

The Use of Cybersecurity-specific Research Methods to Identify Behaviours Preceding Dangerous Traffic Situations

KAZIMIERZ PAWELEC

Abstract Traffic disasters, situations creating the danger of a disaster and road accidents are usually preceded by dangerous activities of individuals who, by act, negligence, or non-compliance, bring about hazardous situations. Such behaviours can be caused by a range of factors, including those that are specific to humans, who are considered to be the weakest link in the entire system of road traffic safety. Hazardous situations can also result from public servant passivity, the lack of reaction to recorded behaviours, defective roads, inappropriate traffic markings, signage and organisation, and from allowing dangerous vehicles on the road. In this article, the author makes an attempt at identifying participant-induced dangerous behaviours. Based on an analysis of traffic camera material, he proposes to develop an algorithm to recognize individuals whose risky behaviour may induce traffic mishaps, hence, allowing prompt measures to be put in place to prevent them from creating dangerous road situations. Furthermore, the paper argues that uniform driving fitness requirements should be imposed across the European Union. It also draws attention to the existing shortcomings in knowledge about the aetiology of traffic crimes, and to the misguided focus of EU Member States' authorities on repressive measures – which fail to deliver the expected outcome of improved road traffic safety.

Keywords: • traffic crimes and petty traffic offences • intoxication • dangerous behaviours • preventive measures

CORRESPONDENCE ADDRESS: Kazimierz Pawelec, Ph.D., Assistant Professor, Siedlce University of Natural Sciences and Humanities, Faculty of Social Sciences, Institute of Security Science, S. Konarskiego 2, 08-110 Siedlce, Poland, e-mail: pawelec.kancelaria@op.pl, ORCID: 0000-0001-8669-0249.

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1 Introduction

Impaired psychomotor reactions of the driver can clearly lead to traffic disasters, the immediate danger of a disaster, or a traffic accident. Many factors can play a role in weakening psychomotor abilities, including those attributable to the driver, i.e. intoxication with alcohol or other psychoactive substances, tiredness, poor health and personality-related factors. This publication has significance for traffic safety, as it attempts to identify, and possibly eliminate, so-called hazardous drivers before they can create specific dangerous situations. Accordingly, the research aim was to develop methods of identifying such individuals before they can take risky, hazardous actions or commit omission. This required devising an internal safety system using cybersecurity-specific methods in order to, in a way, pre-emptively eliminate such individuals from traffic by taking purely preventive measures and developing legal regulations underlying these measures such that they are accepted by the general public without the need to use more repressive methods. This has become more important in that the deterring approach has clearly proven to be ineffective.

One more important issue to consider – highly relevant although beyond the scope of this paper – is related to the significant technological advancements, especially in IT. Indeed, many cars, especially premium class vehicles, are equipped with a range of driving assistance devices, and in some countries, such as China, Canada and the US, so-called “autonomous vehicles” are allowed on the road, where human involvement in driving the car does not go beyond stating the destination. Consideration, therefore, should be given to the possibility of unauthorised intrusion into the IT system of the vehicle to disrupt its operation and cause an accident or disaster. The question, therefore, arises – would it be possible to identify such intrusion before the disruption occurs, and what signs could precede such disruption? In short, we should consider what could serve as research material. Surprisingly, such material already exists and has been successfully used for more than ten years. It is the data recorded by traffic cameras that are now commonly used in many cities and on highways. The employment of such material should not be considered as contributing to repressiveness. Rather, it should be considered as being research material that is useful in developing an algorithm that could help to identify and correctly interpret reactions and other external signs preceding behaviours that are dangerous to others. This is also one of the research aims of this publication. However, these considerations also require at least a synthetic examination of the legal solutions related to the typification of traffic crimes and petty traffic offences, as exemplified by the Republic of Poland. Another important step is to discuss the factors behind traffic hazards caused by traffic participants, and subsequently to name the contributing factors and behaviours relevant to the identification of a future hazard. In conclusive remarks, the author proposes, among others, legislative solutions, including those relating to the EU law, as well as *de lege lata*, that are important for practical considerations, such that the focus is not only on the consequences, but also on the causes, shifting towards preventive measures, and moving away from repression – treating this as a last resort.

