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CHARACTERIZATION OF CELL PHONE USE WHILE DRIVING IN JORDAN

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Abstract. A substantial body of research has shown that the use of cell phones while driving can impair driving performance thus representing a relevant traffic safety issue. The conducted studies have indicated that with an increase in general cell phone use, phoning while driving has also grown. For around 80% of Jordan's population that own cell phones, phoning while driving has become a legitimate concern for potential safety hazards. In order to effectively target interventions towards the drivers using cell phones while driving, information about the characteristics of these respondents is needed. The present study investigates the extent of cell phone use on Jordan's roads and the characteristics of drivers who use cell phones while driving. The data was collected using a questionnaire survey to examine the relationship between phoning while driving and driver demographics, driving experience and exposure and characteristics of users. Among all participants, the study demonstrated that those who reported the use of hands-free devices tended to use the cell phone more often and for a longer duration of time. Further, male drivers tended to use the cell phone while driving more frequently and for longer duration compared with female drivers. In regards to pulling off the road while using the cell phone, the study found this practice to be more prevalent among females, older drivers and more educated drivers. The study has also revealed other findings that are important for characterizing the trend towards using the cell phone while driving in Jordan.

Keywords: cell phone, survey, distraction, traffic safety, Jordan.

1. Introduction

During the last two decades, the use of the cell phone has steadily increased in most countries. One safety issue is phoning while driving which is a natural by-product of the increased use of the cell phone. This issue has raised concerns in many developed and developing countries, and therefore has received increasing scientific attention. Several studies looked at the impact of using the cell phone on driver's attention and safe driving. Researchers used many approaches, including driving simulators, instrumented vehicles on the road and data on the analysis of motor vehicle accidents among other things.

Strayer and Johnston (2001) reported significant slowing in response to simulated traffic signals for phone users. Other studies found that cell phone use during simulated driving extended reaction times and that this effect was more marked for older drivers (Alm and Nilsson 1995; Lam 2002; Consiglio *et al*. 2003; Patten *et al*. 2004; Rakauskas *et al*. 2004; Strayer and Drews 2004). Brookhuis *et al*. (1991) and Lamble *et al*. (1999) also showed that phone use delayed driver's reaction to the decelerating car ahead under on-road conditions while the results of Hancock *et al*. (2003) indicated that phone use seriously impaired crucial stopping decisions.

McKnight and McKnight (1993) and De Waard *et al*. (2001) found that looking up telephone numbers while holding the phone in one hand showed a serious deterioration in driving performance in terms of lane control. This effect was clearly present despite the fact that drivers increased their safety margins by slowing down. Nunes and Recarte (2002) indicated that drivers made fewer saccadic eye movements and spent less time checking related instruments and mirrors when using a cell phone.

Several studies suggested that hands-free devices seemed not to offer essential safety advantage over hand-held devices which encouraged drivers to use their cell phones more frequently and for longer periods of time. Further, if older or less skilled drivers think that it would make phone use safe they might decide to start using it while driving (Redelmeier and Tibshirani 1997; Lamble *et al.* 1999; Horberry *et al.* 2001; Sagberg 2001; Strayer and Johnston 2001; Nunes and Recarte 2002; Matthews *et al.* 2003; Johal *et al.* 2005; Törnros and Bolling 2005).

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Sullman and Baas (2004) investigated the frequency of cell phone use on New Zealand's roads and the characteristics of drivers who used cell phones while driving. The carried out research proved that 57.3% of the participants used the cell phone at least occasionally while driving. Those who reported the frequent use of the cell phone while driving were most likely younger males, residing in the main urban area, reporting higher annual mileage, driving a later model car with a larger engine at higher speeds and having less driving experience (in years). The authors established that there was a significant relationship between accident involvement and the use of the cell phone while driving.

Troglauer *et al*. (2006) studied the use of cell phones while driving among professional drivers of heavy vehicles in Denmark. They mailed a questionnaire to 2000 randomly selected and currently active professional drivers in Denmark and achieved a response rate of 58%. The results showed that more than 99% of the drivers used cell phones while driving. Despite a prohibition of hand-held cell phone use while driving, 31% of the drivers reported doing so. The analysis of variations in usage found a significant relationship between driving hours and phone use. About 0.5% of those reported that using cell phones had contributed to an accident while 6% had experienced their cell phone use causing a dangerous situation. However, 66% of the surveyed participants reported experiencing dangerous situations when other colleagues used the cell phone. The authors stated that even though the use of cell phones posed a threat for traffic safety, they were unable to establish the relationship between accidents and dangerous situations based on their data.

