

DRIVERS' USE OF DIFFERENT TYPES OF MULTIMEDIA DEVICES WHILE DRIVING – A SURVEY STUDY

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Abstract

Accidents and collisions continue to be an ongoing problem in road safety. While driving, drivers are influenced by stimuli that can affect their behaviour in various ways. Nowadays, various types of multimedia devices have become popular, which, when used by drivers while driving, can influence driver attention. The literature undertakes studies of the impact of such devices on the driver's degree of distraction as measured, for example, by the driver's reaction time. A survey was conducted to identify sources of driver distraction. A total of 237 drivers aged between 18 and 78 years participated in the sample. Of the respondents, 64.6% use a mobile phone while driving, 20.3% use a smartwatch, 33.3% use a multimedia control system for vehicle functions. Respondents indicated that they had either witnessed (18.1%) or been involved (6.3%) in a collision/accident when the driver used various types of multimedia devices while driving. Of those surveyed, 2.1% had caused a collision or accident by using a multimedia device while driving. Respondents are aware of the risks of using different types of media devices while driving, but they still use them. The analyses of the survey data will be used in future research using a car simulator.

Keywords: road safety; driver behaviour; driver distraction; multimedia devices

1. Introduction

A persistent problem in road safety is the commonly occurring road accidents and collisions. In Poland in 2022, 21 322 road accidents were recorded, which took place on public roads, in residential zones or in traffic zones [14]. As many as 19 373 of them were caused by the

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driver. This represents as much as 90.9% of the total. As a result of road accidents caused by the driver, 1 621 people died (85.5% of all fatalities). 24,743 were injured in accidents, of which 22,834 were victims of accidents caused by the driver's fault. This is as high as 92.3% of the total. In 2022, 362 266 road collisions were reported to the police units [14]. Statistical data and conducted research illustrate that the human being is the most unreliable and at the same time the least understood element in the human-vehicle-environment system [9, 15]. For many years, studies have been undertaken that quantify and qualitatively determine the influence of various factors affecting the driver [13]. While driving, drivers are influenced by stimuli that can affect their behaviour in various ways [12]. With the development of technology, it has become commonplace for drivers to use various types of devices such as mobile phone, smartwatch, smartband, etc. while driving [19, 21]. Some functions of the aforementioned devices also require manual involvement by the driver requiring, for example, taking their hands off the wheel and operating the device, visual or auditory involvement. It is recognised that mobile phone use while driving is one of the main causes of accidents [23, 25, 26]. It is worth recalling that a car driver cannot talk on a mobile phone while driving in a way that would require one hand to be taken away from the steering wheel of the vehicle [22]. Using a mobile phone while holding it in the hand, e.g. texting while driving, is considered to increase the risk of an accident by 3–4 times [4, 17]. The use of mobile phones has become so common that drivers use them not only for communication purposes but also for entertainment. The article [18] cites examples of studies where drivers admitted to using social media while driving. Quite a few of them believe that recording videos while driving does not pose a risk. Nowadays, vehicles are being fitted with newer and more advanced equipment. The introduction of new solutions is largely aimed at influencing driver safety. For example, the Autonomous Emergency Braking System used in vehicles is designed to react in the event of human error. It is worth bearing in mind, however, that the purpose of such systems is not to initiate emergency manoeuvres on their own in the event of an accident, but to support the driver in such a situation. And although the system will initiate automatic braking as a last resort, in many cases this will not avoid an accident, but only minimise its consequences [3]. For safety reasons, e-call systems (a safety system with an automatic accident notification function) are also being used. Such systems are expected to bring significant benefits such as fewer fatal accidents due to lack of immediate assistance [27]. Hands-free systems that are part of the vehicle's equipment have become a response to the widespread use of mobile phones by drivers by holding such a device in their hand. Drivers also frequently use the hands-free mode of the phone. It should be noted that the results of some studies indicate that using a hands-free mobile phone while driving does not provide greater safety compared to using a hand-held mobile phone while driving [16]. Not all elements currently used in vehicles have a positive effect on the driver's attention. Often, the operation of a device for the driver can be unintuitive and require a high level of attention. Such situations are often the cause of collisions or road accidents. Nowadays, smartwatches are becoming increasingly popular as a complement to the standard smartphone. As smartwatches are increasingly in demand by consumers, there is a real need to understand how the use of such watches while driving affects driving safety. These types of watches allow, among other things, to quickly

