Misuse of Mobile Phone Conversation while Driving: Driver Distraction a Major Public Health Problem

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Abstract

Aim: The aim of the present study is to determine the frequency of mobile phone use while driving and associated factors in a sample of road traffic among Turkish drivers in Istanbul. **Design:** This is a cross-sectional study design. **Subjects and Methods:** The study included a representative sample of 1200 drivers. However, 891 drivers agreed to participate and completed the driver behavior questionnaire (DBQ). **Methods:** The Manchester DBQ was used to measure the aggressive and aberrant driving behaviors causing accidents in terms of sociodemographics, driving attitudes, and behaviors, adherence to traffic laws, and mobile phone use. **Results:** The present study expressed that the frequency of mobile phone use while driving was very high among Turkish drivers who were involved with traffic crashes. There was a significant difference found between mobile phone users and nonusers while driving in age group ($P < 0.01$), education ($P < 0.001$), occupation ($P < 0.001$), seat belt use ($P < 0.001$), vehicle type ($P < 0.001$), and excessive speed ($P < 0.001$). Furthermore, attempting to overtake, missing give way signal, and turning right/left nearly hitting other car were reported as errors. For lapses, there was no significant association found between correct and incorrect parking for drivers in all of the DBQ items. The data showed that the drivers reported higher mean scores of violations such as driving close to the car to go faster, running a red light, disregarding speed limit at night or early in the morning. **Conclusion:** Together, the results provide important insights into mobile phone use and its related factors among Turkish drivers. The type of vehicle, excessive speeding, occupational status, educational level, age group, seat belt use, and crossing a red light were statistically significant associated with mobile phone use among drivers who were involved in the road crashes. When drivers use a mobile phone, there is an increased likelihood of the road accidents that result in injury. There is no doubt that hands-free phone use while driving may not minimize the risk totally. In fact, advancing technology will increase mobile phone use in motor vehicles so it may cause more crashes and fatalities.

Key words: Driving, Istanbul, mobile phone, risk factors, road traffic crash, violation

Introduction

There is growing evidence that the mobile phone use while driving a motor vehicle increases the risk of traffic accidents.[1-4] When drivers use mobile phones including hands-free phones while driving, a four-fold increased risk has been reported in road crashes.[5] However, a nine-fold increased risk was reported in a case–control study that compares the users and nonusers of mobile phones while driving.[1] Furthermore, it is presented in Redelmeier and Weinstein's study that the risk of a crash while using a mobile phone in Toronto was 4 times higher than when a mobile phone was not being used.[5,6] However, it is not mentioned particularly in these studies how mobile phone use interferes with driving and leads to an increase in crash risk. Moreover, the use of mobile phone may affect decision-making process while driving since it is considered as a cognitive and operational task.[7] According to the literature,[8] distraction caused by mobile phone use includes the following types: Visual, audio, physical, and mental. Therefore, Laberge-Nadeau *et al*.[9] and Bener *et al*.[4] linked the use of mobile phones with increased risk of road accidents due to distracted driving.

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A wide range of research asserted that mobile phone use while driving has a negative effect on a number of behaviors and measures. The greatest concern is that drivers engaged in an in-vehicle communication system are not able to respond to brake lights of a car in front or a traffic light turning red.[2,7,10] For example, it is determined by Hancock *et al*. in Massachusetts that use of mobile phone while driving delayed responses by 15% in an important stop light task, forcing drivers to brake later and harder to stop at the right time.[2]

Many studies have been conducted to investigate the impacts of mobile phone while driving. Rosenbloom[11] investigated that speed and safe gap keeping behaviors were affected using a hands-free mobile phone while driving. It is interesting that many drivers do not perceive the effects of the mobile phone conversation while driving to be distracting. Moreover, drivers who had short conversations did not change their speeds whereas drivers who talked for more than 16 min were observed to drive faster. Fitch *et al*.[12] stated that drivers simplified the driving requirements while using a mobile phone. It is necessary to give attention when drivers are texting while driving.[8,13] The increasing use of mobile phones has induced reasonable scientific inquiry, mainly focusing on the impacts of driver inattention. In the 1900s, several studies found out a relationship between mobile phone use and dangerous driving behaviors.[1,4,7,10] Since then, many studies in the literature have investigated the danger of handheld and hands-free mobile phone use while driving.[4,12]

Many researchers believe that the mobile phone conversation is the most important reason of the driver distraction whereas the physical process to use mobile phone (e.g., holding a handheld mobile phone, answering a call, dialing a number, texting) is only the secondary reason of distraction.[3,4,14,15] Observational surveys determined that around 5% of drivers at any given time were using handheld mobile phones that are the main reason of distraction.[3,16] It increases the possibility of road crashes.[9,17] Moreover, males have a significantly higher traffic accident involvement rate than females in regard to the use of mobile phones.[3,14] Also, Pöysti *et al*.[18] observed that the phone-related hazards increase with higher mileage, broader phone use, younger age, low safety motivation, and occupation in a leading position.

