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Is mobile phone use while driving prevalent? Evidence from Saudi Arabia

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ABSTRACT

Mobile phone use while driving is common in Saudi Arabia despite the presence of laws prohibiting it. This study aimed to examine the impact of mobile phone use on driving, as well as the attitudes and behaviors of male drivers. Data were collected through online surveys distributed to 1,000 drivers, representing the driving population. A total of 884 responses were received from licensed drivers who reported driving a car within the 30 days prior to the survey. Frequency analysis was performed for each survey item, and statistical tests, including the chi-square test and the Mann-Whitney U test, were used to identify associations and differences in unsafe driving behaviors. The findings revealed that 98% of participants used a mobile phone for activities such as texting, calling, or answering while driving. Although mobile phone use while driving was high across all regions, significant differences were found based on nationality (98% for Saudis compared to 95% for non-Saudis). However, age, education level, and driving experience did not show significant differences in drivers' attitudes or behaviors. Authorities should consider implementing stricter regulations to limit mobile phone use while driving. Future research should also explore the broader issue of distraction among all road users, including pedestrians.

1. Introduction

Recently, mobile phone ownership has increased rapidly worldwide, and as a result, the use of mobile phones in vehicles is also becoming increasingly common. The use of mobile phones while driving is of primary concern to policymakers. Evidence suggests that this behavior is increasing rapidly because of the exponential growth in the use of mobile phones more generally in societies. Studies in several countries imply that the number of drivers using mobile phones while driving has increased over the past 5–10 years, ranging from 1% up to 11% at every moment, with the use of hands-free mobile phones likely to be higher (Ortega et al., 2021). Recently, automobile drivers' widespread use of mobile phones while driving has raised safety concerns and garnered significant attention from researchers (Al-Ajlouny and Alzboon, 2023). Brown et al. (1969) have studied the impact of telephoning on driving, revealing that the use of mobile phones interfered with hand-eye coordination and posed logical problems that drivers had to address by neglecting their telephone connection. Since then, researchers have presented numerous studies on this topic (Zhang et al., 2019; Geidam, 2021). Overall, almost all studies support the argument that mobile phone use while driving increases the driver's cognitive load, which multiplies the risk of accidents. However, evidence from other studies found that in many countries, the extent of this problem remains unknown, as data on mobile phone use is not available on a regular basis when an accident occurs (Alghnam et al., 2019; Turnbull et al., 2021). Several surveys have found that 80%–90% of mobile phone owners use these devices while driving, at least for a short time (Bastos et al., 2020; Ortega et al., 2021). The extent to which drivers use their phones while driving varies significantly. One recent survey found that 15% of mobile phone owners use their mobile phone for more than 1 hour per day while driving, 15% for 30–60 minutes, 20% for 10–30 minutes, and 39% for less than 10 minutes per day while driving; 11% did not respond to the survey (Lu et al., 2024). Another study compared mobile phone conversations with in-vehicle conversations (with a passenger) to assess the impact of conversation on driving performance and confirmed that the higher the cognitive load of the talks, the worse driving performance (Fancello et al., 2020).

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Voinea et al. (2023) conducted a recent study that investigated the psychological impacts of using mobile phones while driving, both hands-free and hand-held. The study suggests that the order of frequencies for intended mobile phone activities when driving is (1) answering calls, (2) making calls, (3) reading text messages, and (4) sending text messages. According to this research, using a mobile phone while driving not only physically and cognitively distracts drivers but also requires them to split their attention between the conversation and driving-related tasks. An increasing body of research suggests that the use of mobile phones, regardless of whether hand-held or hands-free, while driving leads to an increased crash rate compared to when a driver does not use a mobile phone (Zhu et al., 2021; Kogani et al., 2020).

Alemdar et al. (2023) have also studied the effect of phone use under three driving conditions: (1) in light traffic on a quiet highway, (2) in heavy traffic on a four-lane bypass, and (3) in city traffic. Interestingly, they found that swerving decreased during the phone task, but only in light traffic on a highway road. On the other hand, during the phone task, drivers checked the rear-view mirror significantly less frequently than they would on a quiet highway. This likely resulted in split attention between the traffic ahead and the phone conversation, leaving less time for checking out rear traffic. Heavy traffic caused this behavior, in which drivers reached the minimum level of attention to rear traffic and did not further decrease it with a subsidiary phone task. The sub-tasks of entering a telephone number and having a demanding conversation are particularly likely to increase this risk, especially under heavy traffic conditions and when drivers are young and inexperienced (Boboc et al., 2022).

Mobile phone distractions have been found to have a negative impact on psychological well-being, limiting cognitive ability and leading to stress and negative outcomes such as accidents (Chu et al., 2021). Studies have shown that excessive use of mobile phones can result in psychological consequences like anxiety, depression, fatigue, and exhaustion (Khan et al., 2023). Moreover, mobile phone distraction is associated with cognitive and emotional preoccupation, which impacts users' satisfaction and their intention to use the phone (Subramaniam et al., 2024). Research also suggests that mobile phone use while driving can lead to a reduction in traffic speeds, with male drivers using their phones driving at lower speeds than female drivers not using their phones (Ortega et al., 2021).

