European Commission

European Road Safety Observatory

Road Safety Thematic Report - Pedestrians

This document is part of a series of 20 thematic reports on road safety. The purpose is to give road safety practitioners an overview of the most important research questions and results on the topic in question. The level of detail is intermediate, with more detailed papers or reports suggested for further reading. Each report has a 1-page summary.

The topic "pedestrians" is also addressed in the "Facts and Figures - Pedestrians", presenting more detailed and up-to-date European data in addition to this qualitative analysis.

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Contents

Summary

Pedestrians are vulnerable road users and suffer the most severe consequences in collisions with other road users, because they are unprotected against the speed and mass of the crash opponent. Collisions in which pedestrians cause injury to others are very rare.

About 15 - 25% of all journeys are undertaken on foot. Some groups walk more than others, which is also reflected in their involvement in crashes. Age groups for which walking is particularly common are children and seniors .

Half of all pedestrian fatalities in Europe are aged 65 or over. In particular, from 70 years on, the number of pedestrian fatalities increases significantly.

Pedestrians comprise around 20% of all road deaths in the EU, a proportion that has remained stable over the last decade. The proportion of fatalities who are pedestrians is much higher for females compared to males. The number of pedestrians killed declined by around 20% between 2010 and 2018.

Most pedestrian injuries occur in urban areas and indeed pedestrians account for 38% of all road deaths in such areas. Cars account for over 70% of vehicles hitting pedestrians. Most crashes involving pedestrians occur while crossing the road and frequently at pedestrian crossings which are usually the location at which roads are most often crossed. This indicates that more care is needed when designing these crossings.

The factors identified as contributing to pedestrian crashes are: the road environment; lack or design of crossing facilities; speed of motorised vehicles; their weight and design; the unprotectedness of pedestrians; their (lack of) visibility; and finally the attitudes and behaviours (including intoxication) of all road users.

Countermeasures

- Land-use planning assigning space for pedestrians and physically separating them from motor traffic.
- Good speed management and a default speed limit of 30 km/h in urban areas, since high speed is the most important causal and aggravating factor in pedestrian crashes.
- Implementing safe walking routes, area-wide traffic calming, and improved crossing facilities.
- Street lighting and the promotion of reflective devices for pedestrians to improve their visibility.
- Vehicle design of crash opponents, with a pedestrian-friendly car front and and intelligent speed adaption to enforce low speeds. The new EU Regulation on type approval requirements for motor vehicles makes pedestrian detection linked to automatic emergency breaking mandatory for cars and vans. Moreover side and front detection of vulnerable road users and improved viewing conditions for the driver become mandatory for trucks and buses.
- Education and training for motorists as well as ample opportunities for children to safely practice their pedestrian skills.
- Legal framework and enforcement, to ensure safe behaviour by motorists and pedestrians.

1 Highlights

- The age groups for which walking is particularly common are children and seniors.
- Pedestrians account for 20% of all road deaths, but this rises to 38% in urban areas.
- Pedestrians are particularly vulnerable in crashes with other road users.
- Half of the pedestrians killed in road crashes were 65 and over.
- Speed is the key factor in serious and fatal crashes involving pedestrians.

2 What is the problem?

2.1 Safety issues for pedestrians

In the traffic and transport system, pedestrians play a specific role. Walking is the beginning and end of each journey (walking to a car, walking to public transport), and walking can be the sole transport mode for the journey. Despite the clearly important role of walking, little attention is paid to pedestrians and facilities for them. Moreover, pedestrians are particularly vulnerable in crashes with other road users. Walking is not safe in an environment with many motorised vehicles driving at high speeds and motorised vehicles that are dangerous for pedestrians in crashes (Figure 1). The higher the speed of the vehicle, the higher the percentage of pedestrians that are killed in road crashes. Young and older pedestrians particularly are prone to danger from traffic.

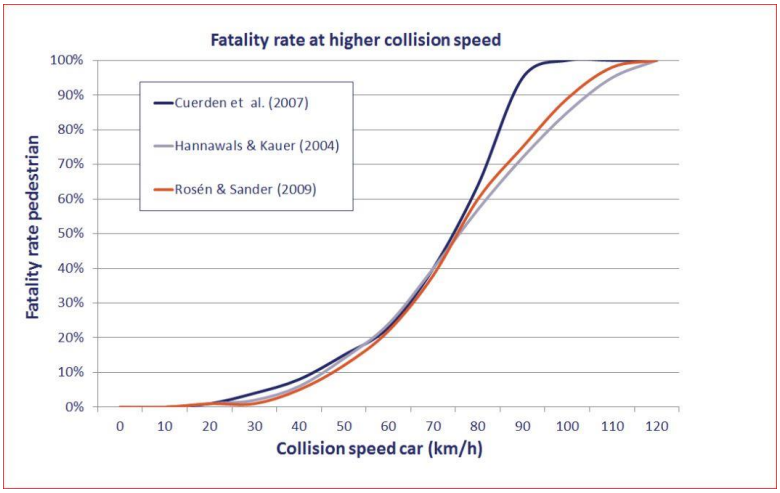

Figure 1. Risk of pedestrian fatality for different impact speeds (fatality rate is the percentage of pedestrians that are killed in a collision with a motorised vehicle) Source: Rosén et al. (2011)

2.2 How do pedestrians participate in traffic?

The incidence of walking relative to other modes of transport is documented in travel surveys in various countries. For a number of countries, Figure 2 (left-hand side) shows that the proportion of trips on foot varies between 8% and 27%. The distance travelled on foot also varies (Figure 2, right-hand side) between 0.8 and 2 kilometres a day.

Figure 2 Proportion and average length of a walking trip in various OECD countries (OECD, 2010)

These differences in share and distance travelled reflect the way people travel in the countries mentioned in Figure 2: in some countries, car use is high, in others bicycle use is high. This in turn reflects traditions, distances between origins and destinations, road networks, and the availability of public transport.

Figure 3 shows the frequency of walking trips for a number of European cities. This figure also shows differences between cities. The differences between these cities are smaller than in Figure 2 above for countries.

How often do you walk on foot 10 minutes or more?										
% responses	Ghent	Liège	Tilburg	Groningen	Düsseldorf	Dortmund	Berlin	Bergen	Trondheim	Total
Never	2.7	0.9	3.0	3.7	2.5	3.2	1.6	3.0	1.7	2.5
Once to a few days a year	6.9	6.5	4.4	4.4	4.1	5.7	3.1	4.1	7.6	5.2
Once to a few days a month	15.2	12.9	11.0	10.8	11.9	11.8	7.1	13.4	10.0	11.6
Once to a few days a week	33.1	31.1	35.4	34.2	24.4	27.9	18.9	24.9	40.0	30.0
At least five days a week	42.0	48.7	46.2	46.9	57.1	51.3	69.3	54.7	40.8	50.8

Figure 3 Frequency of trips on foot in some European cities (ISAAC, 2019)

2.2.1 Age and gender

Some groups of traffic participants walk more than others. These differences are also reflected in their involvement in crashes. Age groups among which walking is particularly common are children and seniors. Data from the Netherlands illustrate this: people aged 75 or over make one-third of their journeys on foot. They use the car slightly more often (38%), but considerably less often than younger adults aged 25 to 74, who drive for more than half of their journeys. Children aged 0 to 11 make 29% of their journeys on foot. The modal split for young adults (aged 18 to 24) is walking (20%), cycling (23%), and public transport (18%). For young people in secondary school (aged 12 to 17), the bicycle is by far the most important mode of transport: they use their bicycles for no less than 52% of