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PERFORMANCES AND SELF-DECLARED OPINIONS ON HANDHELD MOBILE PHONE USE (DISTRACTION IN TRAFFIC) IN POLAND

Summary. This article presents the Motor Transport Institute's research to set out road safety indicators of behaviors and opinions on one of the increasingly important road traffic problems. Two types of studies on the unsafe use of mobile phones and others on board devices (distraction) by road users in Poland between 2014 and 2023 are presented. Safety Performance Indicators (SPI) on handheld mobile phone use from roadside observations and declared opinions on talking, reading messages, checking social media/news, and listening to headphones while driving, cycling, and walking are presented. Overall, 306,240 passenger car drivers observed on all road types all week long in Poland showed a dropping trend (1.8%) between before the study in 2014 SPI 4.1% distracted drivers to SPI 2.3% after the study in 2022. More drivers used mobile phones on single carriageways both in built-up and outside built-up areas. On motorways outside built-up areas, where vehicles are speeding, drivers of passenger cars rarely talk on their handheld mobiles. Results from the first European Union (EU) Baseline project to collect road indicators produced a Key Performance Indicator of 3.8% distracted passenger car (all types of roads, all weekdays and weekend) from 44,011 observed in Poland in 2021. Results from the EU project E-Survey on Road Users' Attitude, third edition (ESRA3), showed declared opinions of mobile use while driving, cycling, and walking down the street in Poland in 2023 compared to 2018 (ESRA2). A positive trend is seen among car drivers who declared lower use of handheld mobile phones than in 2018 (a drop of 11.2%). The survey showed Polish cyclist used more often headphones to listen to music, checked news and messages than cyclists in Europe in 2023. More by 10.1% pedestrians in Europe than in Poland declared checking social media/news, reading messages/emailing while walking down the street in 2023. This lower rate in Poland can be explained by pedestrian's legal prohibition of mobile phone use while crossing the street since 2021. There is strong support for policy measures forbidding all drivers of motorized vehicles to use handheld mobile phone use while driving in all of Europe. Enforcement measures are twice as strong in Europe than in Poland. As the number of accidents and fatalities on distraction is unknown, calculating SPI during roadside observations and questionnaire surveys gives in-depth knowledge of the problem. The authors of the paper represent the Motor Transport Institute's (MTI's) research institution, which systematically analyzes trends in road safety in Poland during its own, national, and international projects.

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1. INTRODUCTION

Poland significantly reduced road deaths by 47% between 2012 and 2022, with the European Union average of 22%. The number of fatalities dropped to 1,896, and there were 21,322 road accidents and 24,743 injuries (7,541 serious injuries) in Poland in 2022 [1]. In 2023, Poland won the Road Safety Performance Index (PIN) award granted annually by the European Transport Safety Council for a significant reduction in the number of fatalities. This achievement made the goal of not more than 1,455 deaths and 5,317 serious injuries on Polish roads by 2030 closer and zero fatalities in 2050 [2].

All engineering, educational, and enforcement initiatives in Poland are consistent with the EU's long-term goal of Vision Zero fatalities and serious injuries by 2050 with no acceptance of a single life loss on the road. The European Commission in the Action Plan for Decade 2021-2030 defined hierarchy of targets to reduce by half the number of deaths and seriously injured in EU. There were designed road safety performance indicators as interim targets to monitor, evaluate and improve progress till 2030 [3]. Road users' behaviors in the adopted Safe System Approach are put at the center of all activities preventing fatalities and serious injuries. The approach builds four protective layers: road use, infrastructure, vehicle, and post-accident care to compensate for each other when one element fails [4]. The Key Performance Indicators (KPI) were adopted in the Action Plan for the Decade 2021-2030 to measure achieving interim targets until 2030 for speed, seat belts, use of protective equipment, alcohol, post care, infrastructure, vehicle safety, and distraction. Indicators for road safety are collected as safety performance indicators (SPI). SPI were introduced within the SafetyNet project to track the progress of road safety policies at the national, local, and regional levels. The concept of KPI and SPI is the same; data is collected and analyzed according to one methodology to produce comparable indicators. Both indicators on road use calculated data collected from roadside observation studies on objective behavior and from questionnaire surveys of no observable information. Two types of research (self-declared opinions and road users' observations in real traffic) offer in-depth knowledge for better understanding of road crashes' causation. This information as indicators, together with statistical data on the number of accidents, fatalities, and serious injuries, describe the level of safety on roads [16]. Distraction as a cause of accidents is not distinguished in police statistics, as crash data is related to exceeding speed limits, drunk driving, and failure to wear a seatbelt [5]. As the number of accidents and deaths caused by distraction is unknown, calculating SPI for them allows us to assess the problem of distraction of handheld mobile phone and others onboard devices use.