The cognitive demands of activities such as phone conversations, emails, texting, gaming, browsing, and social media on mobile phones divert users' attention (Chu et al., 2021), thereby impairing decision-making, negatively impacting mental health, and creating safety risks. Particularly among young people, mobile phone distraction is becoming a major problem that causes cognitive and emotional preoccupation that might finally affect users' psychological well-being (Benedetto et al., 2024).

Truong et al. (2019) examined the use of mobile phones while driving in Malaysia. They found that texting while driving increases the likelihood of a crash or fall by 2.2 times. Therefore, it is crucial for individuals to be aware of the risks associated with distractions, particularly when it comes to using mobile phones while driving. Implementing strict laws and promoting awareness campaigns can help reduce the number of accidents caused by distracted driving. Additionally, educating drivers on the importance of staying focused on the road can also play a significant role in preventing accidents. Drivers should always prioritize safety and avoid any distractions that may lead to hazardous situations. Overall, the results of these studies suggest that mobile phone use concurrent with driving may have a negative impact on safety. As a result, it is critical to investigate drivers' driving behavior and the prevalence of mobile phone use.

1.1. Legislation governing phone use while driving

The safety of mobile calling while driving has become a central topic in public debate and among legislators. It has been legislated in many countries around the world (Choudhary and Velaga, 2017). Scientific evidence suggests that using mobile phones while driving poses significant risks for drivers, passengers, and other road users. As a result, most countries have passed legislation prohibiting this practice (Ortega et al., 2021), leading to a decline in the use of mobile phones while driving. Some studies, shortly after the enactment of the legislation, found that mobile phone restrictions had little to no effect on teenage drivers (Foss et al., 2009), but observational studies continue to reveal the continued use of mobile phones in cars (Szrywer et al., 2021). The wide range of behaviors in the study by Okati-Aliabad et al. (2024a) highlights the complexity of the issue of using mobile phones while driving and the need for comprehensive solutions. To solve this issue, we need therapies that effectively target various forms of mobile phone use while driving. Understanding and influencing decisions and behaviors related to mobile phone use while driving requires consideration of demographic factors, driving qualities, and age (Han et al., 2021). Furthermore, interventions should consider the impact of social norms and peer influences on individuals' mobile phone use behavior while driving; technological solutions such as hands-free devices may provide a safer alternative for drivers who need to stay connected while behind the wheel. Implementing multifaceted strategies that address these various factors will be crucial in effectively reducing the prevalence of distracted driving incidents. These findings highlight the importance of ongoing enforcement and education efforts to address this dangerous behavior on the road.

1.2. How prevalent are mobile phones in Saudi Arabia?

In the first quarter of 2024, the global smartphone market had a 7.8% growth, with over 7.2 billion devices in use (Popal et al., 2024). In early 1997, mobile phones were introduced into the Saudi market, which has since experienced dramatic growth, positioning it as the country with the highest proportion of mobile phone users worldwide. Now, Saudi Arabia has more than 44 million mobile phone subscribers and an 88% smartphone ownership rate. The percentage of smartphones in Saudi Arabia is nearly twice that of other countries (Alsubaie and Lyndon, 2020). Today, the use of mobile phones has become increasingly commonplace in public and at work. Almost everybody, irrespective of age, gender, or profession, is using a mobile phone. The use of mobile phones while driving is one of the top five causes of accidents in Saudi Arabia; accordingly, the authorities have formally banned the use of mobile phones while driving. Under this ban, using a mobile phone while driving results in fines and detention for a certain period for drivers who repeatedly fail to comply with the law. This law aims to reduce the number of drivers who violate traffic laws. Numerous studies have examined the use of mobile phones while driving, each with varying objectives. The purpose of this study is to investigate how drivers in Saudi Arabia use mobile phones while driving. This study also investigates the differences in rates of mobile phone use while driving according to demographic characteristics. Next, this study seeks to test the participants' attitudes toward using their phones while driving. To achieve the objective, we analyzed the data using SPSS and performed a chi-square test and a Mann-Whitney U test.

The structure of this paper is as follows: Section 2 outlines the empirical methodology, Section 3 describes the results of the data analysis, Section 4 discusses the findings and Section 5 provides the conclusions, limitations of the study, and suggestions for future research.

2. Empirical methodology

2.1. Questionnaire and participants

This study employed a 34-item closed-format online questionnaire developed based on a comprehensive literature review (Cain and Burris, 1999; Seo and Torabi, 2004). The target sample consisted of 1000 male residents aged over 17 years, all of whom had held a valid driver's license for at least one year and had driven within 30 days prior to the survey. Females were excluded due to difficulties in gathering information from them via phone or email, which were attributed to social norms. An online questionnaire was chosen to collect data on the extent of usage and perceived risk of phoning while driving. The sample size needed for the study was calculated as 881 respondents, based on a 95% confidence level and a margin of error of 0.033. Out of 1,000 drivers contacted, 911 participated, resulting in a response rate of 91.1%. After excluding 29 incomplete questionnaires, 882 responses were found suitable for statistical analysis. This ensured the study met its target sample size, providing reliable data for analyzing phone usage while driving within the specified population.

