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Research paper

Study on the prevalence of mobile phone use by car drivers – the case of Poland

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Abstract: Distracted driving is a significant factor affecting road safety and it can occur as a result of using mobile phones while driving. The aim of the current research is to present the prevalence of mobile phone use by Polish car drivers, based on the roadside and online survey. The field study showed that 11.6% of 1867 drivers were using mobile phones while being in motion and 26.1% of 203 drivers when stopped in front of traffic lights. While moving, 8.9% were manipulating the device by hand and 2.6% – holding it to ear. During the stop, 14.2% of the observed motorists were manipulating it, 3.0% – holding it to the ear, and 8.9% – talking through a hands-free or headset. To determine how many people generally use mobile phones while driving (not only during momentary observation), a questionnaire was also carried out. The vast majority of 252 surveyed drivers (82.9%) admitted to using mobile phones while driving, and an equally large proportion considered this behavior as dangerous for transport safety (81.3%). Most of the motorists reported using cell phones: rarely (44.4%), both when stopped and being in motion (58.9%), in a built-up area (63.6%), holding it in hand (43.5%) and in order to chat or write messages (81.8%). The majority of drivers using cell phones while driving were male and in the 25–44 or 18–24 age group. None of the respondents caused an accident due to the use of these devices, but 1.6% were guilty of a collision caused by this reason.

Keywords: phone use, cell phone, driving, car crashes, driver distraction

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1. Introduction

Using mobile phones by drivers can cause distracted driving and therefore has a significant impact on road safety. Distracted driving is the diversion of attention away from activities critical for safe driving towards a competing activity [1]. When this occurs, the driver's attention is divided between two tasks – primary and secondary. This causes changes in the driving behavior and makes it impossible to concentrate sufficiently on the traffic situation.

The use of mobile phones while driving, like other electronic devices, can adversely affect the driver's perception, attention and response time. By taking their eyes off the road in favour of looking at the screen, drivers do not make full use of their senses, which allow them to perceive stimuli from their surroundings, and according to research, in urban traffic there can be up to 120 stimuli per minute [2]. A driver who is busy, for example, replying to text messages while driving, has to focus on more than one task, so that one of them becomes secondary and often driving, which creates a traffic hazard. In addition, the use of electronic devices while driving also has a significant impact on response time. It is prolonged because, due to the lack of continuous observation of the situation on the road, it is difficult to predict and respond to the events that occur quickly enough [3, 4].

Determining the risk of being involved in an accident due to the use of mobile phones is a difficult task, because in many countries the police or institutions do not collect data on the cause of traffic incidents and even if they do, the information obtained is often not reliable. However, there are studies that allow to estimate the impact of using mobile devices on road safety. One of the studies was conducted in Australia in 2004. It was shown that the use of mobile phones during or 10 minutes before the estimated time of the accident increased the probability of its occurrence up to four times, with a similar result obtained by analyzing the time interval up to 5 minutes before the incident [5].

It is widely accepted that holding a mobile phone in your hand carries a greater risk of being involved in a traffic accident than using it without your hands – e.g. with headsets. However, various studies show that using a device without holding it can pose the same danger. Of course, speed dialing or voice commands can reduce physical distractions, but hands-free systems do not eliminate the need for manual operation of the smartphone. Nevertheless, many experimental studies have shown that the most negative factor is the conversation, both on the handset and on the speakerphone [6]. Moreover, some of the analyses carried out suggest that a conversation with a passenger may have a similar or even greater impact on drivers' traffic behaviour than a phone call. Still, modern analyses of such regularities clearly indicate a higher risk of being involved in road accidents due to the use of mobile phones. Studies have shown that the response time of people making phone calls while driving is longer than that of those who talk to the passenger [7]. This may be due to the fact that passengers are more aware of the driving situation and the road environment as they travel with the driver and can adjust the intensity of the conversation to the current driving conditions and interrupt it if there is an obstruction of traffic. This is not possible for people who the driver is talking to on his mobile phone because they are not able to watch him or the road [8].

Apart from telephone conversations, also writing or reading messages can have a significant impact on driving safety due to possible cognitive distraction, physical and visual distraction, and, according to some scientists, even greater than a conversation [9]. Unfortunately, there

has been little research on the harmfulness of such activity, mainly experimental. One of them, carried out in 2007 in Australia, showed that drivers writing and receiving text messages were 28% more likely to go to another lane, and 40% to perform more incorrect lane change manoeuvres. The time they spend staring at the screen of their mobile phone without taking their eyes off the screen has increased even 4 times. The drivers surveyed usually decreased their speed and increased the distance from other vehicles when writing SMS messages, which was a sign of compensatory behaviour [10].

The impact of mobile phone use on drivers' activities and the risk to traffic is also different in terms of driving characteristics. The difference is mainly visible depending on the age group. The most negative impact is observed in the youngest and oldest drivers [11, 12]. The younger ones have less experience in driving, so they find it difficult to divide the attention into driving and telephone calls. Older drivers, on the other hand, have reduced cognitive and visual abilities, so their reaction time is prolonged and the division of tasks is also difficult [13]. As far as gender is concerned, according to most studies, men are more likely to use mobile phones while driving [14], but the impact of such activity depending on the driver's gender is not entirely known due to the discrepancy in research results. Some of these analyses highlight the greater impact on the behaviour of women, especially young [15–17], but others suggest that using mobile devices while driving has the same effect on women and men [18]. However, the results of the tests are consistent for people who exhibit other risky attitudes – drivers who drive after consuming alcohol, drive at excessive speed or, for example, do not fasten their seat belts, are more likely to use mobile phones while driving [13].