Mobile phone use in Western industrialized countries had a great majority in these studies. The cultural aspects of driver behavior and mobile phone use are important since regional differences in accident distribution and risky driving have been indicated in international accidents statistics and previous studies.[3,4,14,19] Dula *et al*.[20] reported that more emotional phone conversations while driving would lead to higher frequencies of risky driving behaviors in a simulated environment than more casual conversation or no phone conversation at all.[20] The aim of this study is to determine the frequency and factors associated with mobile phone use among Turkish drivers in Istanbul.

Subjects and Methods

Participants

A cross-sectional survey was conducted between July 2015 and December 2015 in Istanbul, Turkey. A multi-stage stratified cluster sampling design was developed using an administrative division of Istanbul and had approximately equal size to the number of inhabitants. The sampling was stratified with proportional allocation according to stratum size to arrange a representative sample of the study population. Stratification was based on geographical location and with 2.5% error bound, 99% confidence limits the required target sample size computed to be 1200. The health educator and social workers recorded the data on each subject. A representative sample of 1200 Turkish drivers was selected systematically 1-in-2 from both males and females aged 24 years and above in Istanbul. A total number of 891 Turkish drivers with 236 females and 655 males (73.5%) took a part in the present study, and they were included in the statistical analysis. The sampling procedure is demonstrated in Figure 1. All participants had driving licenses and were reassured about anonymity and confidentiality. They filled out the driver behavior questionnaire (DBQ), and items were interested in drivers' driving records and demographic variables.

Outcome measures: Driver behavior questionnaire

DBQ allows researchers to measure the relationship between anomalous behaviors of drivers and accident involvement.[3,19,21] A bilingual coinvestigator and the bilingual expert translated the DBQ into Turkish. Both translators corrected, modified, and reworded the minor differences and discrepancies. The extended version of DBQ contains 10 items of aggressive and ordinary violations, 7 items of lapses and 8 items of errors. Two violation items (e.g., drinking and driving) were dropped due to cultural factors. Participants were asked to determine how often they committed each of the 26 behaviors in the previous year on a 6-point scale (0 = never, 1 = hardly ever, 2 = occasionally, 3 = quite often, 4 = frequently, and 5 = nearly all the time).

A wide range of questions were asked to the participants. A well-versed researcher collected the data of DBQ along

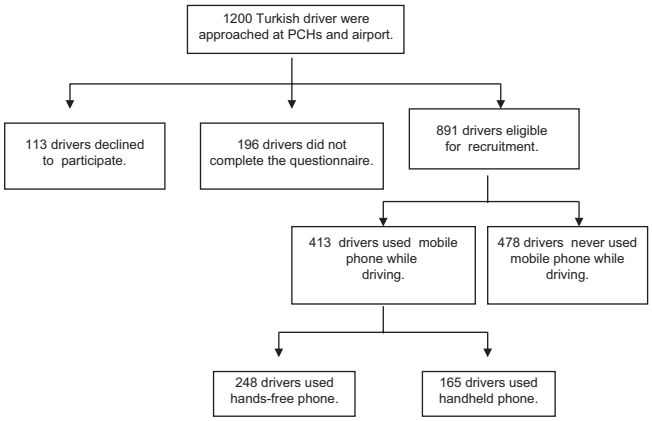

Figure 1: Sampling procedure for the recruitment of drivers

with sociodemographic information, driving history, and other activities while driving by face to face interview. The questions were aimed at identifying drivers' age, gender, marital status, educational level, occupation, place of living, driving experience, type of car (four-wheel drive or small car), seatbelt use, use of CD/cassette player, speed choice on different roads, annual mileage, crossing a red light, and the frequency of mobile phone use. Questions were, for example, included "Do you use mobile phone while driving?" "If yes, what is the average duration of use?"