check notifications, make and receive calls, write back messages by voice, etc. As the watches are always 'at hand', drivers may find it easier to interact with them and be more compelled to interact with them compared to smartphones [8]. Studies are being conducted to analyse the degree of driver engagement with a smartwatch while driving compared to a mobile phone. A study [20] found that participants had, on average, more glances at a notification while using a smartwatch compared to a smartphone. Furthermore, their braking reaction times were longer when they received notifications before the main vehicle braking event on the smartwatch, compared to when they received no notifications and received notifications on the smartphone [20]. Experiments [7] investigated differences between drivers' use of a smartphone and a smartwatch. Experiment one showed that participants engaged faster with a notification on a smartwatch than on a smartphone, took longer to read notifications aloud and were more likely to look longer than 1.6 s. Experiment two showed that participants took longer to respond to notifications and generally looked longer at the smartwatch than at the smartphone, as well as longer to react to the braking of the preceding vehicle. Compared to the baseline without the device, both the smartwatch and smartphone increased lane position variability and resulted in higher perceived risk. Participants in the experiments also felt that using a smartwatch while driving merited a penalty equal to or less than using a smartphone. The findings suggest that smartwatches may have an impact on road safety. There are frequent attempts in the literature to identify driver distractions and their impact on road safety using surveys. For example, [11] a survey was conducted on a sample of 175 drivers. The study aimed to identify, characterise and compare attitudes, behavioural beliefs and other factors related to electronic device use and distracted driving among taxi drivers and drivers providing app-based services. In a study [10], a survey was conducted on a group of 61 drivers to identify distractions resulting from the impact of in-vehicle displays on drivers in neighbouring cars. The survey assessed the frequency with which drivers encounter displays in other vehicles on the road, and the extent to which drivers are likely to pay attention. Study [5] investigated the impact of messaging and internet use while driving on accidents among young drivers. The study was conducted on a sample of 274 students using an electronic questionnaire. The questionnaire focused on their experience of driving and phone use. Another survey [24] examined the relationship between sleepiness experiences, sleep duration and stability, sleep-induced emotional dysregulation and cognitive impairment in younger individuals engaging in risky drowsy driving behaviour i.e.: Continuing to drive while sleepy and having experienced a sleep-related close call. The survey was conducted with the help of an online questionnaire, which was completed by 137 people.

For the purpose of this article, a survey was conducted to collect data on drivers' use of different types of devices while driving. The aim of this paper is to present the results of a survey conducted on a group of drivers to identify possible distractions resulting from the use of different types of multimedia devices (e.g. mobile phone, smartwatch, car radio, etc.) while driving. These analyses will be used in future research using a vehicle simulator to quantitatively indicate changes in driver behaviour with the use of a distraction factor.

2. Characteristics of the research sample

The study involved 237 respondents, with 51% being women and 49% men. Individuals between the ages of 18 and 78 were examined, with an average age of 30. The literature often investigates the correlation between driver's age and reaction time in the presence of a distracting factor [1, 6]. For example, in a study by [1], the impact of a mobile phone task on reaction time, following distance, lateral position, and workload of young and older drivers was examined while they were driving in a column. It was found that the mobile phone task had a negative impact on the selected reaction time of the drivers and that this effect was more pronounced in older drivers. With this in mind, drivers of all ages were invited to participate in the survey. A total of 40.5% of the respondents declared having a driving license for more than 10 years; 31.6% for (6–10) years; 16.9% for (1–5) years, and 11% were "new drivers" with a driving license for less than a year. Among the respondents, the majority – 63.3% – drove a vehicle daily, and 21.5% drove several times a week, while the remaining respondents drove a vehicle occasionally, several times a month (11.4%) or several times a year (3.8%). The largest group – 35% – stated that they traveled approximately (301–1000) km per month. Monthly mileage of approximately (101–300) km was reported by 20.3% of the respondents, while 19.4% reported mileage of up to 100 km or (1001–3000) km. A monthly mileage of over 3000 km was reported by 5.9% of the respondents. The participants in the study also reported an estimated number of kilometers traveled throughout their entire lives. Approximately 26.6% of individuals chose a range of about (50,000–150,000) km, while 24.1% reported a range of about (5,000–50,000) km. 19.4% of the respondents traveled more than 300,000 km, 18.1% reported a range of approximately (150,000–300,000) km, and 11.8% were individuals who had traveled less than 5,000 km throughout their entire lives. The survey was conducted in Poland. In the study, respondents had the opportunity to add their own answer options (if they were not included in the questionnaire).

3. Results

Nowadays, it has become increasingly common to use devices such as a mobile phone, smart-watch, smartband etc. while driving. For some drivers, such behaviour is already accepted as the norm. In the survey, 64.56% of the people surveyed declared that they use a mobile phone while driving (Figure 1).

