IATSS Research 43 (2019) 286–296

Contents lists available at ScienceDirect

IATSS Research

Research Article

Traffic safety culture of professional drivers in the State of Qatar

Chantal Timmermans [a], Wael Alhajyaseen [a,*], Nora Reinolsmann [a], Hideki Nakamura [b], Kazufumi Suzuki [c]

[a] Qatar Transportation and Traffic Safety Center, Qatar University, Doha, P.O. Box 2713, Qatar
[b] Graduate School of Environmental Studies, Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8603, Japan
[c] Department of Civil Engineering, Gunma College, National Institute of Technology, 580 Toriba-machi, Maebashi 371-8530, Japan

ARTICLE INFO

Article history:
Received 17 July 2018
Received in revised form 11 December 2018
Accepted 25 March 2019
Available online 5 April 2019

Keywords:
Professional drivers
State of Qatar
Traffic safety culture
Traffic law
Traffic violation
Crash risk

ABSTRACT

Professional drivers play a significant role within the traffic system of the State of Qatar. With developing infrastructure, the need for professional drivers is growing. However, knowledge is lacking about their perception of traffic safety. Therefore, this study investigates the personal acceptance of risky driving and suggested traffic laws among this specific group of drivers, in order to create understanding about their likelihood to commit certain risky driving behaviors and their resistance to the implementation of certain traffic laws. The aim of this study is to establish which personal attributes of professional drivers in Qatar could influence a high likelihood to commit risky driving behaviors, estimating which specific groups of professional drivers impose the highest risk to violate certain traffic laws. Results indicate that transportation mode, origin and years of driving experience are all personal attributes that have a significant impact on the professional driver's risk to commit risky driving behaviors and their opposition to the implementation of related traffic laws. Distressing results have been found for the high likelihood to violate speed in school zones and the high risk to be distracted by any type of phone use while driving, suggesting the need to put emphasize on these safety hazards during the training programs of professional drivers at professional driving schools in the State of Qatar.

1. Introduction

On a global level traffic safety is a challenging and very serious problem due to the high number of traffic fatalities and injuries. In general, the Gulf Cooperative Council (GCC) countries such as Saudi Arabia, Bahrain, Kuwait, Oman, UAE and Qatar have high numbers of traffic related deaths and injuries (Burgut et al. [1]; Islam & Al Hadhrami [2]; Mansuri et al. [3]; WHO [4,5]).

However, awareness is raised and serious attempts have been made by certain countries, such as Qatar, to counteract this serious issue aiming to improve traffic safety. The National Traffic Safety Strategy was developed for the State of Qatar in 2013 and contains a 10 year plan to develop a safe and maintainable transportation system and to improve Qatar's international position on road safety management. The plan is divided in two phases and includes the participation of a variety of traffic safety related authorities. Phase 1 has recently been completed during the last five years (2013–2018) and the second phase is currently starting continuing for another five years from 2018 to 2022. The first phase has proven successful in decreasing the number of traffic related mortalities from 235 in 2013 to 178 in 2016 (Ministry of Interior Qatar [6]). This achievement led to a significant improvement of Qatar's global ranking within the United Nations classification to a 49th position with lower traffic mortality rates than the worldwide average, making Qatar the first Arab nation to achieve United Nations Development goals. According to the Qatar Ministry of Interior, the goal of the National Traffic Safety Strategy for the coming five years is to reduce serious traffic injuries and decrease traffic related deaths with 50% with an ultimate objective of 130 traffic mortalities and 400 serious traffic related injuries in 2022. Furthermore, the strategy implemented in the State of Qatar aims to decrease pedestrian mortality by implementing pedestrian crossing and bicycle lanes, improving traffic safety in school areas and reducing traffic congestion through the implementation of a sustainable road and transportation network. Consequently, an increased development of road structure has taken place in the State of Qatar and the infrastructure has been remarkably extended with the eye on the year 2022 in which Qatar is hosting the FIFA World Cup. In line with this, the public transportation sector is beginning to play a significant role within the Qatar traffic and transportation system leading to a growing need for professional drivers. Professional drivers will become a larger and more important driving population; therefore, the perception of traffic safety, driving skills and driving style of professional drivers will affect the traffic safety on the public roads in the state of Qatar.

* Corresponding author.
E-mail addresses: t.chantal@qu.edu.qa (C. Timmermans), wyaseen@qu.edu.qa (W. Alhajyaseen), nora.reinolsmann@qu.edu.qa (N. Reinolsmann), nakamura@genv.nagoya-u.ac.jp (H. Nakamura), ksuzuki@cvl.gunma-ct.ac.jp (K. Suzuki).
Peer review under responsibility of International Association of Traffic and Safety Sciences.

https://doi.org/10.1016/j.iatssr.2019.03.004

The professional driver sample in the State of Qatar has special characteristics and unique attributes, especially with regards to the professional drivers' origin. Qatar has a very heterogeneous driver population with a large variety of nationalities and >90% of the general driver population in the State of Qatar is non-Qatari. The latter is significant especially among the professional driver population, as professional drivers appear to be all non-Qatari. Previous research conducted in Saudi Arabia confirmed that the high number of expatriate professional chauffeurs, among the heterogeneous driver population, lead to a variety of traffic habits and different linguistic communication skills, which increases traffic congestion and decreases traffic safety (Alhajyaseen et al. [7]). Therefore, the large heterogeneous population of professional drivers with diverse cultural backgrounds in this study emphasize the importance to study the traffic awareness, safety perception and social- and personal attitudes towards risky driving behaviors for the professional drivers in the state of Qatar. Hence, this study examines whether there is a difference among various nationalities and traffic safety culture among professional drivers in the State of Qatar.

1.1. Literature review

The high number of traffic crashes and traffic casualties within the State of Qatar and other GCC countries has been previously studied in order to understand the relationship between traffic safety and personal attributes such as age, gender, nationality and driving experience. Worldwide, young age was linked to a higher risk for traffic crashes, as do increased years of driving experience at an older age (Tefft [8]). These results were confirmed for the State of Qatar, revealing diverse driving behaviors and related driving abbreviations and traffic violations across different age cohorts (Soliman et al. [9]). Within the State of Qatar professional drivers are regular road users with a normally distributed age range, but with various years of experience driving inside the State of Qatar. For that reason, studying the professional driver sample, this study intends to examine the influence of years of driving experience in relation to risky driving behaviors among professional taxi and public bus drivers, rather than the exploring the differences in age cohorts on driving behavior in the state of Qatar, as conducted by Soliman and colleagues in 2018. In line with this, previous research have found driving behaviors to be related to traffic crashes (Behnood & Pakgohar [10]; Ergun & Al-Khaldi [11]). Diverse factors have been found to influence driving behavior and increase the likelihood of car crashes; for instance, driver distraction (Dibben & Williamson [12]; Klauer, Dingus et al. [13]; McEvoy et al. [14]), phone use while driving (McCarley et al. [15]; Papadakaki et al. [16]; Strayer et al. [17]; Stutts et al. [18]), struggling to identify safety hazards (Underwood et al. [19]), alcohol (Williamson et al. [20]), sleepiness (Ingre et al. [21]; James [22]) and the use of medication (Alvarez & Fierro [23]). This study will examine the effect of individual and different types of risky driving behaviors and suggests a higher risk of traffic crashes among groups of drivers with higher likelihood to commit risky driving, this link between risky driving behavior and traffic crashes is based on previous research as described above.

With a heterogeneous driver population like that of the State of Qatar, the effect of origin on traffic safety should be considered. Previous study have found relationship between nationalities and driving behavior, traffic violations and traffic crashes, with Arabic nationalities reporting more traffic violations in comparison to Western nationalities. Among Arab nationalities, GCC countries report more traffic crashes and violations than other countries in the Middle East (Abay & Mannering [24]; Bener et al. [25]; Blockey & Hartley [26]; Lajunen et al. [27]; Özkan et al. [28]). In accordance, personal attributes and cultural background affect the formation of both attitudes towards risk taking and actual risky driving behavior (Constantinou et al. [29]; Soliman et al. [9]), influencing the traffic safety and determining the driver's traffic safety culture. Hence, it is essential to study the effect of origin on driving behavior and safety perceptions, especially in a heterogeneous professional driving population as in the State of Qatar. While Alhajyaseen and colleagues studied professional drivers in the Kingdom of Saudi Arabia, the effect of origin on risky driving behaviour is not studied for the professional drivers in the State of Qatar, making this study contribute to previous research.