2 The typification of traffic crimes and petty traffic offences in Polish law – basic facts

Crimes against traffic safety are listed in Chapter XXI of the Penal Code of 6 June of 1997 (uniform text, Polish Journal of Laws 2020, item 1444, as amended) (further referred to as “the PC”). The legislators have listed eight misdemeanours against the above-mentioned legally protected right, with only three of them bearing specific consequences, i.e. a disaster (Article 173 PC), creating the immediate danger of a disaster (Article 174 PC), and an accident (Article 177 PC). It should be noted that the above-mentioned misdemeanours are common, with only one of them – accident – considering the violation, including unintentional violation, of safety rules in land, water or air traffic as being an objective element of the prohibited conduct. This does not necessarily mean that the occurrence of a disaster, or the creation of the immediate danger of a disaster, cannot relate to these rules. However, only an accident can be caused inadvertently, whereas a disaster, or the immediate danger of a disaster, can be caused by wilful misconduct through both direct and oblique intent. The legislators have introduced harsher penalties for perpetrators of acts set out in Articles 173, 174, and 177 of the PC, who were intoxicated by alcohol, under the influence of a psychoactive substance, or who fled the scene. They have restricted punishability to drivers of motor vehicles who were driving when intoxicated by alcohol or under the influence of a psychoactive substance (Article 178a PC), or who attempted to escape a chase taken up by a traffic officer (Article 178b PC). Another crime that may be perpetrated only by individuals operating motor vehicles involves driving a motor vehicle despite a revoked driving license (Article 180a PC).

Other provisions of Chapter XXI of the PC provide for the criminal liability of, for instance, a dispatcher who allows the operation of a motor vehicle, or other vehicle, in a condition which directly endangers the safety of land, water or air traffic despite being under a specific obligation to the contrary, or of an individual who is performing traffic safety duties when intoxicated by alcohol or under the influence of a psychoactive substance (Article 180 PC). Of course, the liability of such individuals referred to in Articles 179 and 180 of the PC is not excluded in the event of their causing a disaster, the immediate danger of a disaster or an accident in line with the concept of extended liability, provided that this is warranted by evidence (Pawelec, 2020: 297-302).

Petty offences against road traffic safety and order are typified in Chapter XI of the Code of Petty Offences of 20 May 1971 (uniform text, Polish Journal of Laws 2021, item 281, as amended) (further referred to as “the CPO”). The main idea behind this law was to provide a full catalogue of petty offences against road traffic safety, and to facilitate the application of a “range of laws”, such that petty offences deserving harsh treatment were not treated lightly and, conversely, that the application of such laws would not be overused through the formalistic interpretation of Chapter XI provisions of the PC

(Bardach, 1980: 441). Over the years, however, practical experiences revealed that these provisions were deficient. This was particularly true for the vague provisions that provided general descriptions of prohibited acts or contained references to other regulations. Judged on their merits in terms of ensuring road traffic safety and order, they also had repeatedly proven questionable. The prevailing approach was formalistic, specific to administrative authorities, and as such having little to do with the dynamics, variability and atypicality of road traffic situations (for instance – failure to follow signs, signals or instructions in road traffic – Article 92 CPO; using a vehicle registration certificate that contains false information – Article 95a CPO). The same formalistic approach was adopted in respect of perpetrators of petty offences against traffic order (for instance – failure to clean the road despite being under the obligation to do so – Article 101 CPO; failure to keep access points in a proper condition – Article 102 CPO).

Judging by the system of petty offences in Chapter XI of the PC, it is evident that the prime importance in terms of ensuring safety and eliminating dangers was attached to those petty offences that posed a direct threat to road traffic safety. However, in practice, as well as in interpretations by legal commentators, there was one important aspect that could not be ignored – namely, the repeated atypicality of traffic situations. Legal regulations, including in particular the Traffic Law Act of 20 June 1997 (uniform text, Polish Journal of Laws of 2021, item 450, as amended), which was extensively referred to in the Code of Petty Offences, as were the general safety rules, assume the existence of a certain model of typical behaviours in typical situations. Once this typicality is disrupted, however, it becomes necessary to bring a response that deviates from this model. Traffic participants not only have the right, but also the obligation, to eliminate or minimise dangers on the road. Typical petty offences against road traffic safety are ones that carry a potential for danger to others, as well as to the perpetrator. The danger had to be real. This is the consequence referred to in Article 86 CPO – creating a danger to traffic safety; Article 93 CPO – failure to help a victim of an accident; Article 97 CPO – violating provisions on road traffic safety and order; Article 98 CPO – failure to exercise caution when driving on internal roads, as well as Article 87 CPO – driving after the consumption of alcohol or other substance with similar effects.