Despite the negative impact of phone use on driving, drivers continue to engage in this activity.

European roadside surveys indicate that around 1 to 11% of drivers use mobile phones while driving during their observations. Depending on the country, sample size, or e.g. type of analysis, these data are different. For example, in the Czech Republic in 2011 around 2.7% of drivers used mobile phones while driving, and in Spain around 3%. In 2012, 2% of drivers in France used these devices while holding them in their hand, and in Ireland-about 4% a year later. Based on roadside observations in 2009–2011 in Italy, up to 9% of drivers used mobile phones while driving [6]. According to more contemporary observations, conducted in 2017 in the UK, 1.1% of car drivers were using a hand-held mobile phone, whereby 0.8% of them were holding the phone in hand and 0.4% – to ear. In England and Wales, 0.6% of drivers were using hand-held mobile device and this rate was the highest in Scotland (2.0%) [19].

One of the roadside studies on the use of mobile devices by drivers was also conducted in the United States. Observations were conducted from 2017 to 2018 at 1615 sites and on 50577 passenger vehicles in 2017 and at 1612 sites and on 51414 passenger vehicles in 2018. It has been shown that 2.9% of drivers were talking on hand-held mobile phones in 2017 and this value increased to 3.2% in 2018. Visibly, 2.0% of drivers were manipulating these devices in 2017 and 2.1% in 2018. Almost 0.5% of drivers were speaking with headsets in 2017 (more precisely 0.45%) and this percentage decreased to 0.35% in 2018 [20]. A study in Canada found that 5.9% of drivers in urban areas and 2.8% in rural areas were using mobile phones whilst driving [21].

On the subject of mobile phone use while driving, naturalistic studies are also conducted, i.e. providing insights into the everyday behaviour of drivers, usually using mounted small

cameras and sensors in the observed vehicles. According to such studies, in the United States, 30% of drivers use their phone while driving [22]. This type of research may prove more quantifiable, with longer and more accurate observation and analysis of driver-vehicle-road interdependencies in normal situations, conflict situations, and during traffic accidents, but this method is expensive and requires finding willing drivers and installing equipment.

Roadside surveys on mobile phone use while driving only allow information to be obtained in a given short analysis time (while observing the vehicle while driving or while stopped), with the exception of naturalistic survey methods. Surveys, on the other hand, make it possible to study in detail the attitudes, perceptions and behaviour of drivers on the basis of their own declarations. For example, survey carried out in the Netherlands found that the percentage of drivers using mobile devices is as high as 48%, with a third holding one. About 15–35% of drivers send or read text messages while driving [23]. A 2009 survey in the UK found that 36% of drivers had used a mobile phone while driving, holding it in their hand, and 25% said they had done so during the past week. Additionally, 93% of the drivers surveyed admitted that they had observed other drivers using cell phones while driving in the past seven days [24]. A survey study conducted in Sweden showed that 30% of drivers with mobile phones reported using these devices daily while driving. Above 35% of younger drivers (18–24 years old) and almost 10% of older drivers (65–74 years old) used mobile phones while driving [25]. Next survey, conducted by the AAA Foundation for Traffic Safety, found that 68.9% of 7328 American respondents reported talking on the phone, 26,6% – typing or sending a text or e-mail and 34,6% – reading a text or e-mail at least once in the past 30 days [26]. One survey on mobile phone use by drivers was also created in the Australian state of Queensland and was published in 2017. Nearly half (49%) of 484 drivers reported that they talk on a cell phone on a typical day, with 45% when the phone rings, locating it and answering it, and 72% denying holding it in their hand during a conversation. On average, drivers took a phone call 1. 51 times and talked while holding the device 9.81 minutes per hour. Half of those surveyed admitted to browsing or typing messages, with 39% looking at the screen for more than 2 seconds and doing so an average of 3.9 times per hour [27].

Although there is a lot of research indicating the negative impact of mobile phone use by drivers on road safety and there is publicity about this problem in the media, still, fewer drivers believe that such activity could cause road accident, according to The SARTRE 4 survey [28].

2. Methodology

In order to determine the prevalence of mobile phone use while driving by drivers, two types of research were conducted:

– a roadside observation survey to reveal the number of drivers using mobile phones while driving and while stopped in front of traffic lights,

– an online survey to characterize mobile phone use while driving and the drivers themselves who engage in this activity.

2.1. Roadside survey data collection

The roadside study was conducted in Gdańsk (Poland) on 27.10.2020 (Tuesday) and 28.10.2020 (Wednesday). The task was divided into two parts- on one day (27.10.2020r) the drivers were observed while driving a car (task number 1) and in the next one (October 28, 2020) – while stopped in front of traffic lights at the intersection (task number 2). For the analysis of moving cars, records were created in two periods: morning (8:30–9:30 a.m.) and afternoon (3:30–4:30 p.m.). Thus, in total, the measurements carrying out this task took 2 hours. Observation of vehicles stopped in front of traffic lights was conducted only in the morning hours – from 8:30 to 9:30 a.m., so it lasted 1 hour.

During task number 1, the number of passing cars and the number of drivers using mobile phones while driving were recorded, separated into those holding the device to their ear and those visibly manipulating it, as it was not possible to additionally record driver characteristics due to speed and traffic volume. 15-minute intervals were adopted, i.e. there were four for one hour and eight for a total of two hours of measurement.

