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RESEARCH ARTICLE

Risk Perception and Crash Involvement of Cell Phone Users While Driving Among Young Drivers in Developing Countries: The Case of Qatar

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Abstract:

Background:

Cell phone use while driving is a significant safety problem all around the world. It is considered one of the main factors contributing to road crashes among young drivers.

Aim:

To address this problem, it is important to determine how young drivers perceive the risk of using a cell phone while driving and to understand whether the perception of risk is correlated with their crash involvement.

Methods:

Data were collected through a detailed questionnaire from young drivers in Qatar to assess potential correlations between the drivers' demographic background, perception of risk, and crash involvement. Logistic regression models were developed to explore the relationships between those variables.

Results:

The analysis revealed that female drivers had a higher perception of risk related to using cell phones while driving compared to male drivers. Drivers with higher education levels were found to also have a higher perception of risk when compared to less educated drivers. The analysis showed that participants who perceived lower risk of answering a call while driving were more likely to be involved in a crash.

Conclusion:

These results can be useful to identify the groups that should be targeted through countermeasures. Different countermeasures were presented, and directions for future research were proposed.

Keywords: Mobile phones, Distracted driving, Road safety, Traffic enforcement, Driving performance, Demographics.

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1. INTRODUCTION

Road crashes are one of the main causes of death in developing countries [1, 2]. Improving road safety through the reduction of traffic-related fatalities and serious injuries is one of the top priorities of many developing countries. Young drivers are considered a problematic group [3, 4]. Cell phone use while driving is one of the main factors contributing to road crashes [5, 6]. One common contributing factor to crashes among young drivers is distracted driving caused by cell phone usage [7 - 10]. Previous research has found that drivers who use their phones while driving often drive faster, change lanes more frequently, and engage in more instances of hard braking and high acceleration [11 - 13]. These types of activities increase the probability of being involved in a crash. Previous studies have shown that the relative risk of crashes is higher for distracted young drivers when compared to other age groups [14 - 16].

Despite the apparent risk of cell phone distracted driving and existing laws to counteract the activity, this activity

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remains a common practice among young drivers [17, 18]. In Qatar, a developing country in the Middle East, young drivers have the highest rate of fatalities among all groups and have the highest rate of cell phone use while driving [19, 20]. The magnitude of this problem is alarming when considering the fact that cell phones have evolved from simple devices used to make calls and send text messages to a social communication platform that can be used for multiple purposes. This evolution has increased the potential distractions caused by cell phones, exposing drivers to even higher risks.

Therefore, there is a need to understand why distracted driving is not seen as a risk, particularly in developing countries [21]. This is extremely important when agencies are looking into developing effective countermeasures to counteract this activity. Different studies investigated the reasons why phone usage while driving is still a common practice, particularly among young drivers. One study showed that some drivers believed that they can drive safely while using their cell phones [22]. Another study showed that the perceived importance of the call affects the duration of the usage of the phone while driving [23]. Therefore, it is important to determine how young drivers perceive the risk of using a cell phone while driving and understand whether the perception of risk is correlated with their crash involvement.

This paper aims to address this gap by analyzing data collected from young drivers in Qatar. The current study aims to expand our previous work on cell phone and seat belt use among young drivers [24, 25]. The study first focuses on understanding the impacts of demographic factors on young drivers' attitudes towards using a cell phone while driving. The impact of these factors on drivers' perception of risk is then analyzed, and correlations between driver beliefs and their safety records are explored.

2. METHODS

2.1. Data Collection

Face-to-face interviews were conducted with young drivers (18 to 25 years) as part of a project that aims to understand the behavior of young drivers when being distracted by cell phones, investigate the effect of this type of behavior on traffic safety, and identify possible countermeasures [24]. The interviews targeted young drivers from different nationalities and genders living in Qatar. A total of 500 questionnaire forms were prepared, and interviewers were trained on how to approach the drivers. The interviewers confirmed the age of the drivers and then explained the questionnaire form. The participants were required to complete the form and then return it to the interviewers. This method was used to ensure that the sample size was representative. From the distributed questionnaires, 403 forms were completed and included in the analysis.

The questionnaire form included different sections. The demographics section included information regarding drivers' age, gender, nationality, education level, occupation, and marital status. The driving history section captured information regarding the experience of the drivers in the form of years and frequency in addition to the vehicle type. The cell phone use section collected information regarding the behavior of the drivers. The drivers were asked if they own any hands-free equipment/gadgets, including Bluetooth earphones, AUX, or wired earphones, in addition to the frequency of use. The participants were asked about the frequency of use for calling, answering, texting, and emailing and the effects of the cell phone. Also, they were asked about situations where they would not use the phone. Responses regarding the duration through which a driver can safely keep his eyes off the road were collected. Finally, the drivers were asked about their crash involvement and possible solutions, if any, that can deter the distraction of cell phone use while driving. More details about the data collection can be found in Shaaban *et al.'s* study [24].