The purpose of this article is to investigate the proportion of Polish road users who engage in distraction activity by handheld mobile phone use for talking, checking media, and messaging while driving a car, cycling, or walking. Changing drivers' behaviors while driving and self-reported opinions on distraction among drivers, cyclists, and pedestrians between 2014 *(before study)* and 2023 *(after study)* were analyzed to produce safety performance indicators. They presented two types of research from roadside observations and questionnaire surveys. The problem of the prohibited use of mobile phones in traffic was measured during national and EU projects to produce indicators.

The purpose of the paper is to examine, in accordance with Polish law, the impact of legal measures banning handheld mobile phone use on the road. Legal bans on the handheld use of mobile phones by drivers and cyclists were introduced in Poland in June 1997 according to the Polish Act of Road Traffic Law. The legislative obligation of no mobile phone and other electronic devices use by pedestrians was introduced in Poland in June 2021 at unsignalized zebra crossings and tram track crossings [6]. Despite legislative measures, road users fail to comply with one or more road traffic laws and are involved in collisions.

The structure of the article includes results of two types of research on distraction: roadside observation by trained observers from 2014 to 2022 and self-declared opinions between 2018 and 2023. Research on passenger car drivers' behaviors is presented as national studies (for the National Road Safety Council of Poland, and for the Polish Road Safety Observatory). Data were collected and analyzed separately for each year to compare indicators from 2014 to 2022, except in 2021, when the Key Performance Indicator was calculated with the Baseline project. SPI on distraction were calculated in accordance with national policy. The value of the Key Performance Indicator on distraction was calculated according to the Baseline project to monitor the steps of improvement Road Safety Policy

Framework 2021-2030. Collected data from roadside observations on behaviors of drivers of passenger cars on the prevalence of mobile phones was presented in article. Other data for seat belt use, child restrained system, and use of protective equipment was collected during the same observations but were not subject to this paper. The results and discussion of the research are presented.

The second type of presented data are results from a questionnaire on self-declared attitudes and opinions on distraction from the European Union project E-Survey on Road Users' Attitudes, ESRA. Results from questionaries carried out in 2018 during ESRA2 project were compared to results from third edition of ESRA3 from 2023 as before and after study on distraction among car drivers, cyclists, and pedestrians as Safety Performance Indicator. Polish indicators were compared to European ones. SPI included opinions on the distracted activity of handheld mobile phones (talking, checking media, messaging) while driving a car, cycling, or walking include self-declared attitudes/opinions on unsafe traffic behavior, enforcement, and support for policy measures.

Scientific research on the current road situation is recommended to assess the safety of road users and the effectiveness of road safety initiatives, which indicates areas of intervention to be improved to cut the number of deaths and injuries. Systematically measuring behaviors and opinions on road users' distraction produces safety performance indicators to indicate the scale of the problem.

2. USE OF HANDHELD MOBILE PHONE (DISTRACTION) IN TRAFFIC

The distraction of road users (handheld mobile phone usage) is risky behavior and one major source of accidents. The lack of a standard definition of distraction makes police accident reports inconsistent across Europe. Only a few countries systematically measure the prevalence of mobile phone use, and even when they collect those data, the methods differ between countries [8]. In epidemiological research, about 5 to 25% of car accidents have been attributed to driver distraction. In one study of truck drivers, a much higher estimation of 70% has been found. Differences in estimation between studies may relate to differences in operational definitions, research methods, and driver populations [9].

New future in-vehicle infotainment systems increase distraction, but partial automation systems will reduce distraction by taking driving tasks away from the driver [10]. According to a survey from the United States, about half of smartphone owners check their smartphones at least a few times an hour in traffic. The Forum of European Road Safety Research Institutes confirmed that by 2018, almost 70% of the population of Western Europe had such a device [11].

Driver distraction was defined as "the diversion of attention away from activities critical for safe driving toward a competing activity, which may result in insufficient or no attention to activities critical for safe driving." "Mobile phone use" includes all forms of handheld and hands-free phoning, texting, using apps, etc., and use of other mobile or on-board devices [8, 9]. Sources of distraction vary, but they all have adverse effects, such as decreased driving task performance, slower speed, closer following distance, slower reaction time, and narrower visual focus, resulting in errors in keeping course.