During the hour-long task number 2, the number of cars stopping at red lights at the analyzed intersection was recorded, but only those whose behavior could be observed. Thus, it was usual to note the drivers who occupied the four highlighted lanes first in order and the few people in the car in the right-turn lane. This time, three types of mobile phone use behavior were studied: holding the device to the ear, visible hands-free or headset talking (which was recorded when the driver was talking, not holding the phone in his hand and not conversing with a passenger), and visible manual manipulation of the device. Because the vehicles were stopped, it was also possible to record the gender and age characteristics (belonging to one of the age groups: 18–24, 25–59 and 60+ years) of the drivers. This time, 15-minute time slots were again adopted as they were during the first task, i.e. there were four per hour.

A total of 1867 cars were observed during this task number 1 and 203 in the case of the second task, so the sample size for the road survey was 2070. The characteristics of conducting this study is shown in Table 1.

Table 1. Characteristics of the roadside survey

Trait	Survey carried out on drivers in motion	Survey carried out on drivers of cars stopped in front of traffic lights
Date and time	27.10.2020 (Tuesday) 8:30–9:30 a.m., 3:30–4:30 p.m.	28.10.2020 (Wednesday) 8:30 to 9:30 a.m.
Duration	2 hours	1 hour
Intervals	15 minutes	15 minutes
Observed behaviour	holding cell phone up to the ear, visible manipulation of hand-held cell phone	holding cell phone up to the ear, visible headset cell phone use, visible manipulation of hand-held cell phone
Driver characteristics	none	gender, age (18–24, 25–59 and 60+ years)
Sample size	1867	203

It is important to mention that the research was carried out as a part of the diploma thesis and also without additional funding, so the scope is limited. Moreover, due to the Covid-19 pandemic, it was impossible to conduct a wider research therewithal, and the problem of analysis seems to be serious, therefore therefore an observation was made whether indeed a lot of drivers use mobile phones while driving.

2.2. Online survey data collection

Another survey was conducted using the Internet, sending out a ready-made questionnaire, created using Google Forms. This present study was conducted from 12 to 27 October 2020 and was aimed only at people having a driving license. It was disseminated to selected individuals and groups (mostly students) via social media and an online mailbox. The survey was fully anonymous, so only submitted responses were received. It consisted of twenty questions. The first 4 questions allowed to describe the basic characteristics of the respondent – sex, age, education, domicile. Another five concerned characteristics related to frequency of driving, owning one's own car or using another owner's vehicle, and wearing seat belts while driving. The next questions already refer directly to the use of mobile phones while driving, e.g.: whether the respondent engages in such activity, how often, at what moment, where, how, for what purpose, reducing speed when using the phone. Finally, they were also asked about the frequency of noticing other drivers engaging in this activity and awareness of the dangers it can entail, as well as exploring whether they had noticed other drivers or caused a collision or traffic accident themselves.

Over sixteen days, responses were collected from a total of 252 people, mainly from the Pomeranian Voivodeship, but also from other parts of Poland. The drivers surveyed were more likely to be female (51%) than male (49%). Half of the people belonged to the age group of 18–24 years and almost 36% were aged 25–44 years. The least number of people were in the 65 and over (3.2%) and 45–64 (11.1%) age brackets. An overwhelming number of drivers had secondary education (46.8%) and tertiary education (40.5%), while the fewest drivers had primary education (1.2%) and vocational education (11.5%). About 18.7% of the respondents lived in medium-sized cities (20–100 thousand inhabitants) and 21.0% in small cities (less than 20 thousand inhabitants). Drivers usually had a driving license for over 5 years (50.8%) or from 1 to 5 years (45.2%), and only 4.0% of people had them for less than a year. Half of the respondents admitted that they drive daily and only 4 people (1.6%) do not drive a car at all. The majority own their own car (69.4%), and if not, in 90.9% of cases these people use another owner's vehicle. About 94.8% of the respondents always wear seat belts, 2.8% wear them only as a driver and 0.8% as a passenger. Four people out of 252 (1.6%) admitted to not wearing a seat belt.

2.3. Interval estimation

The result of the roadside survey and questionnaire will be the percentage results on the use of mobile phones by drivers while driving. They determine a certain proportion of car drivers using mobile phones in a random set of all car drivers observed during the observation (sample). It is therefore necessary to estimate an interval from these results that potentially contains the

true (real) value from the population (all car drivers), in other words, to use a method called interval estimation. The confidence interval for a structure index (percentage) in a population with a normal distribution is calculated in accordance with the following formula (2.1):

$$\overline{x} - z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right) < \mu < \overline{x} + z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right) \tag{2.1}$$

where: $\overline{x}$ – sample mean, n – sample size, σ – standard deviation, $z_{\alpha/2}$ – confidence coefficient, α – confidence level.

The confidence level was taken to be 95%, which means that the probability of the event that the confidence interval contains the calculated value of the studied characteristic is 0.95. The larger the sample, the narrower this range is. For 95% confidence interval confidence coefficient $z_{\alpha/2}$ is 1.96.

3. Results

3.1. Results of the roadside study

During the two-hour roadside observation survey, carried out on drivers of cars using mobile phones while driving (in motion), 1867 cars were registered (Table 2). Over 200 people driving them, 216 to be exact, were using mobile phones while driving, which gives a percentage share of approximately 11.6%. The device was held by 49 (2.6%) motorists to the ear and 167 (8.9%) were manipulating it manually.