2. Study Motive

There are several reasons to investigate cell phone use while driving in Jordan. Firstly, cell phone service providers reported that the number of cell phone subscribers grew from a few thousands to about 4 million between 1996 and 2008, reaching a current ownership rate of about 80% of the population (Mobayden 2008). With the widespread use of the cell phone while driving among Jordanian drivers, the issue has become a source of concern for the traffic safety community. However, no study has attempted to quantify the magnitude of this important safety issue. Secondly, as the use of hands-free devices is easier and less distracting, it is perceived to bring potential safety benefits. Its use is encouraged in vehicles in lieu of the hand-held devices, which are currently prohibited by law in Jordan. Again, no information is available from statistics or other studies to assess the extent of using the two types of devices by Jordanian drivers. Lastly, it is still debatable among the traffic safety community in Jordan whether stricter regulations on cell phone use while driving or drivers' educational programs on the distractive effect of cell phones are a better approach to improving safety.

The current study aims at characterizing the trend towards phoning while driving in Jordan by examining this phenomenon using some of the most relevant underlying variables. It is believed that this investigation would reveal relationships and trends that are valuable to understanding this traffic safety phenomenon in Jordan. Such way of understanding is critical to develop appropriate interventions intended to minimize the impact of cell phone use while driving which may include educational campaigns, new enforcement measures and policy changes among other measures.

3. Methodology

A questionnaire survey, shown in Table 1, was used as the main tool for conducting this study. In developing the survey, a preliminary version was first tested on a sample of 20 random drivers and the results obtained were used for preparing the final survey.

3.1. Survey Content

The survey involved variables concerned with driver demographics, driving history, the extent of cell phone use while driving and drivers' opinions on the distractive nature of many in-vehicle activities. Driver demographics involved gender, occupation, age and education level while driving history involved years of experience, license type, distance travelled and driving time.

3.2. Survey Administration

Prospective participants were approached by a research team member and asked to participate in the study. The researcher (survey moderator) introduced himself to prospective participants and informed them of the purpose of the study and the survey format. If a person was a driver and agreed on participation in the survey, s/he was given the questionnaire along with instructions on completing the survey on-site.

The participants were surveyed in two metropolitan areas – the Greater Amman and Irbid cities. These areas are characterized as two major urban areas in Jordan. Survey locations were chosen randomly and were spread widely across each metropolitan area. The surveyed participants were drivers of 18-years or older and had valid driving license to drive on a regular or occasional basis.

3.3. Sample Size Determination

In order to investigate the extent and attributes of cell phone use among drivers in Jordan, a minimum sample size should be determined first. While important for determining the scope of field work, sample size was also important for assuring the required level of reliability in evaluating study results. Specifically, the sample size of making an inference about the population mean or proportion depends on the desired reliability. In this study, the proportion of drivers who used cell phone while driving was a point of interest.

The sample size was estimated using the following statistical formula (McClave and Sincich 2006):

$$n = \frac{\left(Z_{\alpha/2}\right)^2 \left(p \cdot q\right)}{\left(SE\right)^2}, \quad (1)$$

Table 1. Questionnaire variables and related response formats

Human characteristics	gender	male; female
	occupation	public sector; private sector; student
	age	in years
	education	high school; diploma; BS; MS/PhD
Exposure characteristics	experience	in years
	license type	public; private
	daily travelling distance	in kilometres
	time of driving	peak (7 am – 5 pm); off-peak (5 pm – 7 am)
Cell phone use characteristics	talk time	in minutes
	outgoing calls	number per day
	incoming calls	number per day
	use in crowded residential areas	always; sometimes; rarely; never
	use of the hands-free system	always; sometimes; rarely; never
	pull off the road to use the cell phone	yes; no
Traffic safety and regulations	rate the most distraction activity	talking with passengers; adjusting audio devices; smoking; eating or drinking; using a cell phone
	drivers can carry on a conversation on the cell phone and still drive safely	agree; disagree
	using a hands-free device is safer than a hand-held device	agree; disagree

where: n – sample size; $Z_{\alpha/2}$ – a value from the standard normal curve that corresponds to the half-width of the confidence interval (e.g. for a confidence level of 95%, $Z_{\alpha/2} = 1.96$); p – population proportion of interest; q – 1-p; SE – sampling (standard) error.