2.2. Data Processing

2.2.1. Variable Recoding and Themes

Before analyzing the data, several processing checks were conducted to check the data, create new categories for multiple responses, and convert some variables into binary variables. Once the data were processed, questions related to the aim of this paper were classified into three different themes. Questions were classified into those assessing a driver's perception of risk, crash involvement, and cell phone usage behavior. It should be noted that not all questions were used in the analysis. The used classification enabled us to understand how a participant's demographic background and cell phone usage behavior affected their perception of risk and how all these factors affected a participant's crash involvement.

2.2.2. Perception of Risk

Under this theme, the aim was to measure how risky driving while using a cell phone was perceived by individuals. To achieve this aim, several questions from the survey on perceptions of risk were selected. This included a respondents' beliefs on how texting and talking affect driving, situations when a respondent would never make/answer a call, and how long a respondent believes a driver could safely keep their eyes off the road. Respondents had a lowered perception of risk if they indicated a driver could safely keep their eyes off the road for more long periods and if they were prepared to make/answer calls in almost any situation. Additionally, respondents had a higher perception of risk if they believed texting and talking affected their driving.

2.2.3. Crash Involvement

This theme included questions asking about the participant's last crash, including information on the frequency and the cause of the crash. The aim was to understand whether different levels of usage and perception of risk were correlated with crash involvement when cell phone usage was the cause of the crash. This measure was used to determine how often participants were involved in crashes due to cell phone distraction.

2.3. Modeling Procedure

In this study, logistic regression was used to develop a

better understanding of how these variables were related. This included analyzing the relationships among participants' demographic information, cell phone usage, perception of risk, and their crash involvement. Two different regression models were developed. One model was used to relate several independent variables to crash involvement (measured through the last time a respondent was involved in a collision), and the second model was used to relate variables to a driver's risk perception (measured through situations where a driver would never answer a call).

3. RESULTS

3.1. Drivers' Demographics and Responses

A summary of the questions and the response scale for each question are presented in Table **1**. Percentages are calculated for 403 responses. The age of the participants ranged from 18 to 25 years. Approximately half of the participants (50.4%) were male. Most of the drivers were non-Qatari Arab (50.6%), followed by Qatari (27.3%) and Asians (13.6%). The remaining were of other nationalities. A high percentage of the participants (67.2%) had hands-free kits. Half of them (50.4%) use these kits. A high percentage of the drivers (87.6%) mentioned that they answer the phone when receiving a call while driving. A small percentage (12.4%) mentioned that they pull over and then answer the call. The participants were asked to indicate the longest duration through which drivers can keep their eyes off the road. 25.6% of the respondents believed that drivers can safely keep their eyes off the road for only one second or less, and 33.0% of the respondents believed that this was possible for one to two seconds. A significant percentage of the participants (64.7%) were involved in crashes during the last few years. Of those crashes, 6.5% were caused by phone distraction while driving.

Table 1. Survey questions.

Theme	Variable	Categories	%
Demographics	Gender	Male	50.4
		Female	49.6
	Age	20 or less	24.8
		21	18.9
		22	19.1
		23	17.6
		24 or more	19.6
	Occupation	Working Full time	17.6
		Student	79.2
		Housewife	3.0
		Not Working	0.2
	Nationali1y	Qatari	27.3
		Non-Qatari Arab	50.6
		Asian	13.7
		Other	8.4
	Type of vehicle	Small car	51.9
		4WD	37.5
		Motorcycle	0.5
		Other	10.1
	Driving experience	One year or less	20.1
		Two years	24.1
		Three years	17.6
		Four years	15.9
		Five years	11.2
		Six years or more	11.1
	Driving frequency	Everyday	86.1
		Not everyday	13.9
Usage	Own hands-free	Yes	67.2
		No	32.8
	Use hands-free	Yes	50.4
		No	49.6
	How to answer a call?	Pull over	12.4
		Do not pull over	87.6
Perception of risk	How does talking affect driving?	Affects driving	48.9
		Does not affect driving	20.8

(Table 1) contd.....