2.2. Data analysis

We used SPSS 20 to analyze the data. We conducted a frequency analysis of each response by item for all participants. We used chi-square significance tests to examine associations between categorical dependent variables and other variables of interest. We used Mann-Whitney U tests to examine the differences in unsafe driving behavior between mobile phone users and non-users, as well as between Saudi and non-Saudi participants, due to the ordinal nature of the outcome variables. We set a p-value of 0.05 as the threshold for statistical significance across all tests, adhering to the commonly accepted standard in scientific research. This analytical approach allowed for a comprehensive examination of the data, including descriptive statistics, associations between variables, and group comparisons. The ordinal nature of the outcome variables justifies the choice of non-parametric tests (Mann-Whitney U test), ensuring appropriate analysis of the data structure.

3. Results

The study analyzed data from 882 participants, focusing on various demographic variables such as nationality, marital status, education level, work status, age, driving experience, duration of smartphone ownership, and whether participants engaged in conversations with passengers. These variables provided a comprehensive understanding of the participants' backgrounds and characteristics, allowing for an analysis of how these factors might influence the study's main outcomes. The inclusion of driving experience and smartphone ownership duration suggests a focus on driving behavior or mobile phone use while driving. Additionally, the consideration of passenger conversations highlights an interest in examining the impact of in-vehicle distractions on driving performance or safety.

Table 1 presents the demographic characteristics of the survey sample used for our analysis of mobile phone usage while driving. We split the participants based on their nationality, with 88% Saudi and 12% non-Saudi, totaling n = 882. Participants' average age is 28 years, with a standard deviation of 6 years [95% CI: 15.42–40.26]. The distribution of age groups is as follows: approximately 46.3% (n = 408) of the participants in the age group 25–30 years, followed by the age group 18–25 years (31.2%, n = 275), 30–40 years (17.9%, n = 158), 40–50 years (4%, n = 35), and more than 50 years (0.7%, n = 6). In terms of marital status, 311 participants (35.3%) were single, whereas 564 (63.9%) reported that they

were married and 7 were divorced (0.8%). With respect to educational level, 29.4% of the participants had the highest educational level (PhD, MSc, or Diploma), 50.7% had bachelor's degrees, and 20% had less education (primary school, high school, or secondary school). Most of the participants were not in the workforce (29.4%, n = 259), followed by students (26.3%, n = 232), self-employed (25.5%, n = 225), part-time jobs (11.1%, n = 98), and full-time jobs (7.7%, n = 68). Out of the 882 participants, 745 had driving experience for more than 3 years (84.5%), followed by three years' experience (13.9%), two years' experience (1.1%), and one year's experience (0.5%). Analyses revealed that most of the participants (78.1%) had held a smart mobile phone for more than three years, followed by two years (18.6%) and one year (3.3%). This demographic information provided a comprehensive overview of the survey participants, including their nationality, age, marital status, education, employment, driving experience, and duration of mobile phone ownership.

Table 1: Sample characteristics from the survey

Characteristics		N	%
Nationality	Saudi	776	88
	Non-Saudi	106	12
Age	18-25	275	31.2
	25-30	408	46.3
	30-40	158	17.9
	40-50	35	4
	More than 50	6	0.7
Marital status	Single	311	35.3
	Married	564	63.9
	Divorced	7	0.8
Education	Primarily school	25	2.8
	Secondary school	152	17.2
	University graduate	447	50.7
	Highest education level	258	29.4
Work status	Full-time employment	68	7.7
	Part-time employment	98	11.1
	Self-employed	225	25.5
	Student	232	26.3
	Not in the workforce	259	29.4
Driving experience	One year	4	0.5
	Two years	10	1.1
	Three years	123	13.9
	More than 3 years	745	84.5
When do you hold a smart mobile phone	One year	29	3.3
	Two years	164	18.6
	Three years	369	41.8
	More than 3 years	320	36.3

Table 2 highlights the prevalence of mobile phone use while driving. Overall, 98.2% of drivers reported using their mobile phones for some purpose while driving. Among them, 11.6% frequently or very frequently used their phones while driving, 37.4% did so occasionally, 38.1% used their phones based on daily travel distance, and 11.1% seldom engaged in mobile phone use while driving. Only 1.8% of drivers reported never using their mobile phones while driving. Call duration also showed significant variation, with the most common calls lasting between 30 seconds and 2 minutes (32%), followed by calls lasting between 2 and 5 minutes (17.9%), more than 5 minutes, and less than 30 seconds (13.8%).