It is evident that the larger is pq product, the larger is the required sample size, i. e. the closer is p and q to 0.5, the more conservative (or the larger) is the sample size requirement for the specified reliability (level of confidence). It was decided to use p and q values of 0.5 along with a sampling error of 0.05 and a confidence level of 95% in sample size calculations.

The sample size required was found as shown below:

$$n = \frac{1.96^2 \left(0.5 \times 0.5\right)}{0.05^2} = 384.16. \quad (2)$$

423 drivers completed the survey questionnaire during the course of this study, which is about 10% larger than the minimum sample size of 384.16 required as per the above calculations.

3.4. Analysis of the Surveyed Data

All surveyed data were compiled in spreadsheet application and tables and graphs were generated to illustrate different variables included in the questionnaire. Numbers and simple percentages were used throughout analysis and provided for the users and non-users of cell phones. The Pearson's Chi-square (χ^2) test of association was used in this study. The test is a powerful tool for testing association (or independence) between categorical variables pooled from a single population (e.g. association between columns and rows in tabular data). The null hypothesis assumes that there is no association between the variables (one variable does not vary according to the other variable) while the alternative hypothesis assumes that association does exist. Association (dependency) exists when the p-value of

the calculated results is less than the value equal to significance level for analysis (McClave and Sincich 2006).

In this study, frequencies and percentages were computed for all the variables collected in the questionnaire survey. Contingency tables were constructed to examine association between the variables. The Pearson's Chi-square (χ^2) test was used to estimate the strength of possible association between the characteristics of driver demographics, driving experience and exposure, patterns of cell phone use while driving as well as other relevant safety issues. Pearson's Chi-square analysis was conducted using SPSS software with a significance level of 0.05.

4. Results and Discussion

4.1. Driver Demographics

Four demographic variables were included in the survey; gender, occupation, driver age and education. A breakdown of the survey sample by each of these demographic variables is shown in Table 2. Around 85% of the surveyed participants were males, which largely reflect the fact that males form the majority of drivers in Jordan. However, a high percentage of male participants may also be attributed to the difference between the two genders in terms of their willingness to participate in the study upon invitation. A higher percentage of male drivers used cell phones when compared with the females who made 96.9% and 72.7% respectively. Among the surveyed participants, a higher percentage of students and public sector employees (96.9% and 95.2% respectively) reported the use of the cell phone while driving compared with private sector employees who showed a lower percentage (84%). Further, the participants who were between 21 and 30 years of age showed the highest rate of cell phone use (97.5%) compared with all other age groups. The drivers in this age group constituted the majority of the surveyed drivers (57.2%). The majority of participants (87.5%) had post high school education around of whom 61% had a 4-year college degree or higher. Association between cell phone use while driving and the aforementioned demographic variables were all found statistically significant.

4.2. Driving Experience and Exposure

Four variables were used in the questionnaire survey to gather information about driving experience and exposure, namely years of driving experience, license type, daily distance travelled and driving time. The survey results on these variables were summarized in Table 3. The majority of participants (78.2%) had more than six years of driving experience with around a half of them (40%) have been driving for more than 12 years. The use of the cell phone was the highest among those with longer driving experience (6+ years of experience). The Pearson's Chi-square test found a significant relationship between the use of the cell phone while driving and driving experience. Around 14% of the participants held a public driver license while the remaining 86% held a private one. No significant association between cell phone use and license type was found as suggested by Pearson's Chi-square results. In regards to average daily travel distance, roughly a half of the participants (48.2%) reported driving distances of 41 kilometres or more. Further, the obtained results show that it is more likely for drivers who drive longer distances to use cell phone while driving. This relationship was found significant. This is somewhat expected given the fact that cell phones were especially useful for those who spend longer times on the road. Driving time is another variable investigated by the questionnaire sur-