The traffic safety culture of drivers is reflected by the beliefs and attitudes within their own community towards traffic safety related matters. It is defined as a "the socially constructed abstract system of meaning, norms, beliefs, and values held by a group of people" (Myers et al. [30], page 26). Similar cognitions are often shared by a group of people from the same origin which influences the behavioral choices of the individual group members in return. In accordance, the theory of planned behavior confirms that personal attitude and social norm are important predictors of intended risk behaviors (Ajzen [31]). "Traffic-safety culture" is depicted in the literature as a construct that help to explain why drivers engage in risky or safe driving behaviors (Connor et al. [32]). It is also related to the provision of support or opposition towards existing traffic safety policy and laws (Rakauskas et al. [33]). Traffic safety culture is seen as a contextual construct to define high and low risk groups of drivers, based on cultural perceptions that shape both general and personal attitudes and beliefs about traffic safety and their relation to specific driving behaviors (Ward et al. [34]). For that reason, to investigate Traffic Safety Culture within the professional driver sample in the State of Qatar, this study explores four key aspects of traffic safety culture; the perception of changes in traffic problems in Qatar, the social acceptance of risky driving behaviors, the personal acceptance of risky driving behaviors and the support or opposition to implement new traffic laws.

At first, the perception of changes in traffic issues in comparison to three years ago is determined among the professional drivers in Qatar. With the currently very important execution of the National Traffic Safety Strategy within the State of Qatar, large amount of traffic developments have been implemented in order to create a safer and less problematic traffic environment. Hence, it is important to assess how professional drivers have experienced these traffic developments and if they noticed changes in traffic issues in comparison to a couple of years ago. Professional drivers are a valid sample to assess the practical implementation of the current safety strategies, because they are very frequent drivers and often daily traffic participants.

The second assessment of 'Traffic Safety Culture' among the professional drivers in Qatar is the social norm, the social acceptance of risky driving. The social acceptance describes how acceptable and likely it is among the professional driver population to commit risky driving behaviors. Social acceptance of risky driving by other drivers is perceived as indicator for personal acceptance of risky driving behaviors. Therefore, this study emphasizes the importance to establish that there is no discrepancy between social acceptance and personal acceptance of risky driving.

Thirdly, the professional driver's personal acceptance of risky driving is an essential aspect of traffic safety culture examined in this study. Personal attitude towards and acceptance of a particular risky behavior is an indicator of the driver's individual likelihood to commit this specific risky driving behavior (Cestac et al. [35]). Therefore, by examining and understanding the personal acceptance of a variety of risky driving behaviors this study aims to estimate the professional driver's level of risky driving.

Finally, the opposition or support for implementation of potentially new traffic laws is investigated. Law-abiding professional drivers are expected to be supportive of suggested traffic laws, as they are positive towards implementation to improve traffic safety. On the other hand, professional drivers who are at greater risk for unsafe or risky driving are expected to oppose to the implementation of stricter traffic laws, as this increases their likelihood to get punished for their risky driving behaviors.

1.2. Study objectives

This study aims to establish whether professional drivers in Qatar perceive a reduction of traffic problems compared to three years ago, despite the enactment of the National Traffic Safety Strategy. Secondly, this study aims to identify high level of acceptance of risky driving among professional drivers with a variety of personal characteristics. High levels of acceptance is translated into high likelihood to commit unsafe or risky driving behaviors, suggesting a higher risk level among professional driver groups with these specific characteristics.

Finally, this study compares different groups of professional drivers based on their resistance to the implementation of potentially new traffic laws. Therefore this study investigates whether professional drivers who oppose to the implementation of certain traffic laws are indeed also more likely to commit related risky driving behaviors.

Understanding the traffic safety culture among professional drivers in the State of Qatar is essential to counteract risky driving among this driver population. Besides, gaining knowledge about the traffic safety culture is an essential aspect in order to continue improving Qatar's traffic safety developments. The knowledge derived from this study can be applied in professional driver training strategies during the licensing process and for specific skill development, which can become focal points within driving schools who educate professional drivers.

2. Methodology

2.1. The questionnaire on traffic safety culture for drivers

The questionnaire was created to measure the traffic safety culture among drivers within the same geographical and cultural environment. The questionnaire was part of a global research project conducted by the International Association of Traffic and Safety Sciences (IATSS) in which the traffic safety culture within different countries are compared on an international level. In comparison to other countries, the state of Qatar characterizes itself by a highly heterogeneous driving population, with a large variety of nationalities on the Qatari roads. For that reason the questionnaire was provided in both the Arabic and English languages.

The questionnaire on traffic safety culture of professional drivers used in this study has five sections measuring different aspects of traffic safety culture. The questionnaire starts in Section 1 with demographics questions to establish personal attributes of drivers. Information was asked about the driver's age, gender, nationality, frequency of driving, type of car, years of driving experience in Qatar or another GCC country, number of traffic violations committed in the past two years and number of traffic crashes over the past two years. Section 2 of the questionnaire measures the perceived change in traffic congestion, traffic safety, aggressive drivers, distracted drivers and intoxicated drivers on Qatari roads in comparison to three years ago. Section 3 of the questionnaire measures the social norm with regards to risky driving behaviors; the social acceptability to violate speed limit, use a phone while driving, driving without using the seatbelt, sleepy driving, crossing a red light and driving while intoxicated with drugs or alcohol. Section 4 of the questionnaire measures the driver's personal acceptability of the abovementioned risky driving behaviors. This section measures the driver's personal likelihood to commit these risky behaviors, in order to make suggestions for the level of risky driving. Section 5 of the questionnaire is measuring the driver's personal support or opposition towards implementation of new traffic laws. The traffic laws described in the questionnaire are related to forbidding phone use while driving, automatically fining overspeeding, automatically penalizing red light crossing and implementation of alcohol locks and anti-distraction devices inside cars.

2.2. Professional drivers' sample

The required sample of professional drivers were collected from Karwa professional driving school which is the only governmental driving school in the State of Qatar. Karwa professional driving school is responsible for the training, licensing, follow-up, and the overall management of the professional drivers' work (taxi and public bus drivers) in the state of Qatar.

The traffic safety culture was measured using the developed questionnaire that was distributed among Karwa professional taxi and public bus drivers in a paper-and-pencil format. The professional drivers were divided into smaller groups, gathered in a classroom under the supervision of one driving school instructor. The driving instructor remained present to supervise individual completion of the questionnaire and prevent discussion among the participants. The instructor did not discuss the questionnaire, but the only verbal instructions the instructor gave at the beginning of the questionnaire was the explanation of the purpose of the Traffic Safety Culture questionnaire and the task to complete the questionnaire individually.

The sample used for this study are professional drivers, driving a public bus or taxi. Nonetheless, not all the professional taxi and public bus drivers were used for the analysis, as certain cases were excluded from the sample in order to minimize bias and uncertainty. As sampling strategy, a selection of drivers from the professional driver population in the State of Qatar was made based on the characteristics of the driver; thus, for this sample selection certain conditions had to be met for the drivers to be included in the sample. Exclusion of certain professional drivers was based on the small number of drivers with a specific characteristic such as gender. There were only three female professional drivers, which is a number too small to make comparison with male. Furthermore, since the main population of professional drivers in Qatar is male, this study wanted to control for the effect of gender, minimize bias and increase the opportunity to generalize the results to the male professional driving population. Therefore, the three female drivers were excluded for further analysis.