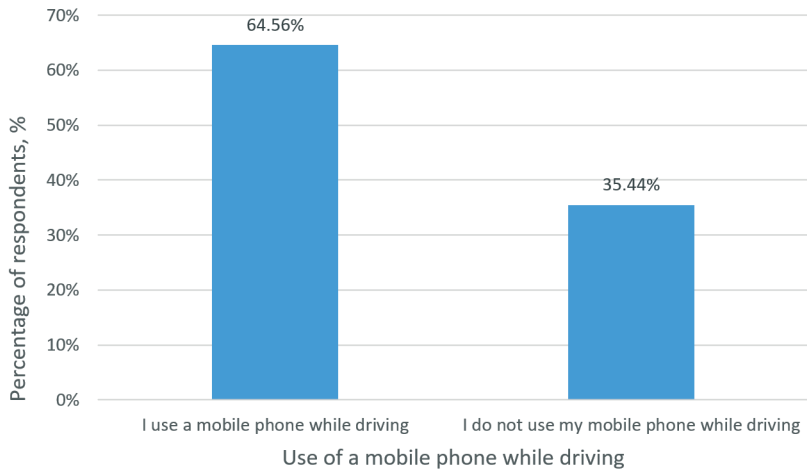


Fig. 1. Use of a mobile phone while driving

Those who declared using a mobile phone while driving were asked to indicate in which situations this happens (Figure 2). Respondents could mark more than one answer.

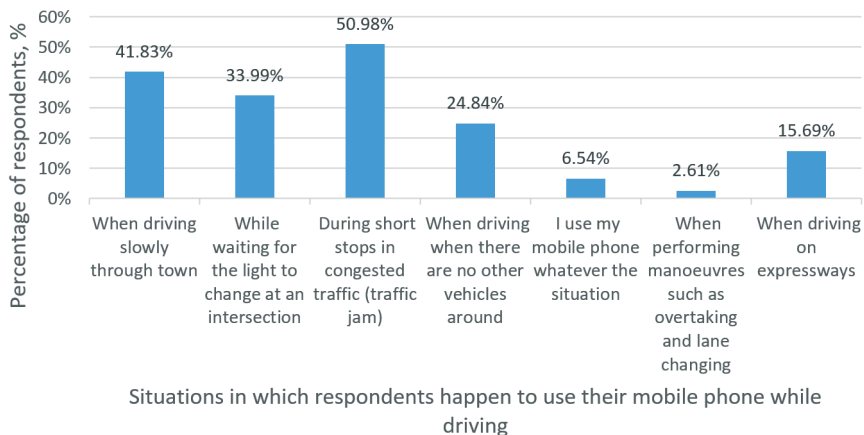
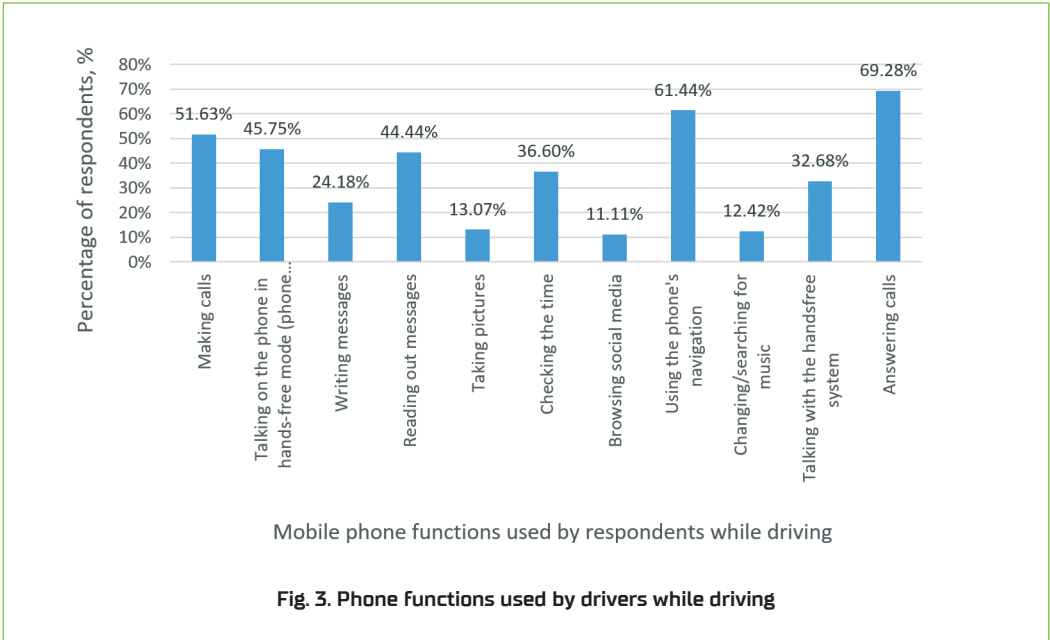