Table 2: The use of a mobile phone while driving (N = 882)

Question	Answer	N(%)
Using a mobile phone while driving	Yes	866(82)
	No	16(18)
How often do you use your mobile phone while driving?	Frequently or very frequently	102(11.6)
	Occasionally	330(37.4)
	On daily travelled distance	336(38.1)
	Seldom or never	98(11.1)
	Do not use	16(1.8)
Call duration while driving	Less than 30 seconds	122(13.8)
	30 seconds to 2 minutes	282(32)
	2–5 minutes	282(32)
	More than 5 minutes	158(17.9)
	Don't use it while driving	20(2.3)
	No response	18(2)

Table 3 displays the use of mobile phones while driving based on personal characteristics, as reported by 866 participants in the entire population. According to their nationality, there were statistically significant differences in the use of mobile phones while driving ($P<0.05$), with 765 Saudis (98.6%) and 101 non-Saudis (95.3%) reporting the use of mobile phones while driving, indicating a higher frequency of use for Saudi drivers compared to non-Saudi drivers. However, for all participants, the rate of mobile phone usage while driving is high. Also, there were statistically significant differences according to marital status ($P<0.05$) and work status ($P<0.05$). However, there were no statistically significant differences in the use of a mobile phone while driving based on age ($P>0.05$), education level ($P>0.05$), and driving experience ($P>0.05$). The average age of the participants who used mobile phones while driving was approximately 28 years. Implicitly, this practice became a normal attitude and behavior among the residents; education and experience in driving might not be able to prevent violations of traffic rules. Thus, further laws and regulations that prohibit talking while driving are required.

Table 4 shows the types of routines and behaviors practiced when drivers use mobile phones. The most frequently reported behavior performed one or two times per week while driving was "making a mobile phone call" (97.1%), followed by "answering a mobile phone call" (96.7%), "reading a text message" (88.6%), "sending a text message" (74.5%), and "operating the phone menu" (64.3%). This finding revealed that a large proportion of participants use mobile phones while driving (calling, receiving, and texting) despite Saudi Arabia's legislation banning the use of mobile phones while driving. Furthermore, 439 (49.8%) of the participants reported using a mobile phone while driving to answer a call more than one time per day, followed by one time per day (37%, n = 326), one or two times per week (10%, n = 88), and do not use it (3.3%, n = 29).

Approximately 61% (n = 540) of the participants reported using a mobile phone while driving to make a call more than one time per day, followed by one time per day (31.6%, n = 279), one or two times per week (4.2%, n = 37), and do not use (2.9%, n = 26). About 40% of the participants reported using their mobile phones while driving to read a text message one time per day, followed by one or two times per week (29%, n = 256), more than one time per day (19.2%, n = 169), and not using them (11.6%, n = 102). The results also show that 42% of the participants (n = 374) reported using a mobile phone while driving to send a text message one or two times per week, followed by one time per day (25.6%, n = 226), do not use (25.5%, n = 225), and more than one time per day (6.5%, n = 57). Participants were presented with a series of questions, including one that inquired about the driver's subjective feeling of disturbance resulting from using a mobile phone while driving in general (''Talking while driving: Interferes with driving?''), and six more variations of this question regarding aspects of the driver's behavior while driving. The participants had the option to strongly agree, agree, remain undecided, disagree, or strongly disagree.

Table 5 presents the frequency and percentage of participants. Of the 882 participants who drove vehicles, 93.5% strongly agreed or agreed that talking while driving interferes with driving; 88.3% of them strongly agreed or agreed that it is more distracting than tuning a car radio; and 92.4% believed that it is more distracting than eating or drinking behind the wheel. Whereas 63.5% of participants strongly agreed or agreed that they always or most of the time wore a seat belt, 74.1% reported frequently or very frequently driving above the posted speed limit. Moreover, approximately 95.8% of the participants strongly agreed or agreed that they listen to music or radio when they drive frequently or very frequently. Finally, 94.4% of the survey sample agreed that the government should ban all types of distractions while driving. We used Mann-Whitney U tests at the 0.05 level of significance to examine the differences in representative unsafe driving behaviors between Saudi and non-Saudi drivers who were operating vehicles. As shown in Table 5, there were no significant differences between Saudi and non-Saudi drivers for all variables that represent unsafe driving behavior (P>0.05 for all variables). This proves that this unsafe behavior is normal and has become widespread among Saudi citizens and non-Saudi residents.