The Statistical Package for Social Sciences (SPSS) for Windows version #21 (IBM, Armonk, NY, USA) was used to analyze the data. Comparison of sociodemographic behaviors related to road traffic violations between different ethnic groups was assessed using Pearson's Chi-square test of significance for categorical variables. Analysis of variance with pairwise *post hoc* Bonferroni correction was revealed differences in tendency to show aberrant driving behaviors in an ethnic group after controlling age, gender, and mileage driven since getting their driving licenses. Furthermore, logistic regression analysis was used for prediction of the risk factors for road traffic crashes among mobile phone users while driving. $P < 0.01$ was considered statistically significant.

Results

The analysis was based on the 891 Turkish drivers (236 female and 655 male) aged 24 years and above who had driving license (mean age of drivers was 33.5 ± 10.0 years). The sociodemographic characteristics of drivers as mobile phone users and nonmobile phone users while driving are shown in Table 1. The results presented that of 891 drivers, 413 (46.3%) of Turkish drivers used mobile phone while driving. The average number of incoming or outgoing calls of drivers during driving was 12.50/day. It is observed that there were significant differences between age groups in frequency of mobile phone use while driving, but the percentage of mobile phone use was not proportional to increasing age. There was a significant difference found between mobile phone users and nonusers while driving in age group ($P < 0.01$), education ($P < 0.001$), occupation ($P < 0.001$), seat belt use ($P < 0.001$), type of vehicle ($P < 0.001$), and excessive speed ($P < 0.001$). A self-report of all past accidents was used to measure the accident involvement and 347 (38.9%) have been involved in one or more than one accidents.

Comparison of driving skills by mobile phone use is highlighted in Table 2. Drivers who used mobile phones while driving seemed to have low skill or high behavior score. Furthermore, red light violations were more common among mobile phone users while driving ($P < 0.001$). There were significant differences found between driving behind slow car without getting impatient ($P < 0.01$), controlling to speed limits ($P < 0.01$), driving carefully ($P < 0.01$), managing the car through a skid ($P < 0.01$), and overtaking ($P < 0.01$).

Table 1: Sociodemographic and behavior characteristics of drivers who are users and nonusers of mobile phone while driving

Variables	Mobile phone user ($n=413$), *n* (%)	Nonmobile phone user ($n=478$), *n* (%)	*P*
Age Group			
<30	105 (25.4)	87 (18.2)	0.008
30-39	148 (35.8)	175 (36.6)	
40-49	90 (21.8)	144 (30.1)	
≥50	70 (16.9)	72 (15.1)	
Gender			
Male	319 (77.2)	336 (70.3)	
Female	94 (22.8)	142 (29.7)	0.019
Marital status			
Single	92 (22.3)	79 (16.5)	0.030
Married	321 (77.7)	399 (83.5)	
Education			
Primary	92 (22.3)	54 (11.3)	<0.001
Intermediate	78 (18.9)	96 (20.1)	
Secondary	134 (32.4)	84 (17.6)	
University	109 (26.4)	244 (51.0)	
Occupation			
Housewife	72 (9.0)	116 (5.6)	<0.001
Sedentary/professional	94 (22.8)	154 (32.2)	
Manual/laborer	159 (38.5)	125 (26.2)	
Business man	53 (12.8)	73 (15.3)	
Army/police	35 (8.5)	10 (2.1)	
Use of seatbelt			
Yes	220 (53.3)	311 (65.1)	<0.001
No	193 (46.7)	167 (34.9)	
Vehicle type owned			
Four-wheel drive	36 (8.7)	81 (16.9)	<0.001
Small car	256 (62.0)	279 (58.4)	
Heavy truck	35 (8.5)	47 (9.8)	
Light/pick up	71 (17.2)	48 (10.0)	
Motorcycles	15 (3.6)	23 (4.8)	
Driving experience			
<2	46 (11.1)	78 (16.3)	0.078
2-5	116 (28.1)	109 (22.8)	
6-10	92 (22.3)	103 (21.5)	
>10	159 (38.5)	188 (39.3)	
Annual mileage (km/year)			
<25,000	239 (57.9)	237 (49.6)	0.016
>25,000-30,000	174 (42.1)	241 (50.4)	
Use CD/cassette player while driving			
Yes	194 (47.0)	260 (56.5)	0.032
No	219 (53.0)	218 (43.5)	
Crossing a red light			
Yes	158 (38.3)	145 (30.3)	0.015
No	255 (61.7)	333 (69.7)	
Over-speeding			
Yes	215 (52.1)	78 (16.3)	<0.001
No	198 (47.9)	400 (83.7)	