2.3. Analysis

A descriptive analysis was conducted on the first, demographics section of the questionnaire on traffic culture safety, in order to have an idea of the characteristics of professional taxi and public bus drivers in Qatar. The second section of the questionnaire, measuring the driver's perception of change in traffic problems over the past three years, was also analyzed using a descriptive analysis.

By comparing the professional drivers' answers on the social acceptability and personal acceptability of risky driving behaviors, this study investigates whether there is discrepancy between social norm and personal attitude towards risky driving behaviors. By transferring the scores into a quantitative scale, a paired *t*-test was conducted in order to compare the means for social acceptability and personal acceptability of the same professional driver.

Certain personal attributes of the professional driver population are characteristic and unique for the State of Qatar. For instance, Qatar has a very heterogeneous driver population with a large variety of nationalities. For that reason, this study examines whether there is a relationship between nationality and personal attitudes towards risky driving behavior or opposition to certain traffic laws. Secondly, the professional driver population that is educated at Karwa professional driving school contains of public bus and taxi drivers, making it interesting to examine the difference between the two types of professional drivers. Finally, as age is heterogeneously distributed among the sample of professional drivers, this study suggests to analyze the influence of years of driving experience instead of the effect of age.

Chi-square tests were conducted in order to analyze the relationship between the personal attributes 'type of professional driver', 'nationality' and 'years of driving experience in Qatar' and the personal attitude and social norm in acceptance of risky driving behaviors. Moreover, the relationship between the abovementioned personal attributes and the opposition to the implementation of suggested traffic laws are also analyzed using chi-square tests. A Bonferroni post-test correction was

conducted for each chi-square analysis aiming to reduce the number of false positive results and prevent Type I error due to the multiple comparisons made in the Chi-square analyses.

3. Results

3.1. Professional driver sample in the state of Qatar (questionnaire Section 1)

The collected sample of professional drivers in this study consists of 343 male drivers with a heterogeneous origin and age, ranging from 22 to 59 years of age with an average age of 36. The professional driver's nationality was divided into four regional origin categories, as visible in Fig. 1. The Arabic drivers have a Yemeni nationality, the Southeast Asian drivers are Filipino and the South Asian drivers are represented by nationalities from India, Pakistan, Bangladesh, Nepal and Sri Lanka. The majority of professional drivers have an African origin with nationalities from Eritrea, Ethiopia, Kenya, Sudan, Tanzania and Uganda. From the 343 professional drivers, 253 males were public bus drivers and 90 males were taxi drivers. All the professional drivers had a low income, with the majority of the professional drivers earning less than QAR 5000 and only 3% earned more than QAR 10000. The frequency of driving for all the professional drivers in Qatar was very frequent; the majority drove daily and only 5% of the drivers drove several times a week. Furthermore, the majority of 81% of the professional drivers did not commit a traffic violation over the past two years, 13% had one traffic violations a year, and 6% had more than one traffic violation a year. A similar trend was visible for the traffic crashes, with the vast majority of 83% of the professional drivers who did not experience a traffic crash over the past two years, 13% crashed one time a year, and only 4% had more than one traffic crashes a year. Fig. 2(a) shows the professional driver's age cohorts and Fig. 2(b) displays the driving experience among the professional drivers in the State of Qatar.

3.2. Perception of change in traffic issues compared to three years ago (questionnaire Section 2)

Section 2 of the questionnaire measures the perceived change in traffic congestion, traffic safety, aggressive drivers, distracted drivers and intoxicated drivers on Qatari roads in comparison to three years ago. The question “For each of the following issues, please tell us how much of a problem it is, compared to 3 years ago...” could originally be answered with 5 answer options; much smaller problem, somewhat smaller problem, unchanged, somewhat bigger problem and much bigger problem. For the purpose of this study the scoring scale has been converted into a three answer options; smaller problem, unchanged, bigger problem. As Section 2 of the questionnaire investigates the perception of drivers over the last three year, it is required for this analysis to exclude drivers with less than three years of driving experience within the State of Qatar. Fig. 3 provides the response frequency for each traffic issue, indicating the changes in traffic problems over the past 3 years perceived by professional taxi and public bus drivers in the State of Qatar.

3.3. Professional drivers' personal acceptance of risky driving behaviors (questionnaire Section 4)

The personal acceptance of risky driving behaviors is an indicator of the driver's individual likelihood to take risks while driving. This study examines the personal likelihood to risky driving among professional drivers in the state of Qatar, in order to establish an estimation of the professional drivers' risk level.

The initial questionnaire measuring the acceptance of risky driving behaviors in Section 4 was using a scoring scale with four answer options; completely unacceptable, somewhat unacceptable, somewhat acceptable and completely acceptable. For the purpose of this study and to improve future practical implementation, the scoring scale has been converted into three ordinal scaling categories; low likelihood to violate, average likelihood to violate, and high likelihood to violate. This creates a three levelled scale describing the likelihood to commit twelve specific risky driving behaviors. Professional drivers who would never commit that specific risky driving behavior are indicated as “low likelihood” and are suggested to be a low risk driver. Professional drivers who sometimes do and sometimes do not commit the risky driving behavior are indicated as “average likelihood” and are estimated at medium risk professional drivers. Finally, professionals who certainly would commit the risky driving behavior are indicated as “very likely” and are proposed to represent high risk professional drivers. For description of all questions asked in Section 4 of the questionnaire and the conversion of the scoring scale, this study refers to Table 1. The risky driving behaviors and the scoring scales in Section 4 of the questionnaire are exactly similar to the risky driving behaviors asked in Section 3 of the questionnaire which measures the social acceptance of risky driving. Therefore, this study also refers to Table 1 when describing the risky driving behaviors asked within Section 4 of the questionnaire.

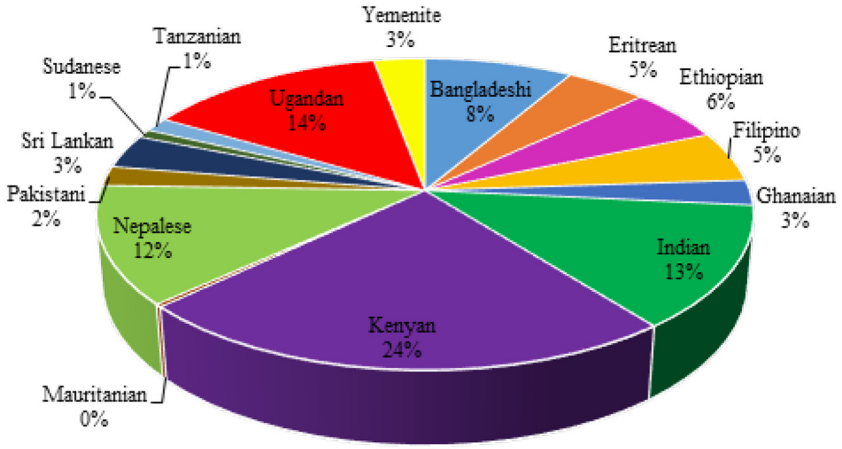


Fig. 1. Heterogeneous professional driver population in the State of Qatar ($N = 343$).

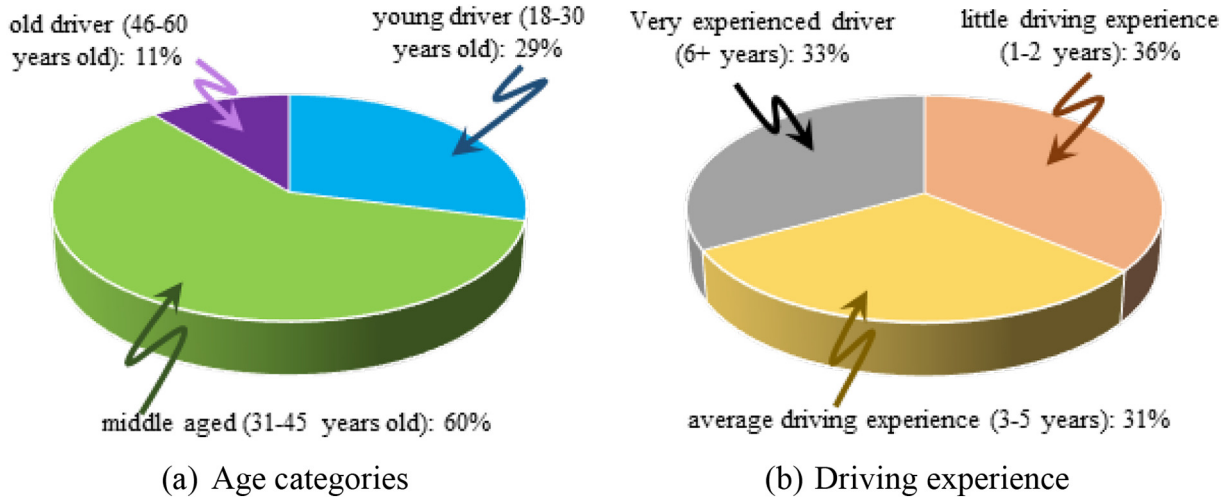


Fig. 2. Heterogeneous professional driver population in the State of Qatar ($N = 343$).