Using mobile phones and electronic devices in vehicles has an impact on driver's perception and response time, resulting in risky behavior, which increases the occurrence of accidents on the road. Drivers replying to text messages or having discussions usually focus on more than one task, so one of them becomes secondary, which usually is driving. Time to react to warning signs is prolonged, as there is a lack of continuous observation of the road situation changing quickly. The latest findings on distraction indicate drivers are more likely to miss hazard warnings than have delay reaction time (due to roadside forgiveness design to tolerate human errors) [7]. Research shows that on-board devices (Apple CarPlay, Android Auto display smartphone apps) impair reaction times behind the wheel more than alcohol and cannabis use [5]. Research made in a simulator among 39 young drivers who underway dual tasks (driving and using communication technologies: responding to a call, texting on WhatsApp, and checking Instagram) confirmed significant differences in driving performance. Distracted young drivers made more ordinary violations in terms of vehicle control (i.e., hard shoulder line violations) than non-distracted drivers [12]. One paper suggests that access to the radio and a mobile phone can improve safety due to the driver being able to receive information about driving conditions and inform other road users about lateness. The safety implications of having passengers in the car will depend on

how much the driver is attached to the passengers; the more concerned about safety a driver is, the more careful they become [13]. Distraction-affected crashes are rarely studied in literature. However, research from Texas assumes that phone use (data recorded for examination by mobile application companies) is an important factor contributing to accidents on the road. Phone use data provide new insights into the safety analyses of distraction-affected crashes. Phone use data cannot be achieved from crash data. Therefore, safety researchers and practitioners are encouraged to incorporate this source of data for analyzing distraction-affected crashes [14].

Drivers' behavior is a description of intentional and unintentional characteristics. Factors such as age, gender, experience, attitude, emotions, fatigue, drowsiness, and distraction can change the same driver's ability to assess risk. A driver's behavior can change from normal to risky and aggressive. Drivers' behavior plays an important role in road safety, as the human factor is crucial for 95% of accidents. Road users' behavior relates to traffic accidents. Tasks such as handholding/touching the display of the smartphone, dialing, locating the phone, texting, reading social media/news, and wearing headphones to listen to music cause the driver to take their eyes off the road and become associated with high risk. Risk is lower when the driver/rider or cyclist does not look away from the road while, e.g., talking, but it is still a distraction [15].

There is a long list of tasks defined as distractions that undermine the driver's or rider's ability to perform the driving task, but the use of mobile phones while driving appears to be a widespread and growing problem. Drivers who drive and use handheld mobile phones are twice as likely to be involved in a collision than those making minimal use of mobile phones [17]. Distracted pedestrians and cyclists who are listening to music, making phone calls, and sending messages increase risk, especially as more people walk and cycle today.

3. ROADSIDE OBSERVATIONAL STUDY ON DISTRACTION

The prevalence of mobile phone use in traffic is examined in a roadside observational study. Monitoring of drivers' riders' behaviors in naturalistic traffic measures the scale of the distraction problem.

In the literature, the problems of distraction from cell phones in traffic have been investigated [18,19,20, 21, 22]. Distraction in passenger cars during roadside observations were measured to produce the Safety Performance Indicator. Drivers' performances were observed in flowing traffic when the vehicle was in movement; driver distraction behavior is different when the vehicle is stationary, e.g., waiting at traffic lights. Each random driver was coded as not distracted when holding hands on the steering wheel or distracted when holding mobile devices in hand (at their ear) or operating on board devices.

In the article, metadata was presented for a comparison to show the change of distracted drivers of passenger cars. Observational studies to estimate SPI of distraction in Poland were carried out by the Motor Transport Institute (for the National Road Safety Council of Poland, Polish Road Safety Observatory) [23]. Measurements of distraction among drivers of passenger cars between 2014 and 2022 were set up before and after the study. The measurement procedure defined the minimum sample size per road type, the selection of locations (urban, rural, motorways), and organizational aspects of setting on fieldwork for observation. Traffic volumes were counted during each observation session for the calculation of the percentage of drivers not holding a mobile device for each observation session and for correct calculation of the confidence intervals. The methods used for systematic measurements of the prevalence of handheld mobile devices by passenger car drivers on Polish roads between 2014 and 2022 were first introduced in a pilot study in 2013 in Poland and then adopted by the Motor Transport Institute. This ensured continuity of research and comparability of results. Measurements of drivers' distraction were part of nationwide behavior monitoring research of all road users' performance from all types of vehicles (passenger cars, light goods vehicles, trucks, motorbikes, mopeds, and bicycles) on the use of protective systems (seat belts, child restraints, protective equipment by bicycles and motorcyclists, moped riders, and use of handheld mobile phones) on all types of roads. Drivers and

passengers' characteristics were defined and codded by gender (female/male), age four child groups, youth (18-24 years), adults (25-60 years), and seniors (61 years and over).