Table 3: The rates of mobile phone use while driving based on demographic characteristics

Characteristics		Users(%) 866(82)	Non-users(%) 16(18)	χ^2 or t-test (P)
Nationality	Saudi	765(98.6)	11(1.4)	5.7(0.034)
	Non-Saudi	101(95.3)	5(4.7)	
Age*	Young (≤ 25 years)	272(98.9)	3(1.1)	0.1.17(0.415)
	Old (≥ 26years)	594(97.9)	13(2.1)	
Marital status	Single	555(98.4)	9(1.6)	6.27(0.043)
	Married	305(98.1)	6(1.9)	
	Divorced	6(85.7)	1(14.3)	
Education	Primarily school	25(100)	-	1.22(0.747)
	Secondary school	150(98.7)	2(1.3)	
	University graduate	437(97.8)	10(2.2)	
	Highest level of education	254(98.4)	4(1.6)	
Work status	Full-time employment	64(94.1)	4(5.9)	9.5(0.049)
	Part-time employment	98(100)	-	
	Self-employed	220(97.8)	5(2.2)	
	Student	203(99.1)	2(0.9)	
	Not in the workforce	254(98.1)	5(1.9)	
Driving experience	One year	4(100)	-	0.30 (0.96)
	Two years	10(100)	-	
	Three years	121(98.4)	2(1.6)	
	More than 3 years	731(98.1)	14(1.9)	

*Mean±SD of age is 27.85±6.22 for Yes and 27.44±5.98 for No

Table 4: The types of behavior practiced by drivers when using mobile phones

The use of a mobile phone	One time per day	More than one time per day	One or two times per week	Never
Answer a call	326(37%)	439(49.8%)	88(10%)	29(3.3%)
Make a call	279(31.6%)	540(61.2%)	37(4.2%)	26(2.9%)
Read a text message	355(40.2%)	169(19.2%)	256(29%)	102(11.6%)
Send a text message	226(25.6%)	57(6.5%)	374(42.4%)	225(25.5%)

4. Discussion

This study investigated the use of mobile phones while driving, with a particular emphasis on the influence of demographic characteristics on drivers. Participants were 882 drivers aged 18–56 who owned mobile phones. The survey assessed the frequency of calling and text messaging while driving, as well as drivers' behavior and beliefs relating to mobile phone use while driving. Despite the law banning mobile phone use while driving in Saudi Arabia, the rate of drivers engaging in this behavior is extremely high (98.2%) compared with other countries, for instance: Iran (Okati-Aliabad et

al., 2024b), Australia and New Zealand (Brown et al., 2023), Canada (Nurullah et al., 2013), Finland (O'Hern and Stephens, 2022), and in the North America and USA (Boboc et al., 2022), all of which found that up to 93% of drivers reported using their mobile phones while driving. The population's characteristics may explain this result. For example, cultural norms, lack of enforcement, and the widespread use of mobile phones in daily life could contribute to the high rate of mobile phone use while driving in Saudi Arabia. Overall, most participants reported using their mobile phones for any purpose while driving. Irrespective of handset type, they were more likely to make calls while driving rather than answering phone calls or texting. In summary, results from many studies around the world reveal that the use of mobile phones while driving remains high despite legislative efforts to limit and reduce such behavior (Eijigu, 2021; Mckeever et al., 2013; Shao et al., 2020). One explanation is that the perceptions of the practical, social, and psychological benefits of using mobile phones outweigh the associated risks (Eijigu, 2021). For instance, Phuksuksakul et al. (2021) found that drivers' perceptions of social interaction were associated with more frequent use of mobile phones while driving.

Table 5: Participants' attitudes toward using their phones while driving

Behavioral beliefs	N(%)					P-value*
	SA	A	U	D	SD	
Talking while driving interferes with driving	586(66.4)	239(27.1)	48(5.4)	5(0.6)	4(0.5)	0.801
Talking while driving is more distracting than tuning a car radio	456(51.7)	323(36.6)	85(9.6)	13(1.5)	5(0.6)	0.545
Talking while driving is more distracting than eating or drinking behind the wheel	543(61.6)	272(30.8)	49(5.6)	12(1.4)	6(0.7)	0.288
Talking while driving must be banned	652(73.9)	181(20.5)	41(4.6)	5(0.6)	3(0.3)	0.330
I wear a seat belt when I drive†	195(22.1)	365(41.1)	222(25.2)	81(9.2)	19(2.2)	0.651
I drive above the posted speed limit‡	300(34)	354(40.1)	188(21.3)	33(3.7)	7(0.8)	.837
I listen to music or the radio when I drive‡	625(70.9)	220(24.9)	31(3.5)	4(0.5)	2(0.2)	0.169

SA: Strongly agree († always, ‡ very frequently); A: Agree († most of the time, ‡ frequently); U: Undecided († and ‡ sometimes); D: Disagree († and ‡ seldom); SD: Strongly disagree († and ‡ never); *: <0.05 is significant