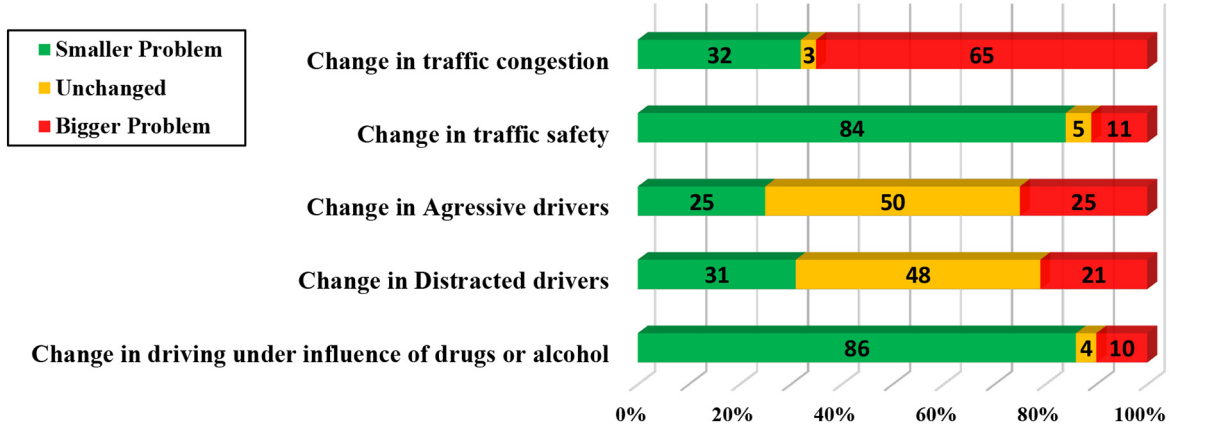
Moreover, Table 1 provides the response frequency for each risky driving behavior, along with the percentage of the complete professional drivers' sample. As displayed in Table 1, the results indicate that the majority of professional drivers score a low likelihood to commit most of the risky driving behaviors, except for 'hands-free phone use'. For the risky behavior 'hand-free phone use while driving', the proportion of professional drivers scoring a high likelihood is similar to the proportion scoring a low likelihood. Despite the relatively low numbers of professional drivers indicating to be very likely to commit most risky driving behaviors, this study is still interested in comparing these specific professional drivers, aiming to estimate which group poses the highest level of risk.

3.3.1. Personal acceptance in relation to social acceptance of risky driving behaviors

The social acceptance among the professional drivers describes how acceptable and likely it is for other drivers to commit risky driving behaviors. Social acceptance of risky driving behaviors, also referred to as social norm, is perceived in the literature as indicator for personal acceptance of risky driving behaviors. For that reason, this study emphasizes the importance to investigate and confirm that there is no discrepancy between social acceptance and personal acceptance of risky driving.

Social acceptance and personal acceptance of risky driving behaviors are both considered as indicator for likelihood to commit unsafe or risky driving. Therefore, both the professional driver's score on social acceptance and personal acceptance are analyzed using the same ordinal scoring categories; low likelihood to commit risky driving behaviors, average likelihood to commit risky driving behaviors, and high likelihood to commit risky driving behaviors.

Results indicate that based on comparison of the professional driver's scores, there are no significant differences between the social likelihood to commit risky driving behaviors and the personal likelihood to commit risky driving behaviors, confirming that there is no discrepancy. For that reason, this study will use the driver's personal acceptance and likelihood to commit unsafe or risky driving as equivalent and representative measure for the social acceptance and likelihood of other drivers to commit risky driving.



	Change in driving under influence of drugs or alcohol	Change in Distracted drivers	Change in Agressive drivers	Change in traffic safety	Change in traffic congestion
Smaller Problem	189 (86%)	68 (31%)	55 (25%)	185 (84%)	70 (32%)
Unchanged	9 (4%)	106 (48%)	110 (50%)	11 (5%)	7 (3%)
Bigger Problem	22 (10%)	46 (21%)	55 (25%)	24 (11%)	143 (65%)

Fig. 3. Perceived changes in traffic problems over past 3 years. ($N = 220$).

Table 1
Section 4 of the Questionnaire – Personal Acceptance of risky driving behaviors ($N = 343$).

How acceptable do you personally feel it is for a driver to...?	Completely unacceptable	Somewhat acceptable & Somewhat unacceptable	Completely acceptable
	Small likelihood to violate N (%)	Average likelihood to violate N (%)	High likelihood to violate N (%)
Q1: Drive 20 km per hour over the speed limit on a freeway/highway	282 (82%)	27 (8%)	34 (10%)
Q2: Drive 10 km per hour over the speed limit on a residential street	192 (38%)	180 (52%)	34 (10%)
Q3: Drive 10 km per hour over the speed limit in an urban area	130 (38%)	188 (55%)	25 (7%)
Q4: Drive 10 km per hour over the speed limit in a school zone	152 (44%)	133 (39%)	58 (17%)
Q5: Talk on a hands-free cell phone while driving	147 (43%)	54 (16%)	142 (41%)
Q6: Talk on a hand-held cell phone while driving	327 (95%)	9 (3%)	7 (2%)
Q7: Type text messages or e-mails while driving	332 (97%)	7 (2%)	4 (1%)
Q8: Drive when they're so sleepy that they have trouble keeping their eyes open	322 (94%)	10 (3%)	11 (3%)
Q9: Drive without wearing their seatbelt	334 (97%)	5 (2%)	4 (1%)
Q10: Drive with passengers not wearing seatbelts	320 (93%)	18 (5%)	5 (2%)
Q11: Drive through a traffic signal light that just turned red, when they could have stopped safely	325 (95%)	7 (2%)	11 (3%)
Q12: Drive when they think they are under the influence of alcohol/illegal drug	337 (98%)	1 (<1%)	5 (2%)

3.3.2. Relationship between transportation mode of professional driver and personal likelihood for risky driving

A chi-square test of independence was applied to investigate the relationship between high likelihood for risky driving and the transportation mode of the professional driver. The relationship between these variables was significant for two different risky driving behaviors after Bonferroni corrections. Table 2 reveals the significant relationships between professional public bus drivers in comparison to taxi drivers and a higher likelihood to risky driving. Professional taxi drivers were significantly more likely to overspeed >20 km on a highway than were professional bus drivers, X^2 (2, $N = 343$) = 19.00, $p < .001$. Professional public bus drivers on the other hand were significantly more likely to use their phone in hands-free mode while driving in comparison to professional taxi drivers, X^2 (2, N = 343) = 67.65, $p < .001$. No significant relationship was found for other risky driving behaviors.