3 The weakest link – is it only man?

Overall, when considering issues around traffic crimes and petty traffic offences, as briefly described above, it should be emphasised that state authorities pass legislation that essentially shifts responsibility to humans – the weakest link of the entire system, one could say (Pawelec, 2021: 27-161). The commonly accepted approach is one of attributing guilt for all road traffic accidents to people. This is the approach that guides all criminal and petty-offence procedures. Yet, state authorities fail to fulfil their obligations and refuse to accept responsibility for their officers – and are absolutely unwilling to admit this. They consider human mistakes – made by traffic participants – as the primary, if not the only, cause of any road incident, forgetting that it is them that

bear responsibility for the condition of roads and associated equipment, traffic organisation and the elimination of identified threats (Pawelec, 2017: 13-14). What they do is engage in the art of manipulation by using a variety of methods, including: “blame attribution”, “newspeak”, “talking through one’s hat”, “intimidation”, and even “making supposed concessions” (Stelmach, 2018: 25-29). While doing so, they seem to disregard their preventive function, the primary aim of which is to eliminate threats. They make no efforts to comprehensively investigate the different causes of road incidents, including the behaviours underlying them. Hence, it would be an overstatement to say that the knowledge of the authorities about the aetiology of traffic crime is modest.

The study of practical experiences leads to a general conclusion that state authorities showed little interest in causes other than those attributable to the behaviour of traffic participants. For instance, they did not inquire into why the system failed to reveal mental diseases, alcohol/drug additions, aggressive tendencies, as well as other impairments, including those related to vision and hearing disorders, long reaction times, etc. Sporadically, some consideration was given to the accountability of state officers who did not react despite their knowledge of poor traffic organisation, markings and signage, road surface defects, or despite being aware that a driving license for motor vehicles had been issued to mentally ill, epileptic, visually impaired or otherwise impaired individuals.

An analysis of the causes of accidents or other road incidents leads to the conclusion that risky decisions creating specific hazards, were the determining factors. These decisions, however, mostly did not cause any danger. According to the author’s research, criminal consequences ensued only in no more than 20% of all cases, although comprehensive research on the subject is yet to be conducted (Pawelec, 2020: 14). So far, no attempts have been made to identify signs of external behaviour preceding dangerous or risky decisions.

4 Impairments of psychomotor abilities and their causes – attempt at assessment

As far as objective elements are concerned, road traffic crimes and petty traffic offences essentially consist in violating the rules of cautious conduct, thereby putting legally protected rights of others at risk, and in leading to specific consequences, provided that such consequences are provided for by law. A violation of safety rules may involve behaviour that runs counter to a specific directive that prescribes a certain behaviour, or failure to behave as prescribed by such directive. Therefore, in addition to observing traffic regulations, traffic participants should exercise common sense, take general precautions and follow established uncodified rules (Pawelec, 2020: 77).

It should be noted that compliance with specific safety rules often requires reaction to atypical situations, provided that they were recognisable and foreseeable, and that there was sufficient time to take protective actions to eliminate the threat. Hence, it is extremely

important that the driver does not have impaired psychomotor reactions due to being intoxicated by alcohol or under the influence of psychoactive substances, and does not attempt to flee the scene, all of which are circumstances subject to harsher penalties and elements of a crime under Article 178s § 1 and Article 180 of the PC, as already mentioned. It should be remembered, however, that psychophysical properties, health status, drugs used, tiredness, skills, experience and other factors are all human-related (Pawelec, 2020: 134-148). They play an important role in safety, and their involvement in causing dangerous situations seems undebatable. Behaviours preceding dangerous situations can be identified by examining material from traffic cameras and CCTV cameras installed on buildings and other structures and fixtures. Such behaviours can be observed in drivers who are psychologically predisposed to being aggressive on the road, and even to display so-called “road rage”.