Theme	Variable	Categories	%
		Do not know	30.3
	How does texting affect driving?	Affects driving	68.2
		Does not affect driving	9.9
		Do not know	21.9
	How long can drivers safely keep their eyes off the road?	One second or less	25.6
		1-2 seconds	33.0
		3-4 seconds	21.6
		5-10 seconds	11.9
		10 seconds or more	7.9
	Likelihood of answering a call while driving	Very likely	29.0
		Likely	44.9
		Somewhat likely	16.9
		Unlikely	9.2
	Most distracting activity	Using a cell phone	22.1
		Other activities	77.9
Crash involvement	Last car crash	Few days ago	6.9
		Few months ago	29.0
		Few years ago	28.8
		Never had any	35.3
	Cause of crash	Distraction by phone	6.5
		Not distracted by phone	58.2
		Never had any	35.3

3.2. Perception of Risk

As shown in Table **2**, when modeling the factors that affect a driver's perception of risk using logistic regression, a number of important observations were made. It was found that the non-Qatari Arabs and other nationalities drivers had a higher perception of risk than the Qatari drivers. Female drivers were also found to have a higher perception of risk than males. Participants with higher education were found to have a higher perception of risk when compared to less-educated participants.

Table 2. Regression analysis for the factors affecting perception of risk.

	Estimate	SE	Sig.	P-value
Intercept				
1	-0.831	0.415	0.045	
2	1.388	0.420	0.001	
3	2.761	0.442	<0.001	
Gender				<0.001
Female	1.376	0.207	0.000	
Male	0[a]			
Nationality				0.042
Asian	0.378	0.318	0.235	
Non-Qatari Arab	0.382	0.229	0.096	
Other	0.962	0.374	0.010	
Qatari	0[a]			
Education				0.014
Freshman	-1.025	0.319	0.001	
High School or Below	-0.571	0.330	0.083	
Junior	-0.108	0.323	0.738	
Senior	-0.332	0.331	0.316	
Sophomore	0[a]			
Last Car Crash				0.021
Few days ago	-1.324	0.421	0.002	
Few months ago	-0.185	0.241	0.443	

(Table 2) contd.....

	Estimate	SE	Sig.	P-value
Few years ago	0.278	0.242	0.249	
Never Had Any	0[a]			
Age				0.046
20 or less	-0.373	0.350	0.286	
21	-0.325	0.352	0.355	
22	-0.420	0.327	0.199	
23	-0.593	0.319	0.063	
24 or more				

[a]Reference group for regression analysis.

3.3. Crash Involvement

Table **3** shows the regression model developed for the factors affecting crash involvement along with the Chi-squared test results for the variables used in the regression. When crash involvement was analyzed, the results revealed that measures of risk perception, gender, education, driving experience, how often one drives, and driver behavior while answering a call all affect crash involvement records of drivers who use cell phones while driving. With respect to the perception of how risky using a cell phone is, it was found that people who perceive a lower risk of answering a call while driving are more likely to be involved in a car crash.

Table 3. Regression analysis for the factors affecting crash involvement.

	Estimate	SE	Sig.	P-value
Intercept				
1	-3.647	0.641	<.0001	
2	-1.647	0.612	0.007	
3	-0.406	0.606	0.503	
Gender				0.046
Female	-0.651	0.221	0.003	
Male	0[a]			
Experience				<0.001
One year or less	-0.078	0.441	0.860	
Two years	0.241	0.408	0.556	
Three years	0.405	0.401	0.312	
Four years	0.423	0.411	0.304	
Five years	0.573	0.450	0.203	
Six years or more	0[a]			
How to answer a call				0.017
Pull over	0.982	0.307	0.001	
Do not pull over	0[a]			
How texting affects driving				0.007
Does not affect driving	0.373	0.328	0.255	
Don’t know	-0.379	0.274	0.166	
Affects Driving	0[a]			
Likelihood of answering a call while driving				0.021
Very likely	-1.269	0.429	0.003	
Likely	-0.837	0.406	0.039	
Unlikely	-0.953	0.453	0.035	
Highly Unlikely	0[a]			
Most distracting activity				0.067
Not cell phone	-0.515	0.265	0.052	
Cell Phone	0[a]			
Education				0.002
Freshman	0.799	0.337	0.018	
High School or Below	0.229	0.338	0.498	
Junior	-0.123	0.338	0.716	
Senior	0.386	0.347	0.266	

(Table 3) contd.....

	Estimate	SE	Sig.	P-value
Sophomore	0[a]			
Driving frequency				
Not everyday	0.430	0.298	0.149	
Everyday	0[a]			

[a]Reference group for regression analysis.