Table 2. Survey results on driver demographics

Characteristic	Cell phone user		Cell phone non-user		Total		χ^2 values
	Number	Percentage	Number	Percentage	Number	Percentage	
Gender							
Male	346	96.9	11	3.1	357	84.4	$\chi^2 = 51.049$ $p = 0.0001$
Female	48	72.7	18	27.3	66	15.6	
Occupation							
Public sector	119	95.2	6	4.8	125	29.5	$\chi^2 = 19.007$ $p = 0.0001$
Private sector	89	84.0	17	16.0	106	25.1	
Student	186	96.9	6	3.1	192	45.4	
Driver age (years)							
18–20	30	83.3	6	16.7	36	8.5	$\chi^2 = 18.418$ $p = 0.0001$
21–30	236	97.5	6	2.5	242	57.2	
31–40	97	89.0	12	11.0	109	25.8	
41+	31	86.1	5	13.9	36	8.5	
Education							
High school	48	90.6	5	9.4	53	12.5	$\chi^2 = 19.276$ $p = 0.0001$
2-year college	95	85.6	16	14.4	111	26.2	
4-year college	227	97.8	5	2.2	232	54.8	
Master or PhD	24	88.9	3	11.1	27	6.5	

Table 3. Survey results on driving experience and exposure

Characteristic	Cell phone user		Cell phone non-user		Total		χ^2 values
	Number	Percentage	Number	Percentage	Number	Percentage	
Experience (years)							
<2	30	78.9	8	21.1	38	9.0	$\chi^2 = 17.363$ $p = 0.001$
2–5	48	88.9	6	11.1	54	12.8	
6–11	157	96.9	5	3.1	162	38.2	
12+	159	94.1	10	5.9	169	40.0	
License type							
Public	54	91.5	5	8.5	59	13.9	$\chi^2 = 0.281$ $p = 0.596$
Private	340	93.4	24	6.6	364	86.1	
Daily distance travelled (km)							
10–20	102	87.2	15	12.8	117	27.7	$\chi^2 = 11.570$ $p = 0.003$
21–40	94	92.2	8	7.8	102	24.1	
41+	198	97.1	6	2.9	204	48.2	
Time of driving							
Peak (7 am – 5 pm)	256	93.8	17	6.2	273	64.5	$\chi^2 = 0.477$ $p = 0.490$
Off-peak (5 pm – 7 am)	138	92.0	12	8.0	150	35.5	

vey and is related to participants' driving experience. This survey used peak hours to refer to daytime hours (7 am – 5 pm). This is mainly due to the fact that in Jordan, there are no clearly distinct peaks for the morning and afternoon commute periods but rather traffic level remains relatively high throughout the daytime period between the two commutes. The majority of participants (64.5%) reported driving during the peak daytime period. Pearson's Chi-square results found no significant relationship between cell phone use and the time of day at a significance level of 5%.

4.3. Characteristics of Cell Phone Use while Driving

The results in this section were based on responses from 394 participants who reported the use of the cell phone in the previous sections of the questionnaire. Cell phone users were asked to report the amount of use in terms of duration and the number of calls as well as whether they used hands-free devices while driving among other questions. The obtained results are summarized in Table 4.

When asked about the time duration of using the cell phone while driving on a typical day, 83.2% of the surveyed participants reported duration shorter than 6 minutes and only 6.1% reported a duration longer than 10 minutes. On the other hand, around 35% of the users made five or more calls per day versus around 46% of those received five or more calls per day. The above numbers on cell phone use in terms of duration and the number of calls may not sound very realistic given the average duration of a single phone call. The questionnaire queried participants about their use of the cell phone while driving in crowded residential areas. A rational argument is that in crowded residential neighbourhoods, drivers should be less distracted and more attentive on the road to avoid conflict with pedestrians and bicyclists. The majority of participants (57.1%) reported the occasional or all-time use of the cell phone while driving in crowded residential areas. This is potentially dangerous practice, particularly in regard to the safety of young children living in these places.