We cross-tabulated the prevalence of mobile phone usage while driving with the participants' demographic characteristics. Statistically significant results indicated that nationality differences existed, with Saudis being more likely than non-Saudis to use their mobile phones while driving. This finding supports the hypothesis that using a mobile phone while driving has a more negative impact on driving behavior for Saudi drivers than non-Saudi drivers. Moreover, married and single participants reported a higher rate of phone usage while driving when compared to those who were divorced. Finally, students reported higher rates (99.1%) of mobile phone usage while driving compared to full-time and part-time employed individuals. However, participants' education status, age, and driving experience did not result in statistically significant differences. This result highlights the potential risk of using a mobile phone while driving, as it has become a common behavior in all societies. It also reveals the precautions needed to promote safety. Furthermore, we need to focus more on risk perception, safety education, and planning. Most participants believe that a ban on mobile phone use while driving is necessary, which is one of the most intriguing findings. Previous research in the United States (David et al., 2016) found that many drivers engage in this behavior and strongly support laws restricting mobile phone use by drivers, which is consistent with this finding. Overall, it is evident that there is a consensus on the dangers of using mobile phones while driving and the need for stricter regulations. This highlights the importance of continued research and education to address this pressing issue in road safety. Most participants engage in mobile phone-related distracted driving behaviors. According to the study, taking a mobile phone call while driving is the most frequently reported behavior, occurring at least once per week, followed by answering a mobile phone call, reading a text message, and sending a text message. In this study, the rate of participants engaged in this behavior is greater than that in prior research, which revealed that the frequency of mobile phone use while driving is associated with risk outcomes (Engelberg et al., 2015; Eijigu, 2021). This suggests that despite increased awareness of the dangers of distracted driving, the prevalence of mobile phone use behind the wheel remains high. It is crucial for policymakers and safety advocates to continue raising awareness about the dangers of using mobile phones while driving to reduce the number of accidents caused by distracted driving

5. Conclusions, limitations, and future research

The results of the survey highlight the prevalence of mobile phone usage while driving. The rate at which drivers engage in this behavior is extremely high (98.2%) compared with other countries. This is probably because the behavior appears to be normal for society. Mobile phones have become one of the most common devices present in cars in Saudi Arabia. As the number and use of mobile phones in traffic continue to increase, concerns about their potential negative effects on traffic safety are also on the rise. Drivers are active users of the WhatsApp app, texting and sending messages. This behavior increases their risk of being involved in a road accident compared to individuals who do not use their mobile phones while driving. The study's findings suggest that policymakers should: 1) create targeted campaigns to reduce this risky behavior among drivers; 2) implement additional laws and

regulations that forbid using mobile phones while driving; and 3) consistently enforce laws as the most crucial and successful approach to alter this behavior. Therefore, prevention strategies that may show the most promise are legislative and corporate policies, coupled with high-visibility enforcement and strict consequences.

As with any study based on self-reported behaviors, this research has certain limitations. These limitations arise from relying on a self-reported survey instead of directly observing mobile phone use during driving. Self-reported data may be affected by biases, particularly social desirability bias, since distracted driving behaviors, such as texting or talking while driving, are widely regarded as dangerous and illegal. Additionally, questions related to impaired or drowsy driving over the past year may lead to underestimating the frequency of these behaviors. Another limitation is the lack of data on crashes involving serious injuries or fatalities caused by mobile phone use while driving. Despite these constraints, the findings provide valuable insights and potentially generalizable information. Mobile phone use is just one aspect of the broader issue of driver distraction. Future research should focus on including female drivers to achieve a more comprehensive understanding of driving behaviors. This inclusion can improve the accuracy of assessing risky behaviors and help design effective prevention strategies for the entire population. Moreover, incorporating psychological and demographic factors into studies on drivers' attitudes toward road accidents may offer significant insights for developing policies and road safety education programs. Additionally, exploring distraction among other road users, such as pedestrians and cyclists, could be an important avenue for future research.

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Compliance with ethical standards

Ethical considerations

Informed consent was obtained from all participants, and their confidentiality and anonymity were maintained. The study adhered to ethical research practices in line with relevant guidelines and regulations.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Al-Ajlouny SA and Alzboon KK (2023). Effects of mobile phone using on driving behavior and risk of traffic accidents. Journal of Radiation Research and Applied Sciences, 16(4): 100662. https://doi.org/10.1016/j.jrras.2023.100662

Alemdar KD, Kayacı Çodur M, Codur MY, and Uysal F (2023). Environmental effects of driver distraction at traffic lights: Mobile phone use. Sustainability, 15(20): 15056. https://doi.org/10.3390/su152015056

Alghnam S, Towhari J, Alkelya M, Alsaif A, Alrowaily M, Alrabeeah F, and Albabtain I (2019). The association between Mobile phone use and severe traffic injuries: A case-control study from Saudi Arabia. International Journal of Environmental Research and Public Health, 16(15): 2706. https://doi.org/10.3390/ijerph16152706 **PMid:31362446 PMCid:PMC6695828**

Alsubaie AQ and Lyndon N (2020). The perceived impact of social media access on rural communities in Al-Ahsa region, Saudi Arabia. e-BANGI: Jurnal Sains Sosial dan Kemanusiaan, 17(9): 61-74.