Observational studies were carried out every year on all types of roads outside built-up areas (single carriageways, dual carriageways, motorways/expressways) and in built-up areas (capital of voivodship, two larger cities) every year. There were nine locations in each voivodship (in each of three cities on single -and dual carriageways and three locations outside built-up areas on single and dual carriageways). Drivers' characteristics from different types of vehicles were separately collected and coded. The sampling size per road type was for: the capital of voivodship 2000 vehicles (drivers), the national/expressways 1, 000 vehicles, per voivodships 500 vehicles, and per municipality roads 250 vehicles.

On-site observation points were located at the areas of intersections with traffic lights or roundabouts (where drivers slow down their speed) with a good view of ongoing traffic and a safe location for observers. The performance of passenger car drivers was monitored randomly (use of handheld mobile phones/seat belts) and coded according to age group and gender. Each measurement per localization lasted a minimum of two hours by one trained observer or one hour by two specially trained observers during daytime in good weather conditions. Data was entered into Traffic Analyser, a dedicated tablet application on mobile devices. The application did not register incomplete data. Data was saved automatically in real-time with GPS location and sent for further statistical analysis.

The paper presents findings from eight years of measurement for calculating Safety Performance Indicators on distraction among passenger car drivers from 2014 to 2022, except for 2021, when the Key Performance Indicator was collected according to Baseline (the first project in the EU). The scope, general principles, and measurement procedures for SPI were the same during all measurements (but the size of the collected sample varied). In 2021, the authors collected Key Performance Indicators on distraction in Poland, and its findings are presented as well. Observations in the Baseline project was made in autumn 2021 for seven days a week for passenger cars (light goods vehicles, and busses/coaches) on three road types together (urban roads, rural roads, and motorways). The methodology in the Baseline project for the estimation of Key Performance Indicators on handheld cell phone use was adopted in 18 participants to compare results. The methodology of collecting, coding, and analyzing KPI was like SPI which indicated distracted drivers of passenger cars [24].

3.1. Results of the roadside observational study on distraction

Extensive research material for analysis to produce a Safety Performance Indicator on distraction in Poland is presented in this section. Data was collected from roadside behavioral observations carried out by the Motor Transport Institute for the National Road Safety Council of Poland from 2014-2015.

Table 1 presents a sample collected in all 16 voivodships of Poland during national measurements on road user performances in 2014-2015 limited to drivers of passenger cars. The sample comprised 243,706 drivers.

Table 1

Collected sample size of passenger car drivers to set up an SPI on the use of handheld mobile phone use from 2014-2015

Year	Voivodeships	On-site observations points	Time of data collection	Observed passenger car drivers	Use handheld mobiles
2014	16	86	September–November	82,898	3400
2015	16	134	March–June /August–November	160,808	5057

The number of vehicles observed was the number of drivers. The sample size was defined by measurement procedures. SPI on distraction was analyzed in two types of locations: roads in built-up areas and outside built-up areas (Tab. 2).

Table 2

Sample size per road location to set distracted drivers from 2014-2015

Year	Observed drivers by type of road location		Distracted drivers by road location	
	Built-up areas	Outside built-up areas	Built-up areas	Outside built-up areas
2014	55,498	27,400	2422	978
2015	115,739	45,069	3607	1450

After finishing measurements in 2015, data collection was continued as an own research project within the Polish Road Safety Observatory at MTI between 2016 and 2020. The methodology and general principles of research were the same, but the sample was smaller in only three voivodships each year. Due to COVID-19, in 2020, data from only two voivodships was collected. Geographically selected voivodships and the size of the collected sample were representative of the whole country. Tab. 3 presents regions of Poland, year, the number of on-site locations, the number of observed drivers from passenger cars, and the number of distracted drivers each year.

Table 3

Use of handheld mobile devices by drivers of passenger cars from 2016-2020

Year	Region of Poland	On-site observations points	Data collection time	Observed drivers of passenger cars	Drivers handheld mobile phones
2016	Mazovia, Lublin, Greater Poland	11	September-November	9698	419
2017	Łódź, Pomerania, Swietokrzyskie Province	16	June-November	12,288	525
2018	Lower Silesia, Kuyavia-Pomerania, Silesia	14	June-November	17,297	442
2019	Lubusz, Lesser Poland, Warmia-Masuria	12	July-November	9543	203
2020	Mazovia, Podlaskie	8	September	7178	198

Table 4 presents the sample size based on the type of area. Roadside observations were made in each voivodship in nine localizations separated for built-up areas (in capitals of voivodships and two larger cities on single and dual carriageways) and outside built-up areas (single carriageways, dual carriageways, and motorways/expressways) [23].