Two of the more interesting survey topics from an educational and policy perspective pertain to the use of hands-free versus hand-held phones and the likelihood of pulling off the roadway to use the cell phone rather than trying to place a call or carry on a conversation while driving. More than 25% of the respondents reported the use of a hands-free device all the time or occasionally when talking on their cell phones while driving. The remaining percentage (around 75%) involved those who strictly used hand-held devices (around 57%) or rarely used hands-free devices (around 18%). Only around 11% of the participants of the survey reported pulling off the road when they used their cellular phones while driving.

To gain further insights into the aforementioned numbers, the duration of use was expressed as a percentage of the respondents for each gender and age group as shown in Fig. 1 and 2 respectively. No apparent relationships can be readily discerned in these figures between the duration of cell phone use while driving on one hand and driver's gender and age on the other hand. However, it seems that male drivers somewhat tended to use the cell phone while in motion for longer durations than female drivers did. Further, older drivers (41+ years of age) appear to be overrepresented among those reporting shorter and longer durations of cell phone use (1–2 minutes and 7+ minutes). Specifically, around 60% of older drivers (41+ years of age) reported the duration of use between 1 to 2 minutes while more than 32% reported a longer duration of use in excess of 7 minutes.

Fig. 3 shows the duration of cell phone use while driving expressed as percentage by years of driving experience. In general, the participants with fewer years of driving experience reported a shorter duration of cell phone use while driving.

Table 4. Survey results on the characteristics of cell phone use while driving

Characteristic	Number	Percentage
Total time using the cell phone while driving on a typical day		
1–2 minutes	95	24.1
3–4 minutes	127	32.2
5–6 minutes	106	26.9
7–9 minutes	42	10.7
10+ minutes	24	6.1
Number of outgoing calls made		
1 call per day	68	17.3
2 calls per day	54	13.7
3 calls per day	70	17.6
4 calls per day	66	16.8
5+ calls per day	136	34.6
Number of incoming calls answered		
1 call per day	33	8.4
2 calls per day	69	17.5
3 calls per day	52	13.2
4 calls per day	57	14.5
5+ calls per day	183	46.4
Do you use a cell phone in crowded residential areas?		
Always	33	8.4
Sometimes	192	48.7
Rarely	121	30.7
Never	48	12.2
How often do you use a hands-free device while driving?		
Always	21	5.3
Sometimes	79	20.1
Rarely	71	18.0
Never	223	56.6
Do you pull off the road to use a cell phone?		
Yes	45	11.4
No	349	88.6

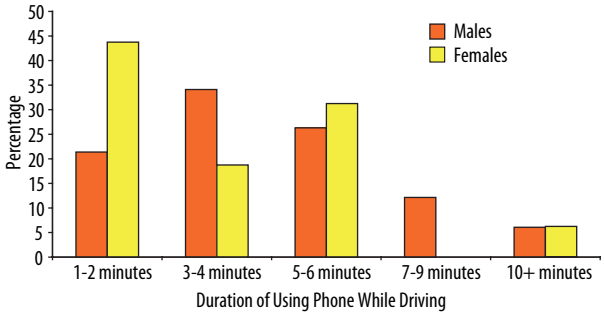

Fig. 1. Duration of cell phone use while driving expressed as percentage for both genders

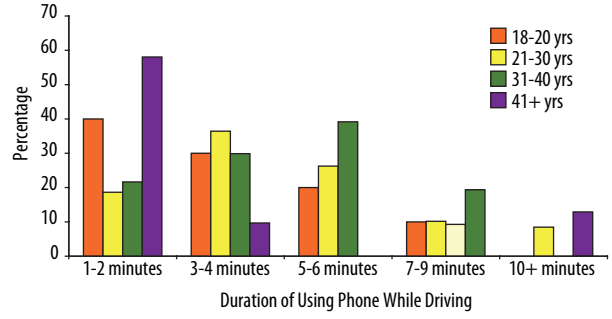

Fig. 2. Duration of cell phone use while driving expressed as percentage per driver's age

