81	140.66	

Note: There were no significant differences between males and females in either age or driving experiences in each age cohort.

A series of t tests were used to determine sample homogeneity (Table 2). Results show no significant differences between male and female drivers in either age or driving experience in every age cohort.

2.2. Instrument

The extended version of the DBQ²¹⁻²⁷ was used. It measures deviant driving behaviors using a six-point scale, comprising 50 items designed to determine irregular driving actions and practices. Respondents are to rate the frequency of experiencing or adopting specific driving behaviors, focusing on four main types of aberrant driving behaviors: errors, ordinary violations, aggressive violations, and lapses²⁸. This instrument has been widely applied and adapted in various countries in both Western and Eastern countries, demonstrating high external validity.

Table 3 The three- factor-loading solution for the 24-DBQ items

	Items	Factors		
		Violations	Errors	Lapses
1	Drive especially close to the car in front as a signal to its driver to go faster or get out of the way	.85		
2	Disregard the speed limits late at night or early in the morning	.83		
3	Disregard the speed limits on a motorway	.82		
4	Have an aversion to a particular class of road user and indicate your hostility by whatever means you can	.82		
5	Become impatient with a slow driver in the outer lane and overtake on the inside (right) lane	.78		
6	Get involved with unofficial ‘races’ with other drivers	.75		
7	Angered by another driver’s behavior, you give chase with the intention of giving him/her a piece of your mind	.72		
8	Sound your horn to indicate your annoyance to another driver	.67		
9	Attempt to overtake someone that you had not noticed to be signaling a left/right turn		.70	
10	Miss ‘give way’ signs and narrowly avoid colliding with traffic having right of way		.70	
11	Queuing to turn right/left onto a main road, you pay such close attention to the mainstream of traffic that you nearly hit the car in front		.69	
12	On turning right/left nearly hit a two wheeler who has come up on your inside		.62	
13	Fail to check your rear-view mirror before pulling out or changing lanes, etc.		.60	
14	Get into the wrong lane when approaching a roundabout or a junction		.47	
15	Underestimate the speed of an oncoming vehicle when overtaking		.44	
16	Apply sudden brakes on a slippery road, or steer wrong way in a skid		.39	
17	Get into the wrong lane when approaching a roundabout or a junction			.75
18	Misread the signs and exit from the roundabout on the wrong road			.74
19	Forget where you left your car in the car park			.74
20	Hit something when reversing that you had not previously seen			.61
21	Attempt to drive away from the traffic lights			.56
22	Switch on one thing, such as headlights, when you meant to switch on something else, such as wipers			.54
23	Intending to drive to destination A and, you ‘wake up’ to find yourself in			.49
24	Realize you have no clear recollection of the road along which you have been travelling			.46

Note: No significant differences were found between the sexes in either age or driving experience, no matter the age cohorts.

3. Results

Results are similar to those found in previous studies^{20, 23, 29}, revealing that when participant responses are compared by age, homogeneity was found. The same result is found when sex is the demographic used. As Helman and Reed²⁷ noted, the number of DBQ items has varied depending on culture and nation. The authors paid attention to the wording for each item in the Arab Gulf context. Hence, the original version of the DBQ was modified to suit the cultural context based on suggestions made by others²³. A total of 28 items were modified and clarified to suit the Arab Gulf context. Principal components analysis was performed for the factorability of the 28 modified DBQ items. Several well-recognized criteria for factorability of a correlation were used. For example, item loading was required to be at least 0.3. Four items were deleted because they did not load on any factor. The remaining 24 items were factor analyzed following the same criteria. Analysis revealed that 57.93% of the variance could be explained by three primary factors: violations, errors, and lapses. In particular, 8 items were loaded on Factor 1 (violations) and explained 23.71% of the variance, 8 items were loaded on Factor 2 (errors) and explained 18.78% of the variance, and 8 items were loaded on Factor 3 (lapses) and explained 15.44% of the variance. The factor-loading matrix for this solution is shown in Table 3.

Analysis of variance was performed to compare the mean differences of the primary independent variables according to the dependent factors. Table 4 shows only the significant results from the analysis. Results show significant relationships between age group and the dependent variables (i.e., violations, errors, and lapses). This remained true when the level of education was interacted with age group at 95% level. Significant interaction was found between education level and car type in all three primary dependent variables. Three-way significant Interaction between age group, education level, and car type) in all three dependent variables remained statistically significant.