Fig. 2. Situations in which drivers use their mobile phone

The people surveyed most often use their mobile phones during short stops in traffic congestion (50.98%), when driving slowly around town (41.83%) and when waiting for traffic lights to change at an intersection (33.99%). As many as 15.69% people use the phone when driving on expressways, 2.61% when performing manoeuvres such as for example overtaking and

lane changing. As many as 6.54% people stated that they use their mobile phone regardless of the situation.

Another important piece of information is which phone functions respondents use while driving (Figure 3). Different smartphone functions require a different level of attention commitment from the driver. In this question, respondents had the opportunity to mark more than one answer.



Most people use their smartphone to answer calls (69.28%), to use the navigation on their phone (61.44%) and to make a call (51.63%). Among the answers frequently selected were also: "talking on the phone hands-free" (45.75%), "reading messages" (44.44%), "checking the time" (36.60%), "talking with the hands free system" (32.68%), "writing messages" (24.18%). Responses also included "taking pictures" (13.07%), "changing/searching for music" (12.42%) and browsing social media (11.11%).

Smartwatches have recently become popular. Of those surveyed, as many as 20.25% confessed to using a smartwatch while driving (Figure 4).

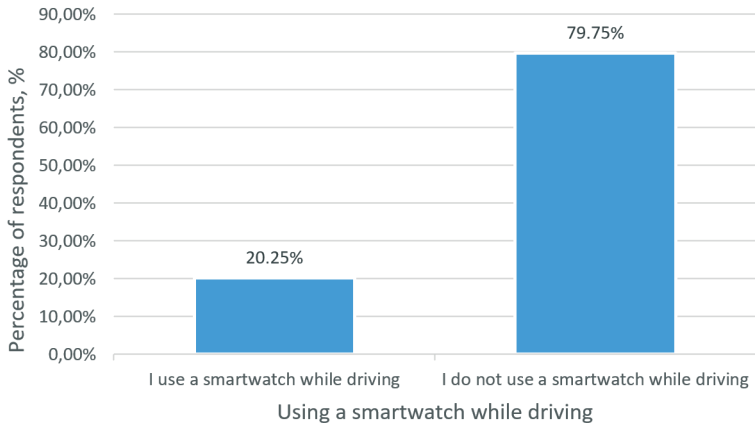


Fig. 4. Using a smartwatch while driving

Those who use a smartwatch while driving were asked to indicate which smartwatch functions they happen to use in such situations. In this question, respondents were allowed to mark more than one answer. The characteristics of the respondents with regard to the use of a smartwatch while driving are shown in Figure 5.

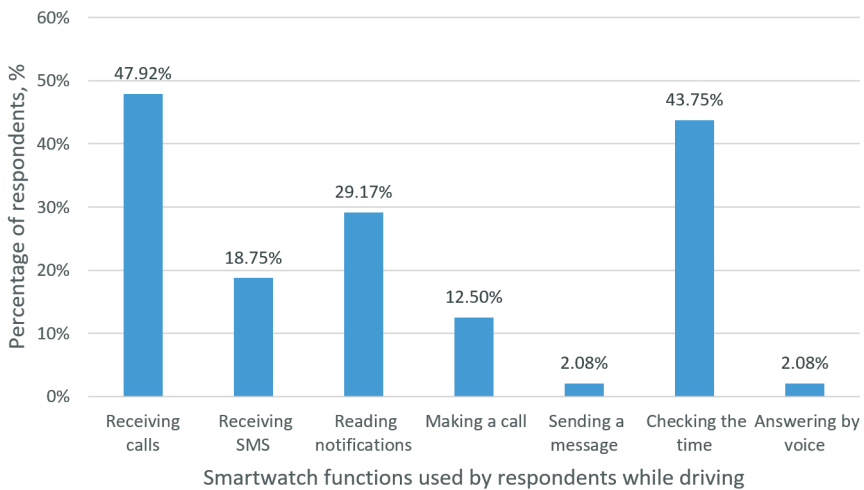


Fig. 5. Smartwatch functions used by drivers while driving

Most people use these types of watches to receiving calls [47.92%] and check the time [43.75%]. Reading notifications [29.17%], receiving SMS [18.75%] and making calls [12.50%] were also common among the responses. Voice replying [2.08%] and sending messages [2.08%] also appeared among the responses [Figure 5].