Another indicator of cell phone use included in the questionnaire survey was the number of outgoing and incoming calls. Figs 4–7 show the number of outgoing and incoming calls as a percentage of all users for both genders and different age groups respectively. A careful examination of these figures reveals very interesting trends as related to cell phone use while driving. First, it is clear that male cell phone users make more outgoing calls and receive more incoming calls than female users in the course of their normal daily driving. This may be attributed, to some extent, to trip type and thus the amount of driving performed by two genders. The relationship between gender and the number of outgoing and incoming calls was found significant as suggested by Pearson's Chi-square results ($p = 0.0001 < 0.05$). The second important trend shown in Fig. 6 suggests

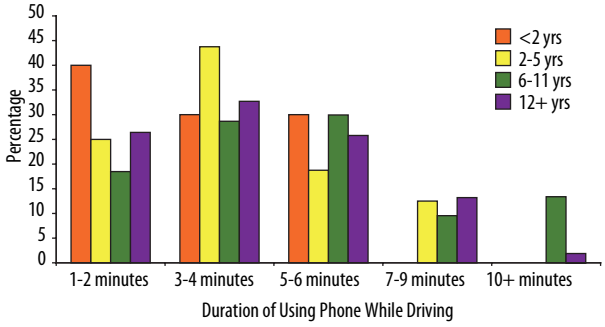

Fig 3. Duration of cell phone use while driving expressed as percentage per years of driving experience

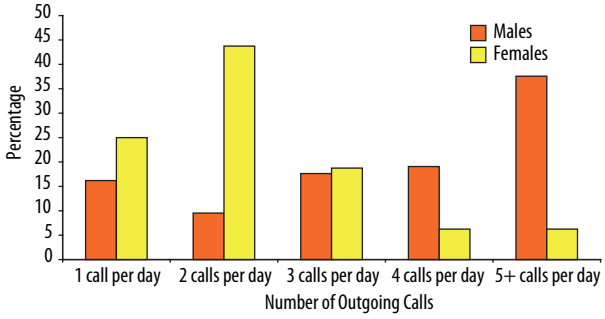

Fig. 4. The number of outgoing calls expressed as percentage for both genders

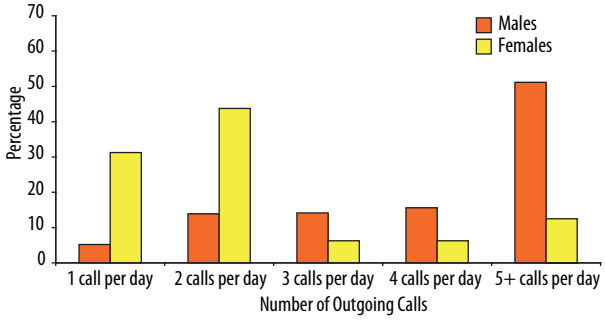

Fig. 5. The number of incoming calls expressed as percentage for both genders

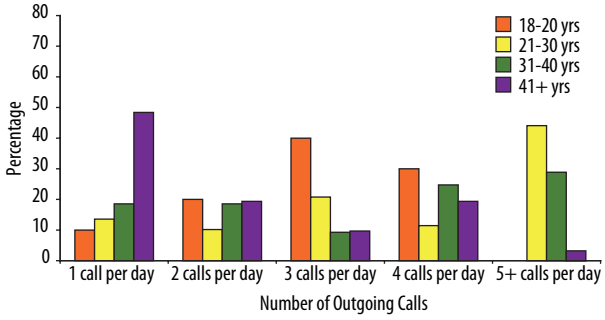

Fig. 6. The number of outgoing calls expressed as percentage per driver's age

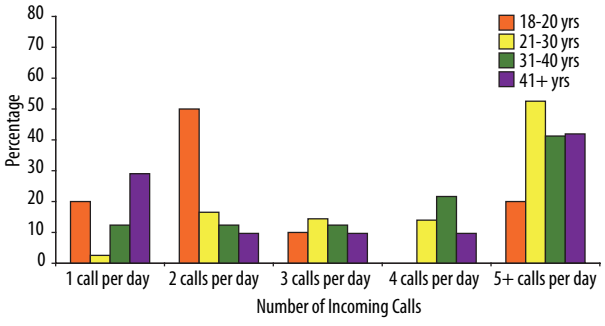

Fig. 7. The number of incoming calls expressed as percentage per driver's age

that older drivers usually make less outgoing calls than the younger drivers. This may partly be attributed to older drivers having more years of driving experience and perhaps more appreciation of risks involved with cell phone use while driving. The Pearson's Chi-square test found significant association between the number of outgoing calls and driver's age ($p = 0.0001 < 0.05$). In regards to incoming calls, Fig. 7 does not exhibit a clear trend between the number of incoming calls and driver's age. This is expected as drivers have no control over the number of calls received by their devices.