Table 4 ANOVA analysis to compare the mean differences of the main independent variables (for only significant results)

Source	Dependent Variable	df	F	Sig.	Partial Eta Squared
Age Cohorts	Violations	4	29.06	.000	.12
	Errors	4	41.77	.000	.16
	Lapses	4	39.97	.000	.15
Age Cohorts * Education	Violations	16	4.31	.000	.07
	Errors	16	3.77	.000	.06
	Lapses	16	2.88	.000	.05
Age Cohorts * Car	Violations	8	1.62	.115	.01
	Errors	8	3.07	.002	.03
	Lapses	8	4.76	.000	.04
Education * Car	Violations	8	2.73	.006	.02
	Errors	8	1.99	.045	.02
	Lapses	8	3.17	.002	.03
Age Cohorts * Education * Car	Violations	31	1.82	.004	.06
	Errors	31	2.29	.000	.07
	Lapses	31	2.31	.000	.07
Age Cohorts * Education * Seat belt use	Violations	15	2.08	.009	.03
	Errors	15	1.55	.082	.03
	Lapses	15	2.92	.000	.05
Age Cohorts * Car * Seat belt use	Violations	8	2.86	.004	.03
	Errors	8	2.53	.010	.02
	Lapses	8	5.26	.000	.05
Gender * Education * Seat belt use	Violations	4	2.92	.020	.01
	Errors	4	3.58	.007	.02
	Lapses	4	2.60	.035	.01
Education * Car * Seat belt use	Violations	8	4.02	.000	.04
	Errors	8	2.96	.003	.03
	Lapses	8	3.35	.001	.03
Age Cohorts * Gender * Education * Car	Violations	11	3.58	.000	.04
	Errors	11	4.11	.000	.05
	Lapses	11	4.56	.000	.05

Furthermore, consistent with previous results³⁰, our findings indicate that gender effect on safe driving habits: for example, women reported wearing seatbelts more frequently than men. Finally, occupation was found to have no significant effect on any independent variable.

These findings suggest that individual Qatari residents share similarities in their approach to driving even though there is great diversity among them, particularly in cultural backgrounds. Another significant finding is that three key factors emerged from application of the DBQ: violations, errors, and lapses. The factor structure and reliability scores of the DBQ appear to represent the Qatari sample, refuting previous investigations that suggested the DBQ is not culture-specific to Gulf countries^{23,31}. This might be because traffic laws and their applications in Arab Gulf countries are not as standardized as in Western countries³². Interestingly, these results also indicate that drivers in the State of Qatar are unaware of differences in driver behavior on the road, and this has consequences on traffic safety and crash potential. Therefore, Qatari drivers might benefit from driving programs that incorporate learning about differentiating between violations, errors, and lapses³³.

This investigation was limited in that it was based entirely on self-reported driving behavior, and no observational techniques were employed. However, many studies have found that self-reported driving behavior corresponds to actual driving performance³⁴. Stutts et al.³⁵ found that social desirability bias in the DBQ is minimal with respect to crashes rates, though it is possible that drivers can forget or underestimate the number of driving crashes they have been involved in over many years of driving. Future investigations should compare the effect of nationality to determine whether this is a key factor affecting driving behavior in Qatar.

4. Conclusions

In this study, we aimed to examine the structure of the DBQ and use it to discover variations in driving behaviors

across various age cohorts in the State of Qatar in light of specific demographics such as sex, seatbelt use, car type, education level, and occupation. This investigation was performed using individuals aged 14 to 55 years. Contrary to the literature, factor analysis revealed three pure factors rather than four [27]. Results show significant differences throughout the five age cohorts (<18 years, 18-25, 26-35, 36-45, and 46-55) in three safety components (violations, errors, and lapses). The age group that committed these driving aberrations most frequently were those aged 18 years or less, followed by those aged 18 to 25 years. Also, individuals who use 4-wheel-drive vehicles and/or who do not wear seatbelts reported more driving aberrations. Additionally, those with low to medium levels of education were more likely to commit each of the driving aberrations. Interestingly, results show that female drivers are more safe than their male counterparts in that they report significantly fewer driving aberrations. Furthermore, female drivers with higher levels of education wore their seatbelts more and committed driving aberrations much less frequently than their male counterparts. Moreover, young male drivers (aged less than 25 years) with low levels of education and who use 4-wheel-drive vehicles were the worst in frequency of committing driving violations, errors, and lapses. This highlights the need for a comprehensive review of the driver education and licensing process in the State of Qatar because these young drivers are significantly affected by the education received while obtaining a driving license.

Acknowledgment

This publication was made possible by an NPRP award [NPRP 9-360-2-150] from the Qatar National Research Fund (a member of The Qatar Foundation). The statements made herein are solely the responsibility of the authors. Furthermore, authors deeply appreciate the Department of Social Sciences in the College of Arts and Sciences at Qatar University for recruiting participants.

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