Nowadays, a common device found in vehicles is the car radio. Over time, newer and newer features are being introduced to make it easier for the driver to use the radio. Respondents were asked if they use a car radio while driving and, if so, how they control it [Figure 6]. Respondents in this question were allowed to select more than one answer.

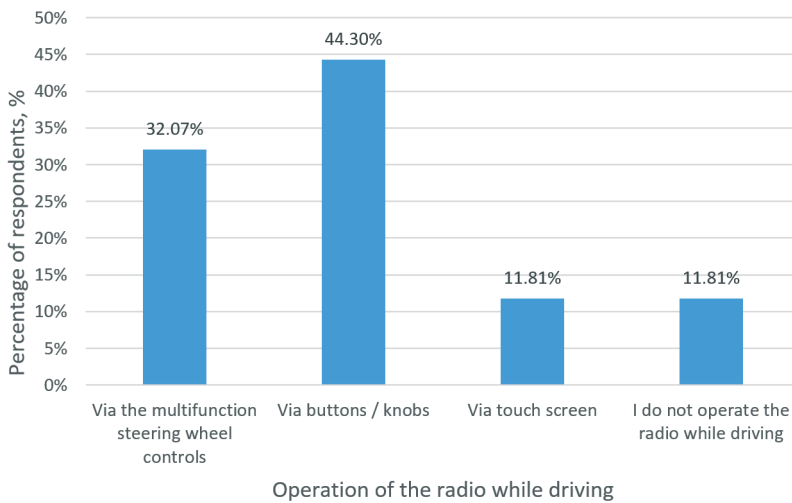


Fig. 6. Car radio operation by drivers

Only 11.81% people answered that they do not operate the radio while driving. The majority of people [44.30%] control the radio via buttons/knobs, 32.07% people chose the answer "using the multifunction controls on the steering wheel" and 11.81% people control the radio via a touchscreen.

Vehicles are increasingly being equipped with inbuilt multimedia systems, whereby various vehicle functions, including navigation, can be controlled using a touchscreen [2]. Such systems aim, among other things, to improve the operation of a function [Figure 7].

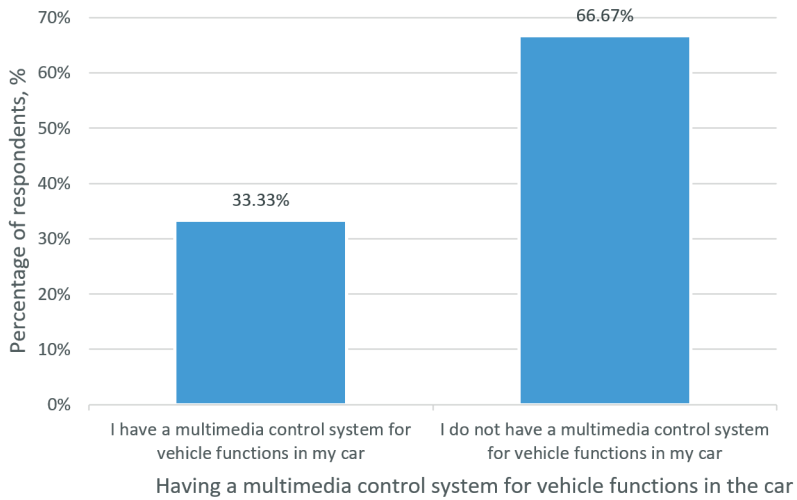


Fig. 7. Presence of a multimedia control system in the vehicle

Of those surveyed, only 33.33% people have a multimedia control system for vehicle functions. These people were asked to indicate which functions of the multimedia control system they use (Figure 8).