Table 2. Number of drivers using mobile phones while driving (in motion) according to the roadside survey, with estimation

Period	Observed drivers	Drivers using mobile phone (in general)		Drivers holding mobile phone to ear		Drivers visibly manipulating hand-held device	
		[%]	95% Confidence Interval	[%]	95% Confidence Interval	[%]	95% Confidence Interval
Morning hours	791	11.9	(9.6–14.1)	2.0	(1.0–3.0)	9.9	(7.8–11.9)
Afternoon hours	1076	11.3	(9.4–13.2)	3.1	(2.0–4.1)	8.3	(6.6–9.9)
Total	1867	11.6	(10.1–13.0)	2.6	(1.9–3.3)	8.9	(7.7–10.2)

In the morning hours, a total of 791 drivers were observed driving cars within one hour, of which 94 (11.9%) were using mobile phones while driving (Table 2). Sixteen (2.0%) subjects were holding the device to their ear, and 78 (9.9%) visibly manipulating it manually. The highest percentage of drivers using cell phones while driving, depending on the hour, in general as well as holding it to their ear or manipulating it, was observed between 9:00–9:15 a.m. and 9:15–9:30 a.m., the hours when traffic was the lowest during the hourly observation. During these time periods, 17.2% of drivers used cell phones (overall) and 3.6–3.3% held the device to their ear and 13.6–13.9% manipulated it.

The highest number of car drivers during the total two-hour field study, were observed in the afternoon, that is, a total of 1076 people, of which mobile phones were used by 122 (11.3%) of them. A total of 33 (3.1%) motorists were holding the device to their ear and the remaining 89 (8.3%) of them were visibly manipulating it. This time, the percentage of drivers using mobile phones (in general) while driving was the highest between 3:30 and 3:45 p.m., i.e. with the highest traffic intensity during the afternoon observation (13.4%), the same as in the case of drivers who were visibly manipulating the device manually (11.4%). However, the percentage of people holding a cell phone to their ear was highest with the least amount of vehicle traffic during the hour-long survey, i.e., 4:00-4:15 p.m. (5.0%).

During the hour-long study of drivers stopped in front of traffic lights at the intersection, a total of 203 cars selected (by the observer) were registered. Among the motorists who were driving these cars, 53 (26.1%) were using mobile phones, with 6 (3.0%) holding the device to their ear, 18 (8.9%) talking via a hands-free or headset set, and 29 (14.3%) were apparently manipulating the phone manually (Table 3). The highest percentage of drivers using mobile phones (in general) was observed between 8:45 and 9:00 a.m., which is the highest number of cars observed (56), as was the case of drivers using a hands-free kit or headset (10.7%). The share of drivers who were holding a mobile phone to their ear was the highest between 9:00 and 9:15 a.m. (3.7%), and those who were visibly manipulating the device – between 8:30 and 8:45 a.m. (17.0%), so in both cases with a slightly smaller number of observed cars (54 and 53 respectively).

Table 3. Number of drivers using mobile phones while driving (when stopped in front of traffic lights) according to the roadside survey, with estimation

Observed drivers	Drivers using mobile phone (in general)		Drivers holding mobile phone to ear		Drivers using a hands-free kit or headset		Drivers visibly manipulating hand-held device	
	[%]	95% Confidence Interval	[%]	95% Confidence Interval	[%]	95% Confidence Interval	[%]	95% Confidence Interval
203	26.1	(20.1–32.2)	3	(0.6–5.3)	8.9	(5.0–12.8)	14.3	(9.5–19.1)

Below, Table 4 also shows the gender and age characteristics of drivers using cell phones while stopped in front of traffic lights. The majority of observed drivers using these devices were male (54.7%). For drivers who held a mobile phone, the percentage by gender took the same value (50%). Men, on the other hand, were more likely to talk using a hands-free kit or headset (66.7%), while women were more likely to manually manipulate the mobile phone (51.7%). Analysis of age characteristics showed that the vast majority of drivers using mobile phones while stopped in front of traffic lights belonged to the age group of 25–59 years (69.8%). They were also most likely to hold the device to their ear (83.3%), talk through a hands-free or headset (61.1%), and visibly manipulate the device (72.4%). At the same time, it should be noted that the highest number of observed drivers was of the male sex and fell within the age group of 25–59 years, while the lowest was 60 years and above. In addition, the age of the drivers was only estimated based on only a momentary glance. This is very important information because it dictates that the following characterization should be treated with considerable uncertainty.

Table 4. Gender and age characteristics of drivers using mobile phones while stopped in front of traffic lights

Driver group	Drivers using mobile phone (in general)		Drivers holding mobile phone to ear		Drivers using a hands-free kit or headset		Drivers visibly manipulating hand-held device	
	Number	% of Drivers	Number	% of Drivers	Number	% of Drivers	Number	% of Drivers
Gender characteristics								
Females	24	45.3	3	50.0	6	33.3	15	51.7
Males	29	54.7	3	50.0	12	66.7	14	48.3
Age characteristics								
18–24	10	18.9	1	16.7	4	22.2	5	17.2
25–59	37	69.8	5	83.3	11	61.1	21	72.4
60 and older	6	11.3	0	0.0	3	16.7	3	10.3

3.2. Results of the online survey

Out of 252 surveyed drivers, only 43 of them (17.1%) declare that they do not use a mobile phone while driving (Fig. 1). The remaining 209 people (82.9%) admit to such behavior, with 112 (44.4%) drivers doing it rarely, 61 (24.2%) – quite often, and each time driving a vehicle – 36 (14.3%).