Bastos JT, Santos PAB, Amancio EC, Gadda TMC, Ramalho JA, King MJ, and Oviedo-Trespalacios O (2020). Naturalistic driving study in Brazil: An analysis of mobile phone use behavior while driving. International Journal of Environmental Research and Public Health, 17(17): 6412. https://doi.org/10.3390/ijerph17176412 **PMid:32899144 PMCid:PMC7504609**

Benedetto L, Rollo S, Cafeo A, Di Rosa G, Pino R, Gagliano A, and Germanò E (2024). Emotional and behavioural factors predisposing to internet addiction: The smartphone distraction among Italian high school students. International Journal of Environmental Research and Public Health, 21(4): 386. https://doi.org/10.3390/ijerph21040386 **PMid:38673299 PMCid:PMC11050649**

Boboc RG, Voinea GD, Buzdugan ID, and Antonya C (2022). Talking on the phone while driving: A literature review on driving simulator studies. International Journal of Environmental Research and Public Health, 19(17): 10554. https://doi.org/10.3390/ijerph191710554 **PMid:36078267 PMCid:PMC9517811**

Brown ID, Tickner AH, and Simmonds DC (1969). Interference between concurrent tasks of driving and telephoning. Journal of Applied Psychology, 53(5): 419-424. https://doi.org/10.1037/h0028103 **PMid:5366314**

Brown PM, George AM, van Boxtel JJ, and Lewis A (2023). Drive in the moment: An evaluation of a web-based tool designed to reduce smartphone use among young drivers. Traffic Injury Prevention, 24(6): 466-474. https://doi.org/10.1080/15389588.2023.2218509 **PMid:37306689**

Cain A and Burris M (1999). Investigation of the use of mobile phones while driving. Center for Urban Transportation Research, College of Engineering, University of South Florida, Tampa, USA.

Choudhary P and Velaga NR (2017). Modelling driver distraction effects due to mobile phone use on reaction time. Transportation Research Part C: Emerging Technologies, 77: 351-365. https://doi.org/10.1016/j.trc.2017.02.007

Chu J, Qaisar S, Shah Z, and Jalil A (2021). Attention or distraction? The impact of mobile phone on users' psychological well-being. Frontiers in Psychology, 12: 612127. https://doi.org/10.3389/fpsyg.2021.612127 **PMid:33959065 PMCid:PMC8093572**

David MS, David LS, Arwen AB, Nathan WB, and Jason MW (2016). Why drivers use mobile phones and support legislation to restrict this practice. Accident Analysis and Prevention, 92(1): 22-33. https://doi.org/10.1016/j.aap.2016.03.010 **PMid:27035396**

Eijigu TD (2021). Mobile phone use intention while driving among public service vehicle drivers: Magnitude and its social and cognitive determinants. PLOS ONE, 16(4): e0251007. https://doi.org/10.1371/journal.pone.0251007 **PMid:33930092 PMCid:PMC8087078**

Engelberg JK, Hill LL, Rybar J, and Styer T (2015). Distracted driving behaviors related to mobile phone use among middle-aged adults. Journal of Transport and Health, 2(3): 434-440. https://doi.org/10.1016/j.jth.2015.05.002

Fancello G, Adamu M, Serra P, and Fadda P (2020). Comparative analysis of the effects of mobile phone use on driving performance using ANOVA and ANCOVA. IET Intelligent Transport Systems, 14(9): 993-1003. https://doi.org/10.1049/iet-its.2019.0638

Foss RD, Goodwin AH, McCartt AT, and Hellinga LA (2009). Short-term effects of a teenage driver cell phone restriction. Accident Analysis and Prevention, 41(3): 419-424. https://doi.org/10.1016/j.aap.2009.01.004 **PMid:19393787**

Geidam S (2021). The effect of mobile phone use on driving style and driving skills (a case study of Yobe state). International Journal of Advances in Engineering and Management, 11(3): 632-639.

Han G, Zhang J, Ma S, Lu R, Duan J, Song Y, and Lau PW (2021). Prevalence of internet addiction and its relationship with combinations of physical activity and screen-based sedentary behavior among adolescents in China. Journal of Physical Activity and Health, 18(10): 1245-1252. https://doi.org/10.1123/jpah.2020-0512 **PMid:34391206**

Khan A, McLeod G, Hidajat T, and Edwards EJ (2023). Excessive smartphone use is associated with depression, anxiety, stress, and sleep quality of Australian adults. Journal of Medical Systems, 47(1): 109. https://doi.org/10.1007/s10916-023-02005-3 **PMid:37858009 PMCid:PMC10587281**

Kogani M, Almasi SA, Ansari-Mogaddam A, Dalvand S, Okati-Aliabad H, Tabatabaee SM, and Almasi SZ (2020). Relationship between using cell phone and the risk of accident with motor vehicles: An analytical cross-sectional study. Chinese Journal of Traumatology, 23(06): 319-323. https://doi.org/10.1016/j.cjtee.2020.08.002 **PMid:32893116 PMCid:PMC7718539**

Lu X, An X, and Chen S (2024). Trends and influencing factors in problematic smartphone use prevalence (2012–2022): A systematic review and meta-analysis. Cyberpsychology, Behavior, and Social Networking, 27(9): 616-634. https://doi.org/10.1089/cyber.2023.0548 **PMid:38979617**