3.3.3. Relationship between driver's origin and personal likelihood for risky driving

To examine the relation between high likelihood for risky driving and origin, a chi-square test of independence was performed followed up by a Bonferroni post-test. The relationship between these variables was significant for four risky driving behaviors after Bonferroni correction. Table 3 reveals the significant relationships between a higher likelihood for risky driving and origin, found within this sample of professional drivers in the State of Qatar. Professional drivers with a South Asian origin were significantly more likely to overspeed >10 km on a residential street, X^2 (6, $N = 343$) = 40.55, $p < .001$, and were significantly more likely to overspeed >10 km in an urban area, X^2 (6, N = 343) = 41.29, $p < .001$, in comparison to professional drivers with other origins. In line with this, South Asian professional drivers in Qatar are also significantly more likely to overspeed >10 km in a school zone than were professional drivers from other origins, X^2 (6, N = 343) = 48.72, $p < .01$. Significant relationship between origin and high likelihood for risky driving was also found for driving when feeling so sleepy that driver had trouble keeping their eyes open. Professional drivers with a South Asian origin are significantly more likely to drive while sleepy than were professional drivers with other origins, X^2 (6, $N = 343$) = 15.51, $p < .001$. No significant relationships were found for the other risky driving behaviors examined in this study.

3.3.4. Relationship between years of driving experience and personal likelihood for risky driving

A chi-square test of independence was conducted to examine the relation between high likelihood for risky driving and years of driving experience in Qatar or other GCC countries. The relationship between these variables was significant for four specific risky driving behaviors, after post-test Bonferroni correction. Table 4 reveals the significant relationship between professional drivers with different years of driving experience and a higher likelihood for risky driving. Professional drivers with more than five years of driving experience are more likely to overspeed >10 km in urban area (X^2 (4, $N = 343$) = 25.96, $p < .001$), on residential streets (X^2 (4, N = 343) = 21.24, $p < .001$) and inside school zones (X^2 (4, N = 343) = 29.38, $p < .001$), when compared to less experienced professional drivers. Very experienced professional drivers with more than five years of driving experience in Qatar are also significantly more likely to use their phone in hands-free mode while driving than professional drivers with less driving experience, X^2 (4, N = 343) = 27.44, $p < .001$. No significant relations were found for other risky driving behaviors.

3.4. Professional drivers' opposition to the implementation of potentially new traffic laws (questionnaire Section 5)

Section 5 of the questionnaire measured the driver's personal support or opposition towards the implementation of suggested new traffic laws. There were four answer options in the initial questionnaire; support strongly, support somewhat, oppose somewhat and oppose strongly. For the purpose of this study the scoring scale has been converted into two answer options; support implementation of law and oppose to implementation of law. For description of all traffic laws measured in Section 5 of the questionnaire and the conversion of the scoring scale this study refers to Table 5.

To investigate the drivers' opposition to implement new traffic laws for different groups of professional drivers, a chi-square test of independence was performed. The relationships between opposition to law

Table 2
Significant relationships between Higher likelihood to commit risky driving behavior and transportation mode after Bonferroni correction (N = 343).

Risky driving behavior	Group significantly higher likelihood	Group lowest likelihood	Bonferroni corrected significance level: $p = .0083$
Overspeed >20 km on highway	Taxi	Bus	$p = .0000$
Hands-free phone use while driving	Bus	Taxi	p = .0000

Table 3
Significant relationships between Higher likelihood to commit risky driving behaviors and Origin professional driver after Bonferroni correction (N = 343).

Risky driving behavior	Group significantly higher likelihood	Group lowest likelihood	Bonferroni corrected significance level: $p = .0042$
Overspeed >10 km residential streets	South Asian	African	$p = .0000$
Overspeed >10 km urban area	South Asian	African	$p = .0008$
Overspeed >10 km school zone	South Asian	African	$p = .0020$
Sleepy driving	South Asian	African	$p = .0002$

implementation and transportation mode, origin, and years of driving experience were separately examined. Table 5 provides the response frequency for each suggested traffic law, along with the percentage of the complete professional drivers' sample. As displayed in Table 5, results indicate that the majority of professional drivers indicate to support most of the suggested traffic laws. Nonetheless, the following traffic laws have a high proportion of professional drivers indicating to be opposed: law against any cell phone use (53%), law against overspeeding >20 km on a highway (48%), law implementing a personal alcohol lock for drivers previously prosecuted for DWI (42%) and law against overspeeding >10 km in a school zone (41%).

The relationship between transportation mode of professional drivers and opposition to traffic law implementation was significant for a variety of suggested traffic laws, after post-test Bonferroni correction. Table 6 shows the significant relationships between professional public bus drivers versus professional taxi drivers and opposition to implement traffic laws. Professional taxi drivers in Qatar are significantly more likely to oppose to the implementation of a law against reading, typing or sending a text message or email while driving, in comparison to professional bus drivers, X^2 (1, $N = 343$) = 15.10, $p < .001$. Accordingly, professional taxi drivers are significantly more likely to oppose to the implementation of a law against hand-held phone use while driving, in comparison to bus drivers, X^2 (1, $N = 343$) = 14.50, $p < .001$. On the contrary, professional public bus drivers are significantly more likely to oppose to the implementation of a law against any type of phone use, in comparison to professional taxi drivers, X^2 (1, N = 343) = 31.32, $p < .001$. Professional public bus drivers are significantly more likely to oppose to a law against automatic ticketing of overspeeding in comparison to professional taxi drivers. Professional public bus drivers are significantly more opposing a law against overspeeding of >20 km on a highway, X^2 (1, $N = 343$) = 51.78, $p < .001$, and significantly more opposing a law against overspeeding of >10 km in a school zone, both in comparison to professional taxi drivers, X^2 (1, $N = 343$) = 46.14, $p < .001$. With relation to the implementation of a new law of alcohol lock for drivers with a conviction for Driving While Intoxicated (DWI), professional public bus drivers are significantly more likely to oppose than are professional taxi drivers, X^2 (1, $N = 343$) = 48.56, $p < .001$.

The relationship between origin and opposition to implement a new traffic law was significant for three suggested traffic laws, after Bonferroni correction. Table 7 shows the significant relationships between different origin among the professional drivers in Qatar and opposition to implement traffic laws. Professional drivers with South Asian origin are significantly more likely to oppose to the implementation of a law against any use of phone while driving than are professional drivers from other origins, X^2 (3, $N = 343$) = 40.81, $p < .001$. Professional drivers with South Asian origin are also significantly more likely to oppose to the implementation of laws against overspeeding >20 km on a highway, in comparison to professional drivers with other origins, X^2 (3, N = 343) = 35.09, $p < .001$. With regards to opposition to implementing a law requiring a personal alcohol lock for DWI drivers, professional drivers with South Asian origin are significantly more likely to oppose than professional drivers with other origins, X^2 (3, N = 343) = 40.80, $p < .001$.

The relationship between years of driving experience in Qatar or other GCC countries and opposition to implement new traffic laws was also significant for four suggested traffic laws, after Bonferroni correction. Table 8 reveals the significant relationships between different years of driving experience among professional drivers and opposition to implement traffic laws. Professional drivers with >5 years of driving experience are significantly more likely to oppose to the implementation of a law against any use of phone while driving than are professional drivers with less driving experience, X^2 (2, $N = 343$) = 18.49, $p < .001$. Very experienced professional drivers with >5 years driving experience are significantly more likely to oppose to the implementation of a law against overspeeding >20 km on a highway, in comparison to less experienced professional drivers, X^2 (2, N = 343) = 26.39, $p < .001$. In accordance with this, professional drivers with >5 years driving experience are also significantly more likely to oppose to the implementation of a traffic law against overspeeding >10 km in a school zone, than are less experienced professional drivers, X^2 (2, N = 343) = 21.55, $p < .001$. Furthermore, experienced professional drivers are significantly more likely to oppose to implement a law requiring a personal alcohol lock for DWI drivers than are professional drivers with less driving experience, X^2 (2, N = 343) = 32.47, $p < .001$.

4. Discussion

Based on the presented analysis, the traffic safety on the Qatari roads are perceived by the professional taxi and public bus drivers to be less problematic in comparison to three years ago. This drivers' perception is in line with the reported reduction in annual number of traffic fatalities by 25% in 2018 compared to 2013, as a result of the implementation of the Qatar National Traffic Safety Strategy 2013–2022 (National Traffic Safety Committee [36]).