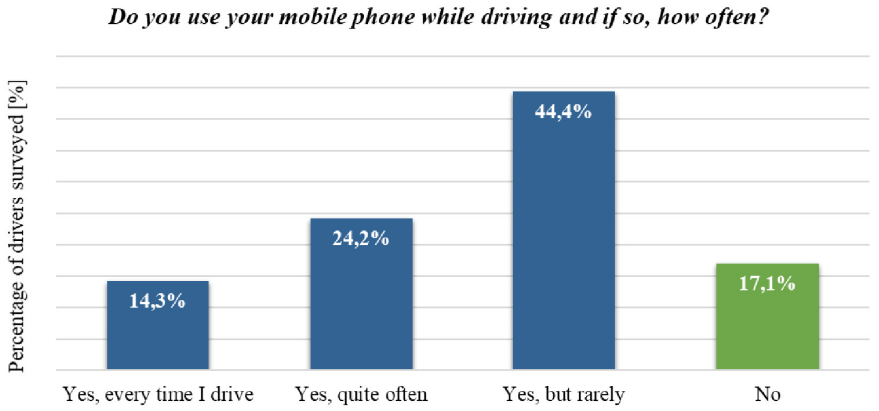

Fig. 1. The frequency of using mobile phones while driving

Majority of the respondents using mobile phones while driving i.e. 58.9% (123), use them both while stopped and in motion (Fig. 2). The fewest drivers use these devices while being in motion, i.e. 4.8% (10), and about 36.3% (76) do it while stopped e.g. in front of traffic lights.

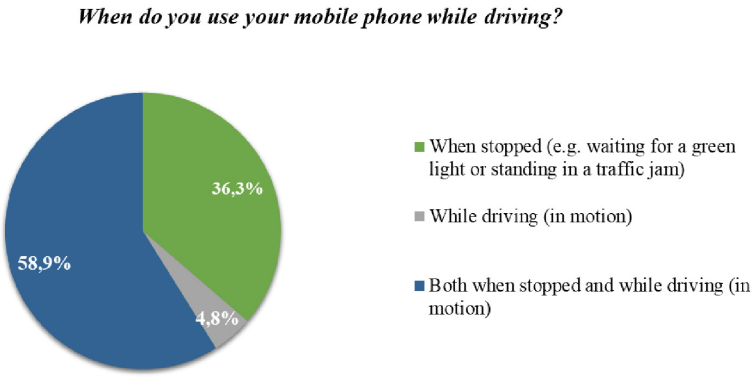

Fig. 2. The use of mobile phones while driving (in motion) and when stopped

Slightly more than half of the people surveyed who use a mobile phone while moving a car, reduces the speed of the car, 57.9% (77) to be exact. The rest of the drivers, or as many as 42.1% (56), admit that they do not do this. Drivers surveyed are more likely to use mobile devices in built-up area and account for 63.6% (133), while the remaining 36.4% (76) usually do so in undeveloped area. Most people use them holding them in their hands (43.5%; 91), and the rest – using a headset or speakerphone (29.2%; 61) or a car phone holder (27.3%; 57) – as shown in Fig. 3.

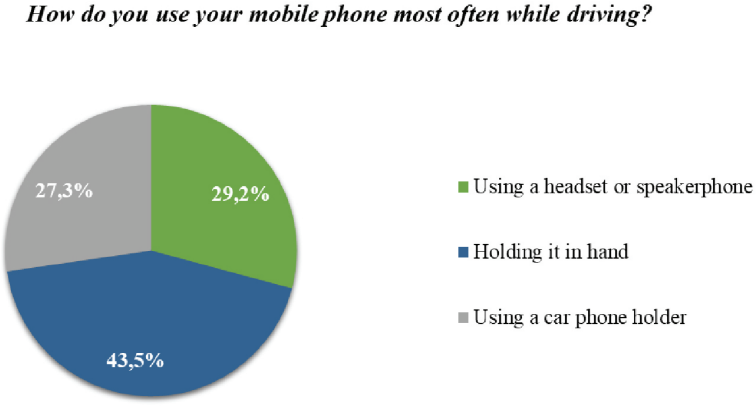

Fig. 3. The way of using mobile phones while driving

The most common purpose for using mobile phones while driving among respondents is to make a phone call and/or text/email (81.8; 171) and to use navigation (76.6%; 160), as shown in Fig. 4. Over 40% of people marked the answer "searching for songs and/or videos (e.g. YouTube, Spotify)" (41.6%; 87), and the fewest responses "social networking sites (e.g. Facebook, Snapchat, Instagram)" (16.7%; 35) and "reading content (e.g. articles, news)" (12.0%; 25). Additionally, 6 people (2.9%) wrote other answers, which included: listening to the radio, listening to an audiobook, online shopping, watching TV series or movies.