Table 2: Comparison of driving skills by mobile phone use

Driving skills	Mean±SD		*P*
	Mobile phone user (*n*=413)	Nonmobile phone user (*n*=478)	
Performance in critical situation	2.37±1.27	2.24±1.37	0.160
Driving behind a slow car without getting impatient	1.93±1.36	1.66±1.21	0.002
Managing the car through a skid	2.25±1.36	1.71±1.43	0.009
Predicting traffic situations ahead	1.76±1.38	1.97±1.42	0.027
Driving carefully	2.1±1.4	1.8±1.4	0.003
Knowing how to act in particular traffic situation	2.13±1.43	2.06±1.48	0.460
Lane changing in heavy traffic	1.87±1.36	1.67±1.34	0.030
Fast reactions	2.09±1.38	1.88±1.40	0.024
Showing consideration for other road users	1.85±1.31	1.64±1.39	0.025
Stay calm in irritating situations	2.00±1.32	1.86±1.34	0.102
Controlling the vehicle	2.19±1.35	2.18±1.36	0.922
Avoid competing in traffic	1.89±1.33	1.87±1.51	0.846
Keeping a sufficient following distance	1.89±1.27	1.75±1.28	0.104
Make a hill start on a steep incline	1.81±1.34	1.85±1.35	0.651
Overtaking	2.20±1.20	1.65±1.36	0.006
Relinquishing legitimate right when necessary	2.03±1.29	1.90±1.43	0.152
Controlling to the speed limits	1.91±1.34	1.65±1.36	0.006
Avoid unnecessary risks	2.20±1.19	2.13±1.29	0.429
Tolerating other drivers errors calmly	1.92±1.31	1.96±1.37	0.662
Reverse parking in a narrow gap	1.86±1.37	1.91±1.35	0.595

SD: Standard deviation

Table 3 shows the comparison of means and standard deviations of items of violations among mobile phone users and nonmobile phone users in Turkey. There were statistically significant differences between mobile phone users and nonusers regarding three driving violations items. Data showed that the drivers reported higher mean scores of violations such as driving close to car to go faster ($P < 0.001$), running a red light ($P < 0.001$), and disregarding speed limit at night or early in the morning ($P < 0.001$).

The results of stepwise logistic regression analysis in which road traffic crashes related to mobile phone use while driving are shown in Table 4. The type of vehicle, excessive speeding, occupational status, educational level, and crossing a red light were statistically significant associated with mobile phone use among drivers who were involved in the road crashes.

Discussion

Mobile communication technology in motor vehicles is becoming more popular and common worldwide. Our study presented mobile phone use while driving (46.3%) in a sample of Turkish drivers. The effect of mobile phone use on traffic safety plays a crucial role in research interest for the past several years.[1-3,5,18,22,23] A number of studies showed deterioration in driving performance due to the mobile phone use.[2,11,20] The use of mobile phones while driving quadruples the risk of an accident during the brief period of a call.[5] On the other hand, undoubtedly mobile phones have some advantages, such as allowing drivers to make emergency calls at the certain circumstances for example calling an ambulance, informing of a traffic crash, or a dangerous road condition.[24,25]

Some studies have highlighted that mobile phone use while driving was associated with poor speed maintenance,[24] failure to maintain an appropriate headway position,[11] increased mental workload,[7,10,26] and the failure to detect relevant traffic signals.[27] As described in a number of studies, mobile

Table 3: Means and standard deviations of items of violations among mobile phone users and nonmobile phone users

Variables	Mean±SD		*P*
	Mobile phone user	Nonmobile phone user	
Violations			
Drive especially close to the car in front as a signal to its driver to go faster or get out of the way	1.38±1.49	1.04±1.31	<0.001
Cross a junction knowing that the traffic lights have already turned red	1.05±1.44	0.64±1.20	<0.001
Disregard the speed limits late at night or early in the morning	1.43±1.52	1.06±1.42	<0.001
Disregard the speed limits on a motorway	1.32±1.56	1.09±1.42	0.024
Have an aversion to a particular class of road user and indicate your hostility by whatever means you can	1.07±1.39	1.06±1.23	0.990
Become impatient with a slow driver in the outer lane and overtake on the inside (right) lane	1.82±1.29	1.61±1.33	0.025
Get involved with unofficial "races" with other drivers	1.09±1.37	0.93±1.40	0.093
Angered by another driver's behavior, you give chase with the intention of giving him/her a piece of your mind	1.26±1.44	1.20±1.40	0.551
Sound your horn to indicate your annoyance to another driver	1.65±1.52	1.59±1.37	0.569
Stay in a motorway that you know will be closed ahead until the last minute before forcing you way into the other lane	1.16±1.49	1.20±1.39	0.626