Intoxicated drivers on the Qatari roads are also perceived as less problematic. Distracted drivers and aggressive drivers are perceived to be a problem that is unchanged compared to three years ago, according to the perception of professional taxi and public bus drivers who are regular road users. Traffic congestion has become a bigger problem according to the perception of professional drivers, which can be explained by the significant increase in number of vehicles on roads combined with the ongoing several mega infrastructural projects such as hundreds of kilometers of expressways with many major interchanges, and the state of art subway system. These mega projects are associated with many detours and work zones along the road network,

Table 4
Significant relationships between High likelihood to commit risky driving behaviors and Years of driving experience in Qatar after Bonferroni correction (N = 343).

Risky driving behavior	Group significantly higher likelihood	Group lowest likelihood	Bonferroni corrected significance level: $p = .0056$
Overspeed >10 km residential streets	Very experienced (>5 y)	Little driving experience (<3 y)	$p = .0006$
Overspeed >10 km urban area	Very experienced (>5 y)	Little driving experience (<3 y)	$p = .0001$
Overspeed >10 km school zone	Very experienced (>5 y)	Little driving experience (<3 y)	$p = .0003$
Hands-free phone use	Very experienced (>5 y)	Little driving experience (<3 y)	$p = .0000$

Table 5
Section 5 of the Questionnaire – Support or Oppose implementation of laws ($N = 343$).

How strongly do you support or oppose...?	Support strongly & Support somewhat	Oppose strongly & Oppose somewhat
	Supporting implementation of law N (%)	Opposing implementation of law N (%)
Q1: Having a law against reading, typing, or sending a text message or email while driving	291 (85%)	52 (15%)
Q2: Having a law against using a hand-held cell phone while driving, for all drivers regardless of their age	296 (86%)	47 (14%)
Q3: Having a law against using any type of cell phone while driving, hand-held or hands-free, for all drivers regardless of their age	161 (47%)	182 (53%)
Q4: Having a law requiring all drivers who have been convicted of DWI (Driving While Intoxicated) to use a device that won't let the car start if they have been drinking, even if it's their first time being convicted of DWI	198 (58%)	145 (42%)
Q5: Requiring all new cars to have a built-in technology that won't let the car start if the driver's alcohol level is over the legal limit	317 (92%)	26 (8%)
Q6: Using cameras to automatically ticket drivers who drive >20 km per hour over the speed limit on freeways/highways	178 (52%)	165 (48%)
Q7: Using cameras to automatically ticket drivers who drive >10 km per hour over the speed limit on residential streets	298 (87%)	45 (13%)
Q8: Using cameras to automatically ticket drivers who drive >10 km per hour over the speed limit in urban areas	298 (87%)	45 (13%)
Q9: Using cameras to automatically ticket drivers who drive >10 km per hour over the speed limit in school zones	201 (59%)	142 (41%)
Q10: Using cameras to automatically ticket drivers who run traffic signal red lights in urban areas	328 (96%)	15 (4%)
Q11: Using cameras to automatically ticket drivers who run traffic signal red lights on residential streets	329 (96%)	15 (4%)
Q12: Having a law requiring all motorcycle riders to wear a helmet	331 (97%)	12 (3%)
Q13: Having the government regulate non-driving-related technologies in cars to make sure they don't distract drivers	317 (92%)	26 (8%)

which worsened the congestion problem and imposed more delays on road users.

The results derived from this study indicate that transportation mode is a significant factor influencing the drivers' likelihood to commit risky driving. Professional taxi drivers are a higher risk group to speed on highways, but no difference is found between professional drivers on risk level for other risky speeding behaviors. No significant difference in risk level between professional drivers is found for hand-held calling or texting while driving; nevertheless, professional bus drivers are a higher risk group to call while driving with their phone in hands-free mode. Despite professional public bus drivers being more likely to use their phones in a hands-free mode in comparison to using phones in hand-held mode, any type of phone use while driving is a traffic safety hazard as the driver will get distracted. This is confirmed by previous research findings showing both handheld and hands-free phone use while driving impair drivers' detection and reaction times to traffic signals (Strayer et al. [17]). Similarly, McCarley et al. [15] found reduced detection of traffic situation changes when drivers were using a phone in hands-free mode. Active engagement in the cell phone conversation, whether hands-free or handheld, appears to interfere with the driving task. In accordance, results show the risky driving behavior 'hands-free phone use while driving' has the largest proportion of professional drivers scoring a high risk with 41% of the complete sample. Therefore, this study underlines the seriousness of hands-free phone use while driving.

Regarding the resistance towards the implementation of related traffic law, it was found that professional public bus drivers pose a higher risk to use their phones in a hands-free mode and they are indeed more likely to oppose to a law against any type of phone use, which would include hands-free calling.

The results in this study also indicates that likelihood of risky driving varies among professional drivers with different origin groups, demonstrating that origin is a useful indicator in order to estimate which nationalities pose a higher risk for risky driving among the professional drivers in the State of Qatar. One main origin group shows to be a higher risk group for different risky driving behaviors; South Asian professional drivers from countries such as India, Pakistan, Bangladesh, Nepal and Sri Lanka, being the highest risk group to commit risky speeding behaviors and driving while feeling sleeping, while drivers from African origin pose a significantly low risk to commit these risky driving behaviors. Concerning is the higher probability of South Asian professional drivers who indicate to be very likely to overspeed >10 km in a school zone. This is an issue that requires further attention within professional driver education programs, as it relates to the safety of a large group of young vulnerable children.

Confirmatory results have been found between high probability to commit risky driving and opposition to law implementation for different origins. Professional drivers with South Asian origin pose the highest risk for overspeeding in school zones and in line with these results, South Asian professional drivers in the collected sample are also significantly more opposing the implementation of automatic ticketing for overspeeding >10 km in schoolzones.

Finally, years of driving experience has also proven to be a factor influencing the likelihood and risk level for risky driving. Very experienced professional drivers with more than five years of driving experience within the State of Qatar pose the higher risk to commit risky driving behaviors related to phone use and other aspects of distraction, as well as risky speeding behaviors, especially in comparison to professional drivers with little driving experience. This might be explained by their higher level of confidence established over the multiple years of driving in the State of Qatar, suggesting that overconfidence might lead to multitasking while driving and thereby more risky driving behavior. Having significantly higher risk for risky driving behaviors

Table 6
Significant relationships between Law opposition and transportation mode of professional driver after Bonferroni correction ($N = 343$).

Suggested traffic law	Group significantly most opposed to implementing law	Group supporting implementation law	Bonferroni corrected significance level: $p = .0125$
Law against texting	Taxi	Bus	$p = .0001$
Law against hand-held phone use	Taxi	Bus	$p = .0001$
Law against any phone use	Bus	Taxi	$p = .0000$
Law implement personal alcohol lock	Bus	Taxi	$p = .0000$
Law ticket >20 km highway	Bus	Taxi	$p = .0000$
Law ticket >10 km school zone	Bus	Taxi	$p = .0000$

Table 7
Significant relationships between Law opposition and Origin of professional driver after Bonferroni correction ($N = 343$).

Suggested traffic law	Group significantly most opposed to implementing law	Group supporting implementation law	Bonferroni corrected significance level: $p = .0063$
Law against any phone use	South Asian	African	$p = .0002$
Law implement personal alcohol lock	South Asian	African	$p = .0000$
Law ticket >20 km on highway	South Asian	African	$p = .0001$

related to overspeeding for very experienced drivers confirms the latter suggestion that increased driving experience might lead to overconfidence and risky behavior. Therefore, it will be interested for future study to investigate which other factors, such as level of confidence, have a significant effect on risky driving behavior among professional drivers in the State of Qatar.