Table 4

Sample of observed drivers versus distracted due to type of area in Poland from 2016-2020

Year	Number of observed passenger car drivers by on-site localization		Number of distracted passenger car drivers by type of area	
	Built-up area	Outside built-up area	Built-up area	Outside built-up area
2016	8307	1391	356	63
2017	8980	3308	382	143
2018	12,368	4929	333	109
2019	5190	4353	128	75
2020	4507	2671	123	75

The latest study on distraction in springtime 2022 in Poland was carried out by the Motor Transport Institute (together with Heller Consult) for the National Road Safety Council of Poland. The presented data from measurements on the prevalence of handheld cell phone use by passenger car drivers were collected in three voivodeships (Mazovia, Greater Poland, and Silesia Province) from 27 on-site observation locations meeting the criteria of road type. Data from 20,826 drivers of passenger cars were collected, and the size sample was representative of the up SPI for the whole country in 2022. Data from 12,867 drivers in built-up areas and from 7959 drivers outside built-up areas were collected, which presents Table 5 [24].

Table 5

Observed versus mobile phones used by drivers of passenger cars due to type of area in 2022

Type of the road	Drivers of passenger cars	
	Observed	Use mobile phones while driving
Built-up area single carriageway	6530	183
Built-up area dual carriageway	6337	157
Outside built-up single carriageway	2199	55
Outside built-up double carriageway	3034	57
Motorway/expressway	2726	30
Total	20,826	482

Data collected from passenger car drivers during an observational study between 2014 and 2022 analyzed the problem of handheld mobile phone use (conversation and reading messages) in relation to the type of road category only. The influences of driver's gender and age on distraction in traffic were not analyzed in this paper, although data were collected.

In 2021, data from 54,011 passenger cars from 66 on-site observations across Poland was collected for the estimation of Key Performance Indicators according to Baseline methodology. Separate data for each road type was collected: 17,443 drivers from urban roads, 16,938 from rural and 19,630 from motorways. Analysis showed that 2,068 drivers of passenger's cars used handheld mobile phones.

The results allow us to formulate findings on the risky behaviors named distraction among passenger's cars by producing Safety Performance Indicators between 2014 and 2022 and Key Performance Indicators in 2021.

3.2. Findings and discussion section on roadside observations

Safety Performance Indicators on distraction due to the prevalence of mobile use by drivers of passengers' cars in Poland show a drop from 4.1% in 2014 (before the study) to 2.3% in 2022 (after the study). A 1.8% drop during eight years of measurement is a positive trend in this risky drivers' performances. Table 6 presents changes in car drivers' behaviors in eight years on all road categories all day, separately for built-up and outside built-up areas from 220 on-site observational sites across Poland.

A drop on urban roads from 4.4% in 2014 to 2.5% in 2022 and relatively on rural roads from 3.6% to 2.0% presents Table 6 with Distraction Safety Performance Indicators for whole country. More drivers used mobile phones on single carriageways both in built-up and outside-built-up areas. On expressways or motorways outside built-up areas, where vehicles are speeding, drivers of passenger cars rarely talked on handheld mobile devices [25].

Another finding from roadside observation is that car driver gender does not play much of a role, as women and men talk on the mobile phone equally while driving a car, but the data were not presented in the article. Senior drivers aged 61+, as they could have difficulties managing two tasks simultaneously, relatively rarely had mobile phones in hand while driving passenger cars. Drivers on roads with high-speed limits (expressways and motorways) use a hands-free device to talk.

Baseline Key Performance Indicators by road type (weekdays and weekend) show passenger cars distraction of 4.7% on urban roads, 4.1% on rural and 2.7% on motorways /expressways. One average value of KPI of 3.8% refers to drivers in Poland in 2021 who behaved negatively by holding mobile devices in their hands while driving. KPI and SPI on distraction for passenger car is percentage of risky drivers. Among 9 EU' participating countries in Baseline which collected disaggregated data by road type for passenger car indicated average of 6.25% KPI distraction which refers to drivers who used a handheld mobile device while driving in 2021 [24]. KPI on distraction of 3.8% in Poland is reasonably good values to compare to EU' of 6.25%.