Crash involvement was also found to be significantly affected by the way a driver tends to answer phone calls while driving. The findings in that respect show that drivers who revealed that they typically tend to pull over to answer phone calls were less likely to have been involved in a crash recently. This also shows that drivers who answer calls while driving are exposed to higher risks. Other variables, which were found to significantly affect crash involvement, are gender, vehicle type, and education. Despite females having a higher perception of risk when compared to males, females were less likely than males to have been involved in a recent car crash. Moreover, freshmen students were found to be more likely to be involved in a car crash when compared to sophomores.

4. DISCUSSION

Previous research indicated that young drivers are involved in more traffic crashes than any other age group and are more willing to accept risk than experienced drivers [26 - 28]. They also have the highest rate of phone use among other groups and are more likely to engage in different distracting activities, including the use of cell phones while driving [29, 30]. This study explores the perception of risk and crash involvement among young drivers in Qatar. The data needed were collected using a detailed questionnaire. Responses were split into different themes, and the association between the different variables from the different themes (level of usage, risk perception, and crash involvement) was tested. Logistic regression models were developed to further explore the variables with significant associations.

The results showed that a high percentage of the participants owned hands-free kits. This percentage is considered high compared to other countries [30 - 32]. More than half of them use these kits. It should be noted that crash risk is higher for hand-held users [33]. The results also indicated that non-Qatari Arabs and other nationalities had a higher perception of risk than Qatari drivers. These results may be an indication that Qatari drivers do not fully realize the risks of cell phone usage while driving. It can also be an indication that Qatari drivers are slightly more aggressive than drivers of other nationalities. Similar results were found in previous studies related to Qatar [34, 35]

The analysis revealed that the female drivers have a higher perception of risk than males, which is expected considering that male drivers are typically more aggressive and risk-seeking than females, as indicated in previous studies [36, 37]. Less-educated participants (high-school students) were found to have a lower perception of risk when compared to participants in higher education. This is quite a positive finding which indicates that the more education drivers receive, the more likely they are to realize the risks of phone usage while driving. This could also be a matter of drivers being exposed to more campaigns highlighting safe driving practices through their education programs.

The analysis also showed that drivers who perceive a lower risk of answering a call while driving are more likely to be involved in a car crash. In other words, drivers who thought answering a call while driving did not expose them to high risks were more likely to have a poor crash record. Similarly, drivers who think that using cell phones is not the most distracting activity while driving were also more likely to have been involved in a recent car crash. While female drivers had a higher perception of risk when compared to males, they were less likely than males to have been involved in a recent car crash. In addition, less-educated drivers were found more likely to be involved in a car crash when compared to sophomores.

These results are of utmost importance and show that some drivers might feel confident in their skills and underestimate the impacts of using a cell phone while driving. There is evidence that those drivers are exposed to a higher risk of crash involvement. The findings also indicated that drivers who revealed that they typically tend to pull over to answer phone calls were less likely to have been involved in a recent crash.

CONCLUSION

This study analyzed the impacts of different demographic factors and usage attributes on driver risk perception (*i.e* ., how risky a driver believes using a cell phone while driving is). These results were needed to identify the groups that should be targeted through countermeasures. As for potential countermeasures, increasing enforcement activity is one of the effective measures to counteract cell phone usage while driving. There is also a need for awareness campaigns, driver-education interventions, and technology-related solutions such as smartphone applications [38 - 41]. These countermeasures could help raise the perception of the risks associated with cell phone distracted driving.

The study has several limitations. First, the participants may not be representative of the whole population, as the convenience sampling method was used in this study. Second, the study relied on self-reports to determine the extent of phone use while driving. Therefore, response biases cannot be overlooked. Some respondents might be reluctant to provide truthful answers due to the pressure of providing more socially acceptable ones. Third, in time estimation questions, some participants may underestimate or overestimate time. Fourth, the study was conducted in one city only. The behavior related to the use of cell phones may vary in other cities. Fifth, the data were gathered from participants in Qatar. Therefore, the results may not apply to other countries. Sixth, the sample used had an almost similar proportion of males and females, which is not typical in Qatar [42]. However, the oversampling was needed to ensure that there were enough participants in the female

subgroup so that more accurate estimates could be reported for this group. Seventh, the study targeted only young participants, which limited the variety of variables such as age and education level. Although this was necessary since the study focused on the behavior of young drivers, future research might consider conducting a holistic analysis of all drivers. It is also recommended that similar studies are conducted in the future in other parts of the world. Regardless of the limitations mentioned, the results are important in identifying and implementing future interventions and countermeasures.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

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CONFLICT OF INTEREST

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