This study indicates that more experienced professional drivers are more likely to perform risky driving behaviors in comparison to less experienced professional drivers and this provides evidence that the impact of different origin and backgrounds on traffic safety culture does not weaken over time, despite expectation. This study observes that specific nationalities have common driving habits that are clearly based on cultural backgrounds. This maintenance of Traffic Safety Culture, despite that the drivers will get adjusted to the different driving environment, could be explained by social groups from similar origin gathering together. However, in the State of Qatar professional drivers with various origin live together in large compounds in a few designated areas in Doha city. Professional drivers also report continuously to Karwa driving school, which provides the advantage of easy access to a large number of professional drivers. For that reason, this study proposes to introduce a continuous training and driving education system, which would be specifically adjusted to and focused on drivers with more years of driving experience and targeted at certain origin groups.

Confirmatory results have been found between high risk for unsafe or risky driving and opposition to law implementation for more years of driving experience in Qatar. Professional drivers with more than five years of driving experience pose the highest risk for both handheld and hands-free phone use. In line, very experienced drivers are also most likely to oppose to the implementation of a law against any type of phone use. Very experienced professional drivers are also more likely to oppose to a law against overspeeding in school zones, being the group of professional drivers that also poses the highest risk to overspeed >10 km in school zones. In conclusion, both the high likelihood for overspeeding in school zones and hands-free calling among various groups of professional drivers in the State of Qatar are concerning results that should be emphasized. This study therefore suggests that extra attention should be given to the danger of hands-free phone use and overspeeding in school zones during driving education at professional driving schools.

For all the different groups of professional drivers varying in transportation mode, origin and driving experience, a significant relationship is found for opposition to law implementation for a personal alcohol lock for drivers previously convicted for Driving While Intoxicated (DWI). This is an interesting finding as only 2% of the professional drivers indicate to be at high risk to commit intoxicated driving, but still a large proportion of 42% of the complete sample of professional drivers oppose to the implementation of this law. Considering the fact that a low proportion of drivers were opposed to the implementation of an build-in alcohol lock for all new cars, it appears remarkable that mainly drivers who do not have a previous conviction of DWI, are opposed to the implementation of this law. This might suggest that drivers fear an increased chance to violate by implementing this new law. As no explanation will be objective, future studies with further examination is advised to investigate the relationship between personal likelihood and opposition to this specific law before any connection can be made.

Few contrary results between likelihood to commit risky driving behavior and the likelihood to oppose to the related traffic law were found. For instance, a small proportion of all the professional drivers have a high likelihood to commit risky driving behavior related to overspeeding >20 km on a highway, but almost half of the professional drivers is resisting to the implementation of a law against overspeeding >20 km on a highway. In line with this, professional taxi drivers are a high risk group to commit this specific risky speeding behavior, but professional public bus drivers are more likely to oppose to the law. Therefore, other factors are expected to influence the relationship between risky speeding behaviors and law opposition for overspeeding >20 km on the highway, for instance social desirability. Professional drivers are very much aware of the fact that overspeeding on the highway is not desirable and is currently penalized with high traffic fines in the State of Qatar, therefore they might be influenced by this when scoring their answers on the questionnaire. Nonetheless, future study is needed to investigate the relationship between likelihood to for risky driving and opposition to implementation of certain traffic laws. In general, future research is required for more detailed investigation of likelihood and level of risk to commit risky driving behaviors, as future research is intended to improve practical implications and is aiming to develop a risk assessment tool for professional drivers.

4.1. Limitations

It has to be taken into consideration that this study compares professional drivers in the State of Qatar in a sample of only public bus and taxi drivers. The results cannot be generalized to professional drivers using other transportation modes or professional drivers outside the State of Qatar. Moreover, it should be emphasized that higher likelihood and higher level of risk suggested in this study is related to groups of professional drivers with certain personal attributes and cannot be attributed to individual professional drivers.

Regardless of the provision of the questionnaire in both English and Arabic language, another possible limitation that should be considered is the variety in languages and diverse levels of literacy among professional drivers in Qatar due to the large range of nationalities within the driver population. Hence, the State of Qatar has a strict requirement of good level of English language proficiency before hiring professional drivers for public buses and taxis. We did not encounter complains from participants regarding the understanding of the questionnaire.

Table 8
Significant relationships between Law opposition and Years of Driving experience after Bonferroni correction (N = 343).

Suggested traffic law	Group significantly most opposed to implementing law	Group supporting implementation law	Bonferroni corrected significance level: $p = .0083$
Law against any phone use	Very experienced drivers (>6y)	Little driving experience (<3y)	$p = .0001$
Law implement personal alcohol lock	Very experienced drivers (>6y)	Little driving experience (<3y)	$p = .0000$
Law ticket >20 km on highway	Very experienced drivers (>6y)	Little driving experience (<3y)	$p = .0000$
Law ticket >10 km in school zone	Very experienced drivers (>6y)	Little driving experience (<3y)	$p = .0001$

However, we still acknowledge that there is a possibility of misunderstanding of the questions due to the language barrier.

The length of the Traffic Safety Culture questionnaire could be a limitation affecting the respondents' answers that should be mentioned. However, this study used a thorough data exclusion process and excluded duplicate answers, high regularity on answer options and missing answers. Furthermore, the questionnaire contains several sections with similar types of questions, is conducted under the supervision of an instructor and is estimated to take approximately 12 min to complete. For these reasons, it is not expected that the length of the questionnaire has affected the quality of the responses or has caused response burden.

5. Conclusion

Significant relationships are found between transportation mode of professional drivers in the State of Qatar and the likelihood to commit risky driving behaviors, confirmed by a similar pattern for resistance to the implementation of related traffic laws. Suggesting professional bus drivers to pose a higher risk for hands-free phone use, but professional taxi drivers to pose a higher risk for overspeeding >20 km on the highway. The professional drivers' origin is also found to be a good indicator to estimate which nationalities among professional drivers in Qatar have a higher likelihood for risky driving. Suggesting South Asian professional drivers to pose the highest risk to overspeed in diverse environments and drive while feeling sleepy. This study also found very experienced professional drivers with more than five years of driving experience in Qatar or other GCC countries to pose the highest risk to commit risky driving behavior related to both overspeeding and hands-free phone use while driving.

Concerning results are the high likelihood among professional drivers in Qatar to overspeed in school zones and opposing to the implementation of a law against this risky driving behavior, especially among professional drivers from South Asian origin and professional drivers with more years of driving experience. Furthermore, the results show a high likelihood among professional drivers to use a phone in hands-free mode and opposing to the implementation of a law against any phone use while driving, especially among public bus drivers and very experienced professional drivers. Hands-free phone use is risky due to the high level of distraction, despite having both hands at the steering wheel.

In conclusion, both the safety of our children in school zones and the level of distraction while calling in hands-free mode are underestimated safety hazards among the professional drivers in the State of Qatar. Therefore, extra emphasis and attention should be given to these two issues during training and education programs at Karwa professional driving school in the State of Qatar, and offer tailored interventions targeting the identified groups of professional drivers who pose a higher risk. In line, continuous training and educational programs are required, in order to target professional drivers with long driving experience (more than five years) on the Qatari roads.

Acknowledgements

Authors are grateful to the International Association of Traffic and Safety Sciences (IATSS) for supporting this study through Project 1601A/1701B/1801C. Furthermore, authors are deeply thankful to Mr. Robert Makondo, the manager of Karwa Drving School in the State of Qatar, and his team for their essential support in conducting the questionnaire survey in their driving school.