McKeever JD, Schultheis MT, Padmanaban V, and Blasco A (2013). Driver performance while texting: Even a little is too much. Traffic Injury Prevention, 14(2): 132-137. https://doi.org/10.1080/15389588.2012.699695 **PMid:23343021**

Nurullah AS, Thomas J, and Vakilian F (2013). The prevalence of cell phone use while driving in a Canadian province. Transportation Research Part F: Traffic Psychology and Behaviour, 19: 52-62. https://doi.org/10.1016/j.trf.2013.03.006

O'Hern S and Stephens AN (2022). Mobile phone use while driving in Finland. Transportation Research Part F: Traffic Psychology and Behaviour, 90: 220-228. https://doi.org/10.1016/j.trf.2022.08.018

Okati-Aliabad H, Hashemi Habybabady R, Sabouri M, and Mohammadi M (2024a). Different types of mobile phone use while driving and influencing factors on intention and behavior: Insights from an expanded theory of planned behavior. PLOS ONE, 19(3): e0300158. https://doi.org/10.1371/journal.pone.0300158 **PMid:38446800 PMCid:PMC10917291**

Okati-Aliabad H, Sabouri M, Mohammadi M, and Habybabady RH (2024b). Associations between personality traits and different types of mobile phone use while driving: A cross-sectional study. Personality and Individual Differences, 227: 112713. https://doi.org/10.1016/j.paid.2024.112713

Ortega CAC, Mariscal MA, Boulagouas W, Herrera S, Espinosa JM, and García-Herrero S (2021). Effects of mobile phone use on driving performance: An experimental study of workload and traffic violations. International Journal of Environmental Research and Public Health, 18(13): 7101. https://doi.org/10.3390/ijerph18137101 **PMid:34281034 PMCid:PMC8297239**

Phuksuksakul N, Kanitpong K, and Chantranuwathana S (2021). Factors affecting behavior of mobile phone use while driving and effect of mobile phone use on driving performance. Accident Analysis and Prevention, 151: 105945. https://doi.org/10.1016/j.aap.2020.105945 **PMid:33385967**

Popal N, Ma B, Reith R, and Shirer M (2024). Worldwide smartphone market. Worldwide Quarterly Mobile Phone Tracker, Needham, USA.

Seo DC and Torabi MR (2004). The impact of in-vehicle cell-phone use on accidents or near-accidents among college students. Journal of American College Health, 53(3): 101-108. https://doi.org/10.3200/JACH.53.3.101-108 **PMid:15571112**

Shao X, Ma X, Chen F, Song M, Pan X, and You K (2020). A random parameters ordered probit analysis of injury severity in truck involved rear-end collisions. International Journal of Environmental Research and Public Health, 17(2): 395. https://doi.org/10.3390/ijerph17020395 **PMid:31936087 PMCid:PMC7013549**

Subramaniam M, Koh YS, Sambasivam R, Samari E, Abdin E, Jeyagurunathan A, Tan BC, Zhang Y, Ma S, Chow WL, and Chong SA (2024). Problematic smartphone use and mental health outcomes among Singapore residents: The health and lifestyle survey. Asian Journal of Psychiatry, 98: 104124. https://doi.org/10.1016/j.ajp.2024.104124 **PMid:38936322**

Szrywer P, Wachnicka J, Kustra W, and Pellegrino O (2021). Study on the prevalence of mobile phone use by car drivers-the case of Poland. Archives of Civil Engineering, 67(4): 225-242.

Truong LT, Nguyen HT, and De Gruyter C (2019). Mobile phone use while riding a motorcycle and crashes among university students. Traffic Injury Prevention, 20(2): 204-210. https://doi.org/10.1080/15389588.2018.1546048 **PMid:30888875**

Turnbull PR, Khanal S, and Dakin SC (2021). The effect of cellphone position on driving and gaze behaviour. Scientific Reports, 11: 7692. https://doi.org/10.1038/s41598-021-87120-2 **PMid:33833300 PMCid:PMC8032768**

Voinea GD, Boboc RG, Buzdugan ID, Antonya C, and Yannis G (2023). Texting while driving: A literature review on driving simulator studies. International Journal of Environmental Research and Public Health, 20(5): 4354. https://doi.org/10.3390/ijerph20054354 **PMid:36901364 PMCid:PMC10001711**

Zhang L, Cui B, Yang M, Guo F, and Wang J (2019). Effect of using mobile phones on driver's control behavior based on naturalistic driving data. International Journal of Environmental Research and Public Health, 16(8): 1464. https://doi.org/10.3390/ijerph16081464 **PMid:31027174 PMCid:PMC6518206**

Zhu M, Shen S, Redelmeier DA, Li L, Wei L, and Foss R (2021). Bans on cellphone use while driving and traffic fatalities in the United States. Epidemiology, 32(5): 731-739. https://doi.org/10.1097/EDE.0000000000001391 **PMid:34348395 PMCid:PMC8318565**