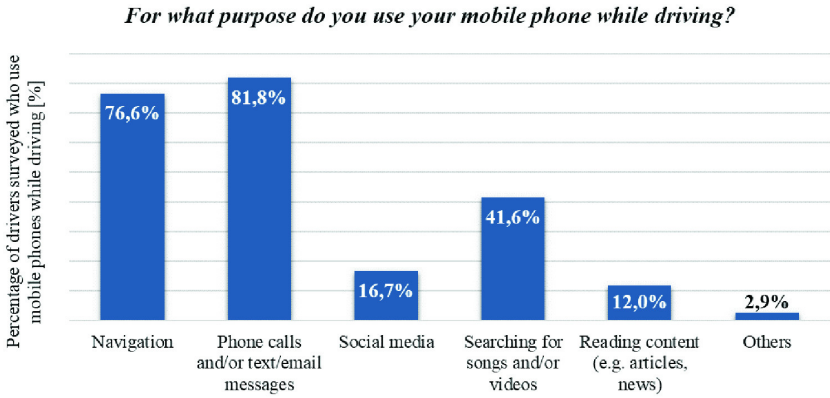

Fig. 4. The purpose for using mobile phones while driving

As part of the study, participants were asked whether they use cell phones while driving because of their job. The majority, i.e. 59.8% (125) to be precise, answered negative, 34.0% (71) admitted that they do it for business purposes, but also for private purposes, and only 6.2% (13) – only for business purposes. All drivers surveyed (252 people) also answered how often they notice other drivers using cell phones while driving. About 57.5% (145) said they see them often, 36.1% (91) – occasionally, 5.6% (14) – very rarely and only 0.8% (2) never see them. Each of the respondents also had to define the subjective perception of the impact of using a mobile phone while driving on road safety. The overwhelming majority (81.3%; 205) stated that the use of mobile phones while driving has a definitely negative impact on traffic safety. Almost 18% (17.9%; 45) perceived a slight risk, and only 0.8% (2) believed that it does not exist.

The last two questions in the online survey were about causing road accidents due to mobile phone use. Survey participants said they had never caused any accident due to this reason, but 1.6% (4) admitted to causing a collision due to such distraction and 13.1% (33) believed they had been close to causing such danger. The remaining 85.3% (215) had not caused or suffered any major traffic incident due to the above mentioned cause. The statistics for noticing other drivers who had caused a collision/accident due to cell phone use while driving are similar. The vast majority, i.e. 85.7% (216), had never witnessed such occurrence, and 9.9% (25) observed a collision due to this reason, 1.6% (4) – an accident, and 2.8% (7) – and a collision and an accident. Table 5 presents the above-described results together with the interval estimation.

Table 6 shows the characteristics of the surveyed drivers, who use mobile phones, also with interval estimation, with the sample in this case being the number of drivers in a given group (column 2). As can be seen, the share of drivers using these devices while driving was the highest in the group of people: male (90.2%), aged 25–44 (87.8%), with higher education (85.3%), inhabited large cities (86.3%), holding driving license for more than 5 years (85.2%), driving cars every day (92.1%), having their own car (89.1%) and not wearing seat belts – always or as a driver or passenger (100.0%). At the same time, it should be noted that some groups included very few drivers, e.g. those aged 65 and over, so these results may not be fully measurable.

Table 5. Online survey results with interval estimation

Questions	Answers	Drivers using mobile phones while driving	Percentage of drivers using mobile phones while driving [%]	95% Confidence Interval
Do you use your mobile phone while driving and if so, how often?	Yes, every time I drive	36	14.3	(10.0–18.6)
	Yes, quite often	61	24.2	(18.9–29.5)
	Yes, but rarely	112	44.4	(38.3–50.6)
	No	43	17.1	(12.4–21.7)
When do you use your mobile phone while driving?	When stopped (e.g. waiting for green light or standing in a traffic jam)	76	36.3	(29.8–42.9)
	While driving (in motion)	10	4.8	(1.9–7.7)
	Both when stopped and while driving (in motion)	123	58.9	(52.2–65.5)
If you use your mobile phone while driving, do you reduce driving speed?	Yes	77	57.9	(49.5–66.3)
	No	56	42.1	(33.7–50.5)
Where do you use your mobile phone most often while driving?	In the undeveloped area	76	36.4	(29.8–42.9)
	In the built-up area	133	63.6	(57.1–70.2)
How do you use your mobile phone most often while driving?	Using a headset or speakerphone	61	29.2	(23.0–35.4)
	Holding it in hand	91	43.5	(36.8–50.3)
	Using a car phone holder	57	27.3	(21.2–33.3)
For what purpose do you use your mobile phone while driving?	Navigation	160	76.6	(70.8–82.3)
	Phone calls and/or text/email messages	171	81.8	(76.6–87.0)
	Social media	35	16.7	(11.7–21.8)
	Searching for songs and/or videos	87	41.6	(34.9–48.3)
	Reading content (e.g. articles, news)	25	12.0	(7.6–16.4)
	Others	6	2.9	(0.6–5.1)
Do you use your mobile phone while driving because of your job?	Yes, only for business purposes	13	6.2	(2.9–9.5)
	Yes, but also for private purposes	71	34.0	(27.6–40.4)
	No	125	59.8	(53.2–66.5)

Table 5 [cont.]

How often do you notice other drivers using mobile phones while driving?	Often	145	57.5	(51.4–63.6)
	Occasionally	91	36.1	(30.2–42.0)
	Very rarely	14	5.6	(2.7–8.4)
	Never	2	0.8	(0.0–1.9)
Do you think that using a mobile phone while driving has a negative impact on road safety?	Yes, definitely	205	81.3	(76.5–86.2)
	Yes, but slightly	45	17.9	(13.1–22.6)
	No	2	0.8	(0.0–1.9)
Have you ever caused a car collision/accident because of using your mobile phone while driving?	Yes, a collision	4	1.6	(0.0–3.1)
	Yes, an accident	0	0.0	(0.0–0.0)
	Yes, and collision and accident	0	0.0	(0.0–0.0)
	No, but it was close	33	13.1	(8.9–17.3)
	No	215	85.3	(80.9–89.7)
Have you ever witnessed a car collision/accident being caused by a driver using a mobile phone while driving?	Yes, a collision	25	9.9	(6.2–13.6)
	Yes, an accident	4	1.6	(0.0–3.1)
	Yes, and collision and accident	7	2.8	(0.7–4.8)
	No	216	85.7	(81.4–90.0)