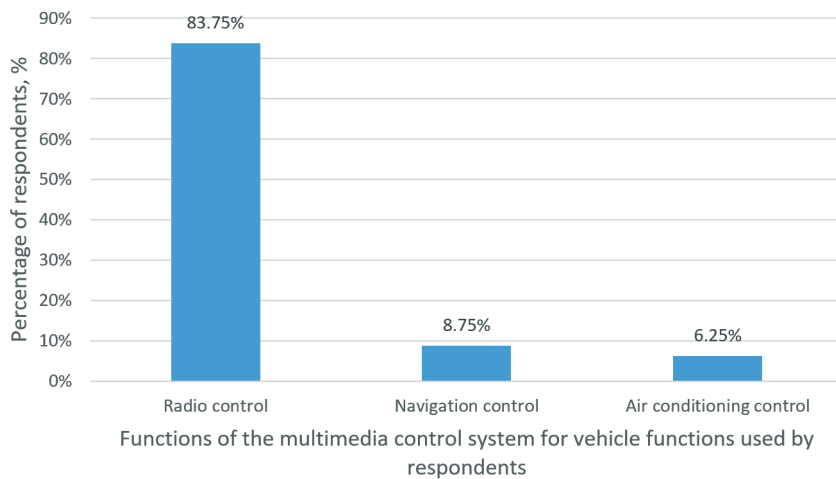


Fig. 8. Multimedia control system functions used by drivers

Most people [83.75%] use this type of system to control the radio. Also appearing among the answers were "air conditioning control" [6.25%] and "navigation control" [8.75%].

The hands-free kit in the vehicle is intended to ensure the safety of the driver. In Poland, the use of a telephone that requires holding the handset in the hand is prohibited [22]. However, phone use is allowed when the driver is using a headset or a hands-free kit. In the survey, respondents were asked whether they had an integrated hands-free kit in their vehicle [Figure 9].

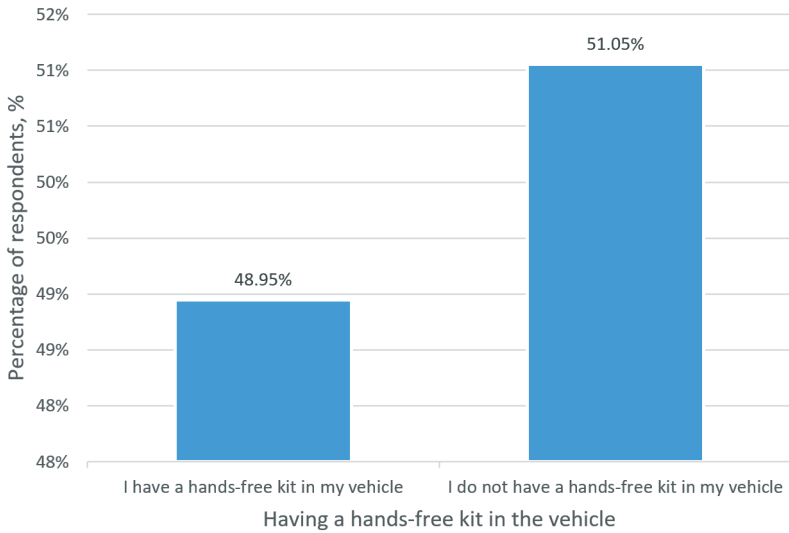


Fig. 9. Existence of an integrated hands-free kit in the vehicle

More than half of the people surveyed [51.05%] answered that they do not have an integrated hands-free kit in their vehicle.

In recent years, Autonomous Emergency Braking Systems have become increasingly important from a safety point of view. Such systems aim to react when the human factor fails. In the survey, respondents were asked whether they had an Autonomous Emergency Braking System in their vehicle [Figure 10].

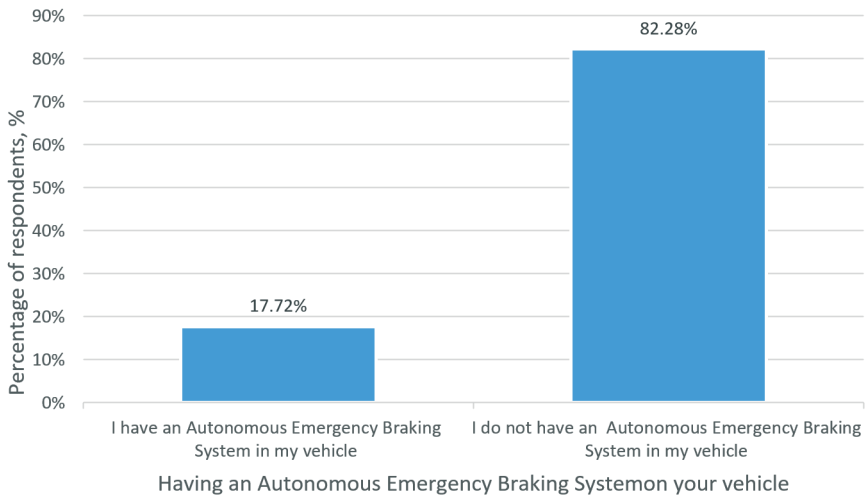


Fig. 10. Presence of an Autonomous Emergency Braking System in the vehicle

Of the people surveyed, only 17.72% have an Autonomous Emergency Braking System in their vehicle. The vast majority do not have such a system.