To examine the relationship between the use of hands-free devices and the extent of cell phone use while driving, Table 5 shows the numbers and percentages of the users and non-users of hands-free devices broken down by the different levels of cell phone use indicators along with Pearson's Chi-square test results. The users of hands-free devices reported higher use levels in terms of total talk time and, to a lesser extent, the number of outgoing calls. Both relationships were found significant using the Pearson's Chi-square test. These trends may suggest that people who were more engaged in phoning while driving were more prone to use hands-free devices. However, it may also be reasonable to assume that the use of hands-free devices encourage people to be more engaged in phoning while driving. Regardless of the situation, these results are consistent with the notion that the use of hands-free devices is perceived to be safer by most drivers. The Pearson's Chi-square test found no significant association between the use of hands-free devices and the number of incoming calls. This may be due to the fact that drivers have no control over the number of calls they receive while driving.

A question pertaining to cell phone use was how often cell phone users pull their cars off the road to use their cell phones. As illustrated in Table 6, the majority of users (88.6%) said they never pulled their cars off the road. The practice of pulling off the road while using the cell phone was found to be more prevalent among females, older drivers and those with more years of education. However, the Pearson's Chi-square test only proved association between pulling off the road on one hand and age and education level on the other hand to be significant.

Table 5. Cell phone use for users who reported the use or non-use of hands-free devices

Phone use characteristic	Use of a hands-free device				χ^2 values
	Yes		No		
	Number	Percentage	Number	Percentage	
Total time using a cell phone while driving on a typical day					
1–2 minutes	29	17.0	66	29.6	$\chi^2 = 19.519$ $p = 0.002$
3–4 minutes	47	27.5	80	35.9	
5–6 minutes	62	36.3	44	19.7	
7–9 minutes	21	12.2	21	9.4	
10+ minutes	12	7.0	12	5.4	
Number of outgoing calls made per day					
1 call	29	17.0	39	17.5	$\chi^2 = 17.480$ $p = 0.002$
2 calls	21	12.3	33	14.8	
3 calls	35	20.5	35	15.7	
4 calls	15	8.7	51	22.9	
5+ calls	71	41.5	65	29.1	
Number of incoming calls answered per day					
1 call	15	8.8	18	8.1	$\chi^2 = 1.598$ $p = 0.809$
2 calls	27	15.8	42	18.8	
3 calls	20	11.7	32	14.3	
4 calls	27	15.7	30	13.5	
5+ calls	82	48.0	101	45.3	

Table 6. The practice of pulling off the road while using the cell phone by selected driver demographics

Driver Demographics	Pulling off the road while using the cell phone				χ^2 values
	Yes		No		
	Number	Percentage	Number	Percentage	
Gender					
Male	36	10.4	310	89.6	$\chi^2 = 2.902$ $p = 0.088$
Female	9	18.7	39	81.3	
Driver age (years)					
18–20	0	0.0	30	100.0	$\chi^2 = 53.292$ $p = 0.0001$
21–30	15	6.4	221	93.6	
31–40	15	15.5	82	84.5	
41+	15	48.4	16	51.6	
Education					
High School	3	6.2	45	93.8	$\chi^2 = 37.989$ $p = 0.0001$
2-year college	9	9.5	86	90.5	
4-year college	21	9.3	206	90.7	
Master or PhD	12	50.0	12	50.0	

4.4. Driver's Opinions on the Safety of Cell Phone Use

Both cell phone users and non-users were asked to rate how distracting they thought various activities were to driving. Besides using the cell phone, these activities included talking to passengers, adjusting audio devices, smoking and eating or drinking. Table 7 indicates the opinions of the surveyed participants as to the most distracting activity expressed in numbers and percentages among users and non-users. Using the cell phone was found to be the most distracting activity by more than a half of the participants while talking with passengers was found most distracting by only around 8% of the respondents. Other activities were ranked in between as shown in Table 7. The relationship between the type of activity and the driver being cell phone user or non-user was not found statistically significant as per the Pearson's Chi-square test.