Generally speaking, aggressive driving means driving a vehicle in a way that creates dangerous situations for others. It is manifested by excessive speed, ignoring traffic regulations, performing risky manoeuvres, disregarding other traffic participants, violating the give way rule, etc. Research has provided examples that the increased frequency of such behaviours is tantamount to the so-called road rage, which involves attacking other traffic participants physically, acting verbally aggressive towards them, and making non-verbal offensive gestures (Hołyst, 2019: 631-634).

In summary, it can be concluded that research on road aggression, considering its different dimensions and aspects, could, or rather should, represent an important first step towards improving prevention in road traffic. It is assumed – in fact, fairly commonly – that road aggression deserves special attention because it involves problems with interpersonal communication, limited by means of expression and interpretative ambiguity, that are not found elsewhere (Parkinson, 2001: 507-526; Hołyst, 2019: 636).

Research on road aggression – an increasingly common phenomenon, regrettably – considering its different dimensions and aspects, should lay the foundations for a concept that is relevant to preventing aggression, since it deserves special attention due to its involving problems with interpersonal communication, limited by means of expression and interpretative ambiguity, that are not found elsewhere (Hołyst, 2019: 636).

Clearly, considering road rage as the intentional violation of safety rules – which represents a highly aggravating circumstance – might prove a significant oversimplification. Indeed, aggression can be caused by various preparations that have little to do with psychoactive substances or alcohol. Among these is Boldeon – a substance used for muscle building and body sculpting. The users of this drug are not advised that it is an anabolic-androgenic steroid, classified in Group S1 of anabolic substances on the World Anti-Doping Agency’s (WADA) List of Prohibited Substances and Methods. The Warsaw Anti-Doping Laboratory has noted that anabolic-androgenic steroids (AAS) cause a number of adverse effects, including mental symptoms, such as

mood swings, irritability, uncontrolled aggression, and other affective and mental symptoms and syndromes. For instance, this drug was detected, among others, in a person charged with uncontrolled aggression towards another traffic participant (Pawelec, 2020: 147).

5 Conclusion

Weakened psychomotor reaction, including a longer reaction time, can be caused not only by intoxication with alcohol or the effects of psychoactive substances, but also by factors that are altogether ignored during criminal proceedings, or in petty-offence cases, including, health status, tiredness, psychological attributes and personality features, and the use of certain drugs and preparations, even if they are legally marketed. Usually, the dangerous situations created by such drivers, which might lead to disasters, or cause the immediate danger of such disasters, may be preceded by atypical behaviours, specific, for instance, to mental diseases, associated with severe pulmonary diseases, balance disorders, eye disorders and other factors, including those associated with the use of certain drugs, as well as addictions.

According to the European Transport Safety Council, there has been little interest in these issues. The author has found clear evidence that the reports issued by the Road Traffic Office of the Polish National Police Headquarters do not mention the health status of traffic accident perpetrators, and also do not examine significant doubts as to the driver's health or qualifications. A similar situation applies to the Car Traffic Inspection. Meanwhile, an analysis was run in Finland of fatal road accidents in the years 2014-2018. Therein, it was found that in 16% of all cases, the driver's health status directly caused the tragic event. It is, therefore, worth undertaking work, in accordance with the EU Directive on driving licenses, to examine the psychomotor abilities of driver candidates. Particular attention should be paid to health issues related to poor vision, mobility impairment, cardiovascular diseases, diabetes, neurological diseases and obstructive pulmonary disease, epilepsy, mental disorders, alcohol issues, addiction to drugs and medications, as well as renal dysfunctions. Such examination should also be compulsory for drivers whose behaviour led to dangerous situations for other traffic participants. In such cases, they should be referred by traffic authorities – or by prosecutor's offices if crime is involved – to undergo specific medical examinations. Decisions in this regard should be subject to judicial control. In cases where dangerous situations have been documented, state authorities should take preventive measures following relevant regulations. After all, the main idea is to make sure that such behaviour does not lead to a crime. Hence, it seems reasonable to develop the aforementioned algorithm. Finally, efforts should be focused on preventing specific incidents instead of increasing repressive measures against consequences. Repressiveness is a road to nowhere, as we have yet to see comprehensive scientific research that would provide conclusive insights into the aetiology of road traffic crime.

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