The next question in the survey asked for respondents' opinions on the use of different types of devices while driving. Respondents were asked to indicate whether they felt that the use of devices such as mobile phones, smartwatches etc. while driving negatively affected the driver's attention (Figure 11).

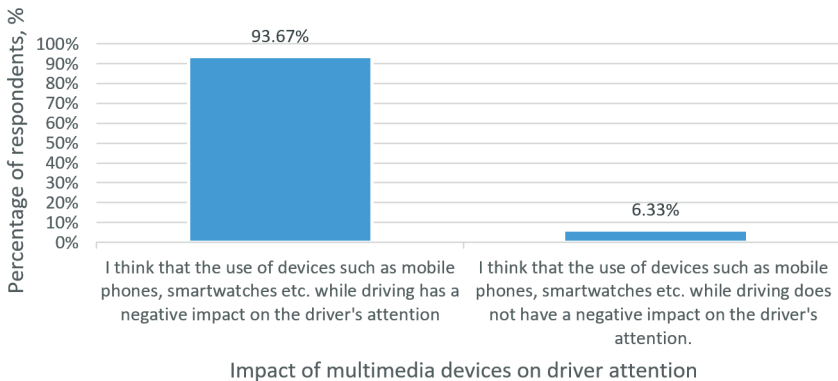


Fig. 11. Respondents' opinion on the use of sample multimedia devices while driving

The majority of people surveyed believe that using devices such as mobile phones, smart-watches etc. while driving negatively affects the driver's attention (93.67%). Such responses also appeared among those who use such devices themselves while driving, which means that they are aware of the danger they can cause with their behaviour.

Further questions asked about respondents' experiences of road traffic collisions or accidents where the driver had used various types of devices such as a smartphone or smart-watch. Respondents were asked whether they had ever been involved in a road traffic collision or accident when a driver used different types of devices (such as a phone, smart-watch etc.) while driving (Figure 12).

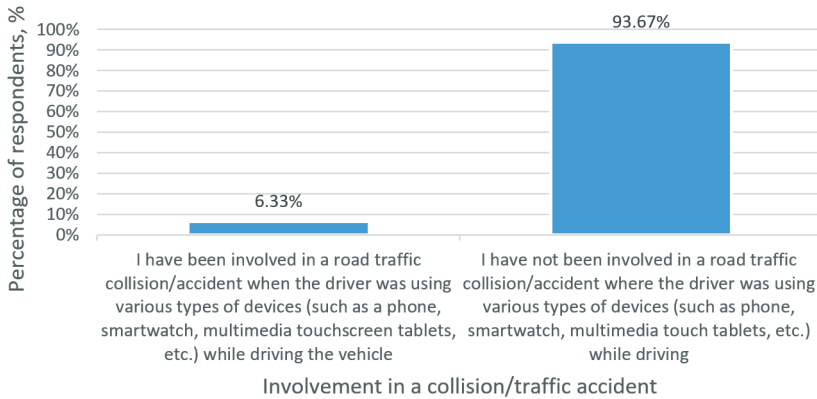


Fig. 12. People who have ever been involved in a collision/accident where the driver used exemplary multimedia devices

As many as 15 people (6.33%) of those surveyed had been involved in a traffic collision/accident where the driver used various types of devices while driving.

Next, respondents were asked whether they had ever caused a traffic collision or accident by using different types of devices (such as a phone, smartwatch, etc.) while driving (Figure 13).