Table 6

Safety Performance Indicator on the distraction of passenger cars' drivers systematically collected due to the type of area between 2014 and 2020 and 2022 in Poland

Year	Number of drivers using handheld mobile phones due to the type of area		Percentage of drivers' passenger cars used handheld mobile phones		SPI
	Built-up area	Outside built-up area	Built-up area	Outside built-up area	
2014	2422	978	4.4%	3.6%	4.1%
2015	3607	1450	3.1%	3.2%	3.1%
2016	356	63	4.3%	4.5%	4.3%
2017	382	143	4.3%	4.3%	4.3%
2018	333	109	2.7%	2.2%	2.6%
2019	128	75	2.5%	1.7%	2.1%
2020	123	75	2.7%	2.8%	2.8%
2022	340	142	2.5%	2.0%	2.3%

SPI and KPI distraction in Poland indicated the problem of hand-held mobile phones and other devices among passenger cars on all road types 7 day a week according to national and EU requirements. Research presented in the paper compares SPI at the national level before and after the study. The Baseline KPI first introduced in 2021 was comparable to the average of all UE countries. The continuation of the Baseline project by the Trendline project to 2025 for the collection of road safety indicators in the EU allows the comparability of results across Europe and in each country. MTI was chosen as a reliable partner to collect data for the Trendline project in Poland.

Observation-based studies to produce SPI have limitations, such as the number and limited nature of observable variables. They require a sophisticated study design and protocol and are often very time-consuming [26].

Annual surveys (observation and self-report studies on risk perception, alcohol, law enforcement, protective elements, mobile phones, and fatigue) to collect and analyze data for the strategy safety performance indicators (SPIs) and the EU key performance indicators are the primary interim targets for casualty reduction, highlighted in national road safety strategies (Poland, Ireland, and Great Britain) [27]. Indicators are important for the assessment of the implementation of road traffic safety programs.

4. DISTRACTIONS IN SELF-REPORT OPINIONS, QUESTIONNAIRE SURVEY

The prevalence of handheld mobile phone use in traffic was examined in self-reports (questionaries), which are usually combined with roadside observational studies. Assessment of road users' attitudes and opinions toward talking, reading/writing messages, news, and wearing headphones in traffic produces road safety performance on distraction. SPI measures the problem and gives knowledge about who and how often is using a phone while driving or walking. In this section, the results are presented from a study on self-declared behaviours, attitudes, and opinions on unsafe traffic behaviour distraction), enforcement experiences and support for policy measures on mobile phone use among car drivers, cyclists, and pedestrians between 2018 and 2023.

Studies on declared opinions of road users about the use of mobile phones have been present in literature since the 1990s. The first study carried out in Poland and simultaneously in other countries on road users' attitudes and declared opinions toward the use of mobile phones in traffic was conducted by Millward Brown in 2009. The survey "We are giving you a free hand" revealed that 97% of the respondents perceived talking on a handheld phone on the road as an offense; 95% declared it as a risky behavior; 60% admitted talking on the phone while driving a car, 27% read, and 18% wrote messages on their phones, 7% used as navigation. Another European study, SARTRE4 (Social Attitudes to Road Traffic Risk in Europe), confirmed that 60% of the group of 730 respondents used a handheld mobile phone while driving in Poland in 2010 [8].

Research from the United States ("Impact of distracted driving and fatigue on road safety") showed that nearly 1/3 of pedestrians, while crossing the street, either listened to music, used a handheld phone, or read text messages. In the Netherlands, at this time, 39% of cyclists occasionally listened to music, and 55% were engaged in a phone call. Then the Institute for Road Safety Research defined distraction among cyclists and pedestrians as a competing critical activity for safe driving in 2014 [11].

E-Survey of Road Users Attitudes (ESRA) is the first global research initiative to collect and examine between countries comparable data on road safety performance and road safety culture within the use of mobile phones [16]. The core of the ESRA project is jointly developed questionnaires survey with ca 240 variables in 41 questions per respondent translated into national language version. The ESRA identified four types of road users (car drivers, moped riders and motorcyclists, cyclists, and pedestrians). The safety topics include attitudes towards driving under the influence of alcohol, drugs and medicine, speeding, protective systems (e.g., seat belt, helmet use), distraction, fatigue, enforcement, and support for policy measures. The ESRA data is used as a basis for a set of road safety indicators. In the survey, the respondent answered the question of how often he or she experienced the surveyed situations in the last 30 days.

The first ESRA1 project (which was continuation of SARTRE) was carried out in 38 countries across five continents in 2015. Poland was one of the participants of the ESRA1 project; its findings were not presented or analyzed in this paper.

ESRA2 was carried out in 2018 and collected data from 993 road users in Poland (of a total ca 45,000 respondents from 48 countries and six continents; representative samples of national adult population based on gender and six age groups). ESRA3 survey from 2023 collected data from 1,050 road users in Poland aged 18-74 (a total of 42,000 road users from 39 participating countries across five continents).