In addition, the participants were asked to indicate whether they agree or disagree with the following two statements:

1. Drivers can carry on a conversation on their cell phones and still drive safely.
2. Using a hands-free device is safer than a hand-held device.

Cell phone users and non-users were less likely to agree with statement 1 and they were generally more supportive of statement 2. The majority in both groups

Table 7. Survey results of driver's opinion on the safety of cell phone use

Cell phone safety issue	Cell phone user		Cell phone non-user		c^2 values
	Number	Percentage	Number	Percentage	
Most Distracting Driving activity					
Talking with passengers	30	7.6	3	10.3	$c^2 = 5.296$ $p = 0.258$
Adjusting audio devices	44	11.2	5	17.3	
Smoking	48	12.2	6	20.7	
Eating or drinking	66	16.8	6	20.7	
Using a cell phone	206	52.2	9	31.0	
Statement 1: Drivers can carry on a conversation on the cell phone and still drive safely					
Yes	51	12.9	5	17.2	$c^2 = 0.434$ $p = 0.510$
No	343	87.1	24	82.8	
Statement 2: Using a hands-free device is safer than a hand-held device					
Yes	283	71.8	15	51.7	$c^2 = 5.244$ $p = 0.022$
No	111	28.2	14	48.3	

believed that using a cell phone in motion was a safety hazard. The Pearson's Chi-square test found no significant relationship between the driver being user or non-user of the cell phone and the agreement or disagreement to this statement. Those who believed that using a hands-free device was safer than using a hand-held device represented 71.8% among cell phone users versus 51.7% among non-users. The relationship between the two groups of drivers and agreement or disagreement with this statement was found significant using the Pearson's Chi-square test.

5. Summary and Conclusions

With a dramatic increase in the use of cell phones in Jordan, driver distraction has emerged as a major safety concern among respective authorities and the traffic safety community. Programs and policies to minimize the hazards associated with phoning while driving are being discussed in these forums to improve safety. For any programs and policies to be effective, they need to target those who are more prone to this hazard. This research, which is a step in this national effort, aims at examining the extent and attributes of cell phone use while driving on Jordan's roads and at analyzing the characteristics of drivers who use cell phones while driving.

A questionnaire survey was conducted to gather information used in this study. The survey included questions on driver demographics, driving experience, the use of a cell phone and opinions about hazards associated with cell phone use. Around 93% of the licensed drivers reported the use of the cell phone while driving although the law in Jordan bans such practice. The drivers who reported using the cell phone while driving tended to be males, between 21 and 30 years of age, students and those working for the public sector. Further, the number of cell phone users was overrepresented among those who reported higher daily travelling distance, those travelling during peak hours and those who had longer years of driving experience. The duration of using the cell phone while driving and the number of outgoing calls decreased with increasing age which was higher for males than that for females. Further, the obtained results showed that the drivers who used a hands-free device while driving tended to use the cell phone more often and for a longer duration of time. The latter finding supports the notion found in literature that the use of hands-free devices may encourage drivers to be more on the phone. The vast majority of participants viewed the use of the cell phone while driving as a hazard. Nonetheless, the majority of drivers appeared to be prepared to take this risk as evidenced by the number of survey participants who reported such use.

Cell phone use was not the only thing distracting drivers. Interacting with other passengers in the vehicle, adjusting audio devices, smoking and eating or drinking were all potential driving distractions reported by the surveyed drivers. However, the largest number of study participants found using the cell phone while driving as being more distracting than all other activities

The results of this investigation are important for planning and designing appropriate interventions and countermeasures. For example, information on drivers' characteristics could be used for guiding the design of educational programs and campaigns targeted at the users of specific attributes. Further, characterizing cell phone use while driving could provide valuable information on highway safety to enforcement agencies so that to design new regulations and introduce policy changes.

The authors strongly recommend future research on cell phone related accidents using data on accidents to develop a better understanding of the safety aspects of phoning while driving in Jordan.

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