References

[1] H.R. Burgut, A. Bener, H. Sidahmed, R. Albuz, R. Sanya, W.A. Khan, Risk factors contributing to road traffic crashes in a fast-developing country: the neglected health problem, Turk. J. Trauma Emerg. Surg 16 (6) (2010) 497–502.
[2] M.M. Islam, A.Y. Al Hadhrami, Increased motorization and road traffic accidents in Oman, J. Emerg. Trends Econ. Manag. Sci 3 (6) (2012) 907.
[3] F.A. Mansuri, A.H. Al-Zalabani, M.M. Zalat, R.I. Qabshawi, Road safety and road traffic accidents in Saudi Arabia: a systematic review of existing evidence, Saudi Med. J 36 (4) (2015) 418.
[4] World Health Organization WHO, Global Status Report on Road Safety 2013: Supporting a Decade of Action: Summary, 2013.
[5] World Health Organization WHO, Global Status Report on Road Safety 2015, 2015.
[6] Ministry of Interior Qatar, NTSF Announces Launching of Action Plan for Second National Traffic Safety Strategy, Retrieved from Ministry of Interior website https://portal.moi.gov.qa/wps/portal/MOIInternet/MOIHome/!ut/p/a1/dc3NCoJAFIbha-kG5hw1ZLajQf4ioWCdTYyk06A5OondfhZt-3YfPPACwRIolKtWctFmlMPnk39NokOMXonpMfM9FGWWh254QkQfaqAviQXfRw46KY-Qb6RKqqAIXUTnB_DPBEICpAbTbLk6ALrNc1ClrXwRY-NxBWTbrrWtZXfzXOA8GbvIgT2MZsqsbJYw9X2X69fuDYXdWqY!/?1dmy&page=pg.moi.newsdetails&urile=wcm%3Apath%3A%2Fwcmlib-internet-en%2Fsa-moinews%2Ff2f7e28d-af8e-4b3e-8e21-c2950a657589 2018.
[7] W. Alhajyaseen, N. Ratrout, D. Muley, Relationship between Chauffeurs' demographics, and knowledge of traffic signs in the Kingdom of Saudi Arabia, Procedia Comput. Sci 130 (2018) 34–41.
[8] B. Tefft, Car Crashes Rank Among the Leading Causes of Death in the United States–Impact Speed and a Pedestrian's Risk of Severe Injury or Death, Foundation for Traffic Safety, Washington, DC, USA, 2010.
[9] A. Soliman, W. Alhajyaseen, R. Alfar, I. Alkaabi, Changes in driving behavior across age cohorts in an Arab culture: the case of State of Qatar, Procedia Comput. Sci 130 (2018) 652–659.
[10] M. Behnood, A. Pakgohar, The Preliminary Plan for Budgeting the Costs of Social Training of Traffic, Organization of Transportation and Traffic Management, Tehran, 2008.
[11] G. Ergun, H. Al-Khaldi, Effects of driver characteristics on accident involvement: a study in Saudi Arabia, AL-MAJALLAH AL-'ARAB'IYAH LIL-'UL'UM 9 (4) (1984).
[12] N. Dibben, V.J. Williamson, An exploratory survey of in-vehicle music listening, Psychol. Music 35 (4) (2007) 571–589.
[13] S.G. Klauer, T.A. Dingus, V.L. Neale, J.D. Sudweeks, D.J. Ramsey, The Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data, 2006.
[14] S.P. McEvoy, M.R. Stevenson, M. Woodward, The prevalence of, and factors associated with, serious crashes involving a distracting activity, Accid. Anal. Prev. 39 (3) (2007) 475–482.
[15] J.S. McCarley, M. Vais, H. Pringle, A.F. Kramer, D.E. Irwin, D.L. Strayer, Conversation disrupts visual scanning of traffic scenes, Paper Presented at the 9th Vision in Vehicles Conference, Brisbane, Australia, 2001.
[16] M. Papadakaki, G. Tzamalouka, C. Gnardellis, T.J. Lajunen, J. Chliaoutakis, Driving performance while using a mobile phone: a simulation study of Greek professional drivers, Transport. Res. F Traffic Psychol. Behav. 38 (2016) 164–170.
[17] D.L. Strayer, F.A. Drews, W.A. Johnston, Cell phone-induced failures of visual attention during simulated driving, J. Exp. Psychol. Appl. 9 (1) (2003) 23.
[18] J.C. Stutts, D.W. Reinfurt, L. Staplin, E.A. Rodgman, The role of driver distraction in traffic crashes, Report Prepared for AAA Foundation for Traffic Safety, Washington, DC, 2001.
[19] G. Underwood, P. Chapman, Z. Berger, D. Crundall, Driving experience, attentional focusing, and the recall of recently inspected events, Transport. Res. F Traffic Psychol. Behav. 6 (4) (2003) 289–304.
[20] A.M. Williamson, A.-M. Feyer, R.P. Mattick, R. Friswell, S. Finlay-Brown, Developing measures of fatigue using an alcohol comparison to validate the effects of fatigue on performance, Accid. Anal. Prev. 33 (3) (2001) 313–326.
[21] M. Ingre, T. Åkerstedt, B. Peters, A. Anund, G. Kecklund, A. Pickles, Subjective sleepiness and accident risk avoiding the ecological fallacy, J. Sleep Res. 15 (2) (2006) 142–148.
[22] J.E. James, Acute and chronic effects of caffeine on performance, mood, headache, and sleep, Neuropsychobiology 38 (1) (1998) 32–41.
[23] F.J. Alvarez, I. Fierro, Older drivers, medical condition, medical impairment and crash risk, Accid. Anal. Prev. 40 (1) (2008) 55–60.
[24] K.A. Abay, F.L. Mannering, An empirical analysis of risk-taking in car driving and other aspects of life, Accid. Anal. Prev. 97 (2016) 57–68.
[25] A. Bener, T. Özkan, T. Lajunen, The driver behaviour questionnaire in Arab gulf countries: Qatar and United Arab Emirates, Accid. Anal. Prev. 40 (4) (2008) 1411–1417, https://doi.org/10.1016/j.aap.2008.03.003.
[26] P.N. Blockey, L.R. Hartley, Aberrant driving behaviour: errors and violations, Ergonomics 38 (9) (1995) 1759–1771.
[27] T. Lajunen, D. Parker, H. Summala, The Manchester driver behaviour questionnaire: a cross-cultural study, Accid. Anal. Prev. 36 (2) (2004) 231–238.
[28] T. Özkan, T. Lajunen, J.E. Chliaoutakis, D. Parker, H. Summala, Cross-cultural differences in driving behaviours: a comparison of six countries, Transp. Res. F Traffic Psychol. Behav. 9 (3) (2006) 227–242, https://doi.org/10.1016/j.trf.2006.01.002.
[29] E. Constantinou, G. Panayiotou, N. Konstantinou, A. Loutsiou-Ladd, A. Kapardis, Risky and aggressive driving in young adults: personality matters, Accid. Anal. Prev. 43 (4) (2011) 1323–1331.
[30] D.J. Myers, J.M. Nyce, S.W.A. Dekker, Setting culture apart: distinguishing culture from behavior and social structure in safety and injury research, Accid. Anal. Prev. 68 (2014) 25–29, https://doi.org/10.1016/j.aap.2013.12.010.
[31] I. Ajzen, The theory of planned behavior, Organ. Behav. Hum. Decis. Process. 50 (2) (1991) 179–211, https://doi.org/10.1016/0749-5978(91)90020-T.
[32] D.F. Connor, R.J. Steingard, J.J. Anderson, R.H. Melloni, Gender differences in reactive and proactive aggression, Child Psychiatry Hum. Dev. 33 (4) (2003) 279–294, https://doi.org/10.1023/a:1023084112561.
[33] M.E. Rakauskas, N.J. Ward, S.G. Gerberich, Identification of differences between rural and urban safety cultures, Accid. Anal. Prev. 41 (5) (2009) 931–937, https://doi.org/10.1016/j.aap.2009.05.008.

[34] N. Ward, J. Otto, S. Swinford, J. Borkowski, Measuring Minnesota's Traffic Safety Culture, (April), 2015.
[35] J. Cestac, F. Paran, P. Delhomme, Young drivers' sensation seeking, subjective norms, and perceived behavioral control and their roles in predicting speeding intention: how risk-taking motivations evolve with gender and driving experience, Saf. Sci. 49 (3) (2011) 424–432, https://doi.org/10.1016/j.ssci.2010.10.007.
[36] National Traffic Safety Committee (2018, November 28). Traffic Accident Deaths Decreased by 25% in Five Years. The Peninsula. Retrieved from https://www.thepeninsulaqatar.com/article/28/11/2018/Traffic-accident-deaths-decrease-by-25-in-five-years