Results from the EU project E-Survey on Road Users' Attitudes were used to formulate road safety indicators on distraction in Poland between 2018 and 2023. Findings from questionnaires on SPI on distraction were compared inside Poland (ESRA3 versus ESRA2) and between Poland and the average value for European countries (ESRA2 collected data from 24 European countries; ESRA 3 from 22 countries) [28].

The questionnaire surveys were carried out by the authors of the paper. For the purpose of this paper data from the second and third editions of the ESRA produced SPI on distraction among car drivers, cyclists, and pedestrians in Poland.

4.1. Results from a questionnaire survey on distraction

Results from an online self-reported opinion survey as SPI on distraction as unsafe behavior in traffic from ESRA3 versus ESRA2 were presented in this section. Presented indicators as results from after and before the study are easy to compare in Poland and Europe between 2023 and 2018.

Safety Performance Indicators of distraction according to *self-declared opinions* showed that in Poland 62.2% of Polish car drivers declared talking on hands-free mobile phone while driving in 2023 compared to 59.6% in 2018 (respectively in Europe 51.0% to 48%); 30.9% declared talking handheld mobile phone in 2023 to 42.1% in 2018 (respectively in Europe 22.2% to 28.9%); and 28.2% Polish drivers admitted reading text messages, emailing, checking social media while driving in 2023 to 26.7% in 2018 (respectively in Europe 23.2% to 24.4%).

Comparable SPI on distraction according to personal acceptability on unsafe traffic attitudes from the online ESRA3 to ESRA2 studies among car drivers showed that the same number of Polish car drivers (3.4%) accepted reading messages or checked social media/news while driving in 2023 and in 2018 (in Europe increased to 3.1% from 2.2% in 2018); the same situation is with taking on handheld mobile phone while driving, the results among Polish car drivers in 2023 and in 2018 were the same of 5.2 to 5.6% (compared to Europe respectively 4.3% to 3.5%).

53.6% of Polish pedestrians in 2023 according to their self-declared opinions read messages/emails, checked social media/news while walking down the street to 51.9% in 2018 (in Europe 63.7% in 2023 to 58.9%in 2018); 41.3% pedestrians in Poland declared listened to music through headphones while walking down the streets in 2023 to 36.7% in 2018 (in Europe 44.2% and in before survey 33.7%) [28].

SPI on distraction among cyclists in Poland from ESRA3 from self-declared opinions showed that 23.1% of them in 2023 declared the use of cell phones while cycling (in before study ESRA2, 19.3%). Moreover, 40% of cyclists declared listening to music through headphones while cycling in 2023 and in before survey in 2018 33.0% (in Europe respectively 35.5% to 29.6%).

Both in Poland and in Europe, there is a strong acceptance for supporting legal obligation forbidding all drivers of motorized vehicles to use handheld mobile phone use while driving (respectively 80.7% to 79.3%).

Enforcement measures (police checks, camera/radars on the use of handheld mobile) according to road users' declared opinions were much often in Europe (15.0%) than in Poland (8.5%), in 2018 respectively 19.1% to 26.6%.

Presented results from research allow to formulate findings on distraction among car drivers, pedestrians, and cyclists between 2023 and 2018.

4.2. Findings and discussion section on questionnaire survey

Presented in this section, findings are formulated from road users' questionary surveys on self-declared attitudes and opinions on distraction from ESRA 2 and ESRA 3. The findings show increasing numbers of car drivers in Poland and in whole Europe who declared talking on hands-free mobile phones while driving between 2018 and 2023. But according to ESRA3 more Polish car drivers than in others EU' countries admitted reading text messages, emailing, checking social media, and talking on handheld mobile phones while driving in 2023.

SPI on distraction among pedestrians in Poland and Europe, according to their self-report opinions, show this increasing tendency among car drivers between 2018 and 2023 too. Pedestrians' risky use of mobile phones by writing messages/reading social media while walking down the street increased in Poland by 1.7% in Europe by 4.8% and wearing headphones by 4.6% in Poland and in Europe by 10.5%. More pedestrians in Europe than in Poland (by 10.1%) declared using mobile phones for writing messages/checking social media while walking down the street. Lower use of mobile phones by pedestrians in Poland in 2023 could be explained by pedestrians' legal prohibition of mobile use while crossing street in Poland since 2021.

The number of cyclists in Poland in 2023 who declared reading messages or checking social media/news while cycling increased by 3.9% compared to a survey from 2018, and the number of those who declared listening to headphones increased by 7% in Poland and by 5.9% in Europe.