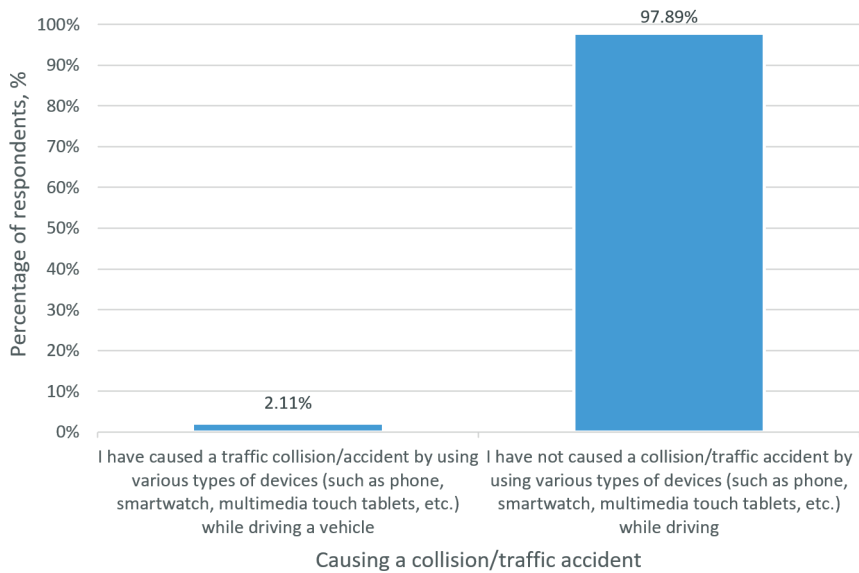


Fig. 13. People who caused collisions while using sample multimedia devices

Of those surveyed, 5 people (2.11%) had caused a collision or traffic accident while using various types of devices.

In the last question of the survey, respondents were asked whether they had ever witnessed a collision or traffic accident while the driver was using different types of devices (such as a phone, smartwatch, etc.) (Figure 14).

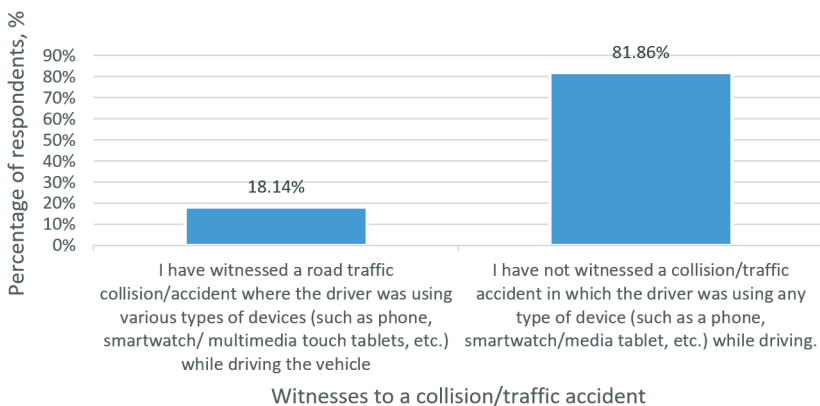


Fig. 14. People who witnessed a collision/ accident when a driver was using exemplary multimedia devices

As many as 43 people [18.14%] witnessed a collision or accident when a driver was using various types of devices. Of those surveyed, 81.86% said they had not witnessed such an accident. They also include some who do not know what caused the collision they witnessed.

4. Conclusions

Analysing the statistical data, it is worth noting that a very high percentage of people admit to using various types of devices while driving. Among those who declared the use of various types of multimedia devices were both women and men of all ages. People even use multimedia devices for entertainment purposes such as taking photos or browsing social networks. It is worth mentioning that in the survey, the vast majority (as many as 94%) of respondents believe that using such devices while driving negatively affects the driver's attention, yet they use them themselves. In this survey, as many as 2.61% of drivers declared that they use various types of multimedia devices even when carrying out manoeuvres such as overtaking, during which the driver should be particularly careful. Some drivers (6.54%) also declared that they use multimedia devices regardless of the situation. These are particularly dangerous. For some drivers, this has become a habit. Respondents declared that they sometimes use, for example, their mobile phone while driving slowly in a traffic jam or while waiting for the traffic lights to change at an intersection. Among other things, they sometimes browse social media or take photos or videos in these situations. These are activities that primarily provide entertainment and should not be carried out while driving. As many as 5 people admitted to causing a collision or traffic accident by using various multimedia devices. When analysing the statistical data, it was noted that of these persons, as many as 4 answered in subsequent questions that they do not use, for example, a mobile phone while driving. This may mean that after a traffic incident, drivers are more aware of the danger of using multimedia devices while driving. The results of the survey presented in the article show that the use of multimedia devices is accepted as the norm by most drivers. Drivers mostly admit to using these devices. It is worth recalling that it is the human being who is the most unreliable element in the human-vehicle-environment system, and it is the human factor that is indicated as the most frequent cause of accidents or collisions. These include those caused by the distraction of the driver precisely by the multimedia devices he or she uses while driving. A positive aspect that was noted is that drivers are mostly aware of the risks that this type of behaviour entails. The survey conducted for this article is a prelude to carrying out further research. As technology develops, drivers should become increasingly aware of the impact that the use of different types of multimedia devices while driving has on parameters such as reaction time or the correctness of the manoeuvre performed. Identifying the sources of driver distraction provides an opportunity for further research that could quantify and qualitatively determine changes in driver behaviour when distractions occur. The present survey made it possible to determine which multimedia devices drivers use most frequently, for what purpose they use them, what functions they use and in what situations.

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