Table 6. Characteristics of drivers using mobile phones according to the online survey, with interval estimation

Trait	Drivers surveyed	Drivers using mobile phones while driving	Percentage of drivers using mobile phones while driving [%]	95% Confidence Interval
Gender				
Female	129	98	76.0	(68.6–83.3)
Male	123	111	90.2	(85.0–95.5)
Age				
18–24	126	105	83.3	(76.8–89.8)
25–44	90	79	87.8	(81.0–94.5)
45–64	28	21	75.0	(59.0–91.0)
65 and older	8	4	50.0	(15.4–84.6)

Table 6 [cont.]

Education				
Primary	3	0	0.0	(0.0–0.0)
Vocational	29	23	79.3	(64.6–94.1)
Secondary	118	98	83.1	(76.3–89.8)
Higher	102	87	85.3	(78.4–92.2)
Place of residence				
Village	72	60	83.3	(74.7–91.9)
Small town	53	43	81.1	(70.6–91.7)
Medium town	47	37	78.7	(67.0–90.4)
Big city	80	69	86.3	(78.7–93.8)
Possession of a driving license				
Less than a year	10	5	50.0	(19.0–81.0)
1–5 years	114	95	83.3	(76.5–90.2)
Over 5 years	128	109	85.2	(79.0–91.3)
The frequency of driving a car				
Zero	4	0	0.0	(0.0–0.0)
Several times a year	8	2	25.0	(0.0–55.0)
Several times a month	26	16	61.5	(42.8–80.2)
1–2 times a week	18	13	72.2	(51.5–92.9)
3–6 times a week	70	62	88.6	(81.1–96.0)
Every day	126	116	92.1	(87.3–96.8)
Possession of a car				
Yes	175	156	89.1	(84.5–93.8)
No	77	53	68.8	(58.5–79.2)
Fastening seat belts while driving				
Always	239	196	82.0	(77.1–86.9)
Only as a driver	7	7	100.0	(100.0–100.0)
Only as a passenger	2	2	100.0	(100.0–100.0)
No	4	4	100.0	(100.0–100.0)

4. Conclusion

The aim of the article was to determine the prevalence of the use of mobile phones by drivers while driving on the basis of a roadside observation survey conducted in Gdańsk (Poland) and an online questionnaire.

As a result of the analysis of the literature, it was shown that road safety and the safety of the driver himself are greatly influenced by his features such as perceptive abilities, the ability to focus and reaction time, which can be negatively affected by the use of mobile phone while driving. As a consequence of using these devices, drivers are often unable to perceive even the most important stimuli from the environment, their attention is distracted, and their reaction time is longer. Due to the destructive modification of the behavior of motorists due to the use of mobile phones, the risk of being involved in a road accident may be even four times higher. Despite the existing danger, according to reliable European research conducted in over a dozen countries, up to 11% of drivers can use mobile phones according to roadside surveys and up to 50% according to self-report studies.

The conducted field study allowed for the conclusion that about 11.6% of drivers were using mobile phones while driving, while 8.9% were manipulating the device manually, and 2.6% – holding it to their ear. While stopped in front of a traffic lights, 26.1% of the observed drivers were using mobile phones, among which 14.2% were manipulating them, 8.9% – talking visibly through a hands-free or headset, and 3.0% – holding the phone to the ear. However, this study was conducted only on the basis of temporary observations and does not show how many people can actually use mobile phones during the entire car journey.

By analyzing the results of the online survey, it was proved that overall 82.9% of the surveyed drivers may use a mobile phone while driving, with the most (44.4%) saying that they do it rarely. Most people (58.9%) use it both while stopped and while being in motion, and among drivers who do it while moving, as much as 42.1% do not reduce the driving speed. Most respondents use a mobile while driving a car: in a built-up area (63.6%), holding it in their hand (43.5%), to make phone calls and (or write text) e-mail messages (81.8%) . Additionally, only 6.2% do it for business purposes. More than half, i.e. 57.5%, often notices other drivers using mobile phones and 81.3% believe that such behavior has definitely a negative impact on road safety. None of the respondents had caused an accident due to the use of these devices, but 1.6% had been guilty of a collision. On the other hand, 9.9% had witnessed a collision by another driver due to the above-mentioned reason, 1.6% – an accident, and 2.8% – both a collision and an accident. Regarding the basic characteristics of the respondents, the majority of drivers using mobile phones while driving were male and aged 25–44 and 18–24.

The roadside and online survey research carried out showed that the problem of using mobile phones by drivers in Poland may be more serious than it previously seemed, as the percentage of drivers distracted by the use of mobile phones is approx. 12% according to temporary observations (roadside study) and about 80% according to the online survey, which shows whether drivers generally use their phones while driving, even rarely.

The scale of the problem of the use of mobile phones by drivers provides grounds for taking measures to minimize it. Therefore, it is recommended, first of all, to conduct social campaigns on driver distraction, as well as to establish a national organization that would conduct research on this topic, including the use of electronic devices among drivers on Polish roads.