Between 2018 and 2023 Polish car drivers more than in Europe accepted reading messages or checking social media/news while driving (increase by 1.4% in Poland and 2.5% in Europe) and use handheld mobile phone while driving (increase in Poland by 0.6% and in Europe 2.3%.

According to the ESRA 3 car drivers in Poland and in Europe supported legal obligation forbidding all drivers of motorized vehicles handheld mobile phone use while driving.

Due to the survey from 2023 road users in Europe, are two time often checked by the police, camera/radars on illegally use of mobile phone use in traffic than in Poland. This means enforcement measures are stronger in Europe than in Poland (15.0% compared to 8.8%). In Poland, according to ESRA3dropped the number of police check up by18.8% (from 26.6% in 2018 to 8.8% in 2023).

Factors that influence the use of mobile phones while driving a car are personal acceptability and perceived behavior; drivers with more risky perceptions used more mobile phones while driving. Professional drivers supporting legal obligation used any mobile phone while driving and were less likely to engage in this behavior. Countries whose populations spend more time a day using mobile internet and social media have higher percentages of drivers declaring texting while driving.

Questionnaire surveys that measure road users' opinions have some limitations, as self-reported data tend to provide answers creating a favorable image of the respondent. There are situations where respondents misunderstand questions, have problems with difficult words, or provide unintentional answers due to memory errors [26].

Road user questionnaires give valuable information for a better understanding of the process that leads to road crashes. Studies carried out systematically give insights into motivations and socio-cognitive factors such as attitudes and habits regarding the use of mobile phones by car drivers, cyclists, and pedestrians. The Motor Transport Institute collects data on drivers' performances and attitudes and gives a set of large road indicators for policymakers.

5. CONCLUSIONS AND RECOMMENDATIONS

Findings from roadside observations and self-reported opinions on distraction in Poland between 2014 and 2023 presented in the article showed wide research material for conclusions and recommendations. Safety Performance Indicators on reading messages, checking social media/news, talking on handheld mobile phones while driving, and listening to headphones while walking the street or cycling provide evidence that unsafe behavior of distraction is associated with crash and injury risk.

Systematic national measurements of safety performance indicators on distraction made by the Motor Transport Institute between 2014 and 2022 indicate a dropping number of distracted passenger car drivers (from 4.1% to 2.3%). More drivers used mobile phones on single carriageways both in built-up and outside built-up areas. On expressways or motorways outside built-up areas, where vehicles are speeding, drivers of passenger cars rarely talk on handheld mobiles.

The results from the first UE project Baseline indicated 3.8% distracted passenger cars in Poland in 2021. Polish values are comparable across Europe showing the problem is at the same level in other countries. National and EU indicators on distraction give overall knowledge about the scale of the problem over a long time from all road types, during all week. The indicators from roadside observations indicate that 2.3% to 3.8% of Polish drivers do not comply with the legislative obligation of no handheld use of mobile phones while driving a passenger car according to the Polish law.

Comparable results from the ESRA2 in 2023 and the ESRA3 in 2023 projects on declared options showed more drivers, cyclists, and pedestrians declaring checking social media, emailing, and texting in traffic than before. Cyclists and pedestrians declared more often wearing headphones while cycling or walking down the street today than in 2018. Findings from ESRA 2 and ESRA 3 in all Europe indicate an increase in the number of drivers and cyclists accepting risky behaviors while driving or cycling, but otherwise declaring more often talking on hands-free cell phones than in 2018. There is a strong acceptance for supporting legal obligation forbidding all drivers of motorized vehicles to use handheld mobile phones. Enforcement measures are twice as strong in Europe than in Poland.

The survey ESRA3 gives answers about the number of distracted pedestrians walking down the street but, in the survey, there was no question about pedestrians' use of mobile phones while crossing the street. This is the reason in the article we cannot answer – if pedestrians in Poland according to their declarations are complying with the legislative obligation of no handheld use of mobile phones while crossing the street.

Conclusions should help decision-makers understand distraction as a broad problem that affects every road user today, not only in Poland but across Europe. As everyone in traffic seems to be distracted, the introduction of low-speed zones in cities (30 km) is justified as a safe speed for vulnerable road users. Recommendations to carry out a public awareness campaign to promote road safety, an educational initiative, and enforcement with police checks are important. The consequence of risky

driving should clearly indicate the losses, financial costs, and penalty points. Studies should be carried out systematically to assess road users' behaviors and opinions in traffic to measure the level of safety and problem areas. Data collection and analysis to produce up-to-date SPI and KPI from research on distraction are recommended to move closer to the European Union's long-term goal of zero fatalities by 2050.

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