SD: Standard deviation

Table 4: Factors associated with mobile phone use among drivers of road traffic crashes using stepwise logistics regression analysis

Independent variables	OR	99% CI	*P*
Educational level	2.67	1.68-4.26	0.005
Excessive speeding	2.53	1.81-3.45	0.001
Crossing at a red light	2.04	155-3.58	0.002
Vehicle type (four-wheel drive)	1.73	1.14-2.56	0.010
Occupation	1.32	1.12-1.73	0.024

OR: Odds ratio, CI: Confidence interval

phone use while driving (either hands-free or handheld phone) can increase drivers' braking lag when they need to respond to hazards[28] or to common traffic signals,[2,25,27] so it leads vehicles decelerating in a long time.[29] Moreover, a mobile phone conversation while driving is associated with an increased risk of being involved in a road crash between four and nine times more.[5,30-32]

The present study shows that mobile phones are becoming increasingly popular communication devices. This is consistent with other reported studies in Western countries.[7,17,24,26,33] In the present study, older drivers (50 years and above) had a lower rate of mobile phone use (16.9%) than middle-aged (age range of 30–39 years) (35.8%) and young drivers (age range of 24–30 years) (25.4%). These findings are consistent with those from Melbourne.[33] Male drivers who use mobile phones had a significantly higher rate than females; also, this result is similar to earlier reported studies.[3,5,14,15,30,31] Furthermore, the educated drivers were using mobile phones while driving less frequently than less educated drivers. Clearly, mobile phone use is part of a risky driving style.[3,14,15,30]

In addition to general risky driving style, failure to stop at red traffic lights while having a mobile phone conversation would be connected to cognitive process. Several studies noted that delayed reactions lead to change in following distance.[29,34,35] It is indicated that mobile phone use damages crucial stopping decisions.[2] Moreover, the present study asserted that running the red signal was significantly higher among the mobile phone users while driving. De Waard *et al*.[34] stated that checking the phone numbers while holding the phone in one hand caused a critical impairment in driving performance regarding lane control.[4,12]

Furthermore, hands-free equipment does not seem to offer an essential advantage over handheld units although now it becomes obligatory in many countries.[1,3,5,14,23,30] In fact, handheld phones used while driving may not remove the risk at all, since a hands-free phone is not any safer. Such facilities and technology definitely will increase mobile phone use in motor vehicles, it could invite to even more crashes and casualties.

Methodological limitations

One of the limitations of the study was to rely on self-reports of the participants about their mobile phone use while driving. The data were based on drivers' self-reports of behaviors. No observations were made and thus calling patterns may not be completely accurate. However, several studies have stated that self-reports of driving directly correspond to actual driving behaviors. Second, we do not have information about who initiated the calls or what the calls were about. This makes it difficult to determine the contribution of social distance and call purpose in the unique calling patterns that were found. Finally, there is no way of knowing whether both parties were aware that someone was driving during calls and texts which could reasonably be expected to alter behavior. A self-report of all past accidents was used to measure the accident involvement and 347 (38.9%) have been involved in one or more than one more accidents. They may have forgotten to report the number of road accidents in which they had been involved. Also, information about the location and severity of injury at the time of crash was not recorded.

What is already known on this topic

- Many drivers use mobile phones while driving, therefore face-to-face interview-based research has highlighted that using mobile phones impairs driving performance
- A link between phone use and increased risk of crashes resulting in property damage has been presented in epidemiological research.

What is new on this topic

- The use of mobile phones causes the increase likelihood of traffic accidents that result in injury
- Using hands-free devices does not reduce the accident risk.

Conclusion

Together, the results provide important insights into mobile phone use and its related factors among Turkish drivers. The type of vehicle, excessive speeding, occupational status, educational level, and crossing a red light were statistically significant associated with mobile phone use among drivers who were involved in the road crashes. When drivers use a mobile phone, there is an increased likelihood of the road accidents that result in injury. There is no doubt that hand-free phone use while driving may not minimize the risk totally. In fact, advancing technology will increase mobile phone use in motor vehicles so it may cause more crashes and fatalities.

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Conflicts of interest

There are no conflicts of interest.

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