The aim of the above work was therefore achieved by conducting a survey on the prevalence of the use of mobile phones by car drivers, which consisted of a field and online survey. As part of the continuation of the analysis of this issue, it is recommended to verify the obtained results in other sites and other cities in Poland. About a decade ago, at the request of the ministry, the percentage of vehicle users' use of seat belts (also thanks to observations from outside the vehicle) throughout Poland was regularly examined. Thanks to this, it was possible to analyze dangerous behaviors in larger sample and to identify differences between different provinces. The results obtained from the sample in the research on which this article was based, indicate that perhaps it is necessary to return to regular monitoring of drivers' behavior in terms of using electronic devices such as mobile phones. It is also suggested to carry out work on the role of the use of mobile devices by drivers in the occurrence of accidents on Polish roads.

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Badanie powszechności używania telefonów komórkowych przez kierowców samochodów w Polsce

Słowa kluczowe: używanie telefonów, telefony komórkowe, kierowcy, wypadki samochodowe, rozproszenie kierowcy

Streszczenie:

Celem artykułu było określenie powszechności używania telefonów komórkowych przez kierowców w trakcie prowadzenia samochodów, na podstawie przeprowadzonego badania poligonowego w Gdańsku oraz badania internetowego w formie ankiety.

W wyniku analizy literatury wykazano, że na bezpieczeństwo drogowe i bezpieczeństwo samego kierowcy niewątpliwie duży wpływ ma jego zachowanie i cechy, takie jak: zdolności percepcyjne, umiejętność skupienia uwagi oraz czas reakcji, na które to może negatywnie wpłynąć używanie urządzeń elektronicznych podczas jazdy. W konsekwencji korzystania z tych urządzeń, kierowcy często nie są w stanie dostrzec nawet najistotniejszych bodźców z otoczenia, ich uwaga jest rozproszona, a czas reakcji wydłuża się. Ze względu na destruktywną modyfikację zachowania kierujących samochodami wskutek używania telefonów komórkowych, w ich przypadku ryzyko uczestniczenia w wypadku drogowym może być nawet czterokrotnie większe. Pomimo występującego niebezpieczeństwa, według europejskich badań, przeprowadzonych w kilkunastu państwach, do 11% kierowców może korzystać z telefonów komórkowych według analiz drogowych i do 50% według ankiet.

W rezultacie przeprowadzonego badania poligonowego, wykazano, że około 11,6% kierowców korzystało z telefonów komórkowych podczas jazdy, przy czym 8,9% manipulowało urządzeniem ręcznie, a 2,6% – trzymało je przy uchu. Podczas zatrzymania przed sygnalizacją świetlną 26,1% obserwowanych kierujących korzystało z telefonów komórkowych, wśród których 14,2% manipulowało nimi manualnie, 8,9% rozmawiało w widoczny sposób przez zestaw głośnomówiący lub słuchawkowy, a 3,0% trzymało telefon przy uchu.

Wskutek przeanalizowania wyników badania ankietowego, udowodniono, że 82,9% ankietowanych kierowców używa telefonu komórkowego podczas jazdy, przy czym najwięcej (44,4%) stwierdziło, że robi to rzadko. Większość osób (58,9%) korzysta z niego zarówno w trakcie zatrzymania jak i podczas jazdy, a wśród kierujących, robiących to w trakcie ruchu, aż 42,1% nie zmniejsza prędkości jazdy. W trakcie prowadzenia samochodu najwięcej ankietowanych używa telefonu komórkowego: na obszarze zabudowanym (63,6%), trzymając go w ręku (43,5%), w celu prowadzenia rozmów telefonicznych lub/i pisania wiadomości tekstowych/mailowych (81,8%). Dodatkowo tylko 6,2% dokonuje tego w celach służbowych. Ponad połowa, czyli 57,5%, często zauważa innych kierowców używających telefonów komórkowych

i 81,3% uważa, że takie zachowanie wpływa negatywnie na bezpieczeństwo ruchu drogowego. Nikt z badanych nie spowodował wypadku z powodu korzystania z tych urządzeń, przy czym 1,6% było winnym kolizji, a 13,1% otarło się o takie zdarzenie drogowe. Za to 9,9% było świadkiem spowodowania kolizji przez innego kierowcę z wymienionego powodu, 1,6% – wypadku, a 2,8% – i kolizji i wypadku. Jeżeli chodzi o podstawową charakterystykę ankietowanych, większość kierowców używających telefonów komórkowych podczas jazdy, było płci męskiej i w wieku 25–44 lat oraz 18–24 lat.

Cel powyższej pracy został zatem osiągnięty poprzez przeprowadzenie badania powszechności używania telefonów komórkowych przez kierowców samochodów, na które składało się badanie poligonowe i ankietowe. W ramach kontynuacji analizy niniejszego zagadnienia, rekomenduje się weryfikację uzyskanych wyników również w innych lokalizacjach i miastach w Polsce. Około dekadę temu na zlecenie ministerstwa regularnie przeprowadzano badania, mające na celu wykazanie odsetka użytkowników pojazdów używających pasów bezpieczeństwa (również dzięki obserwacjom z zewnątrz pojazdu). Dzięki temu możliwe było przeanalizowanie niebezpiecznych zachowań w większej próbie i zauważyć różnice między wynikami uzyskanymi w różnych województwach. Rezultaty pochodzące z próbek badań, na podstawie których ten artykuł został zredagowany, wskazały, że prawdopodobnie należy wrócić do regularnego badania zachowań kierowców pod kątem używania urządzeń elektronicznych, takich jak np. telefony komórkowe. Jednocześnie zaleca się podjęcie prac, mających na celu wykazanie roli korzystania z urządzeń mobilnych przez kierujących w powstawaniu wypadków na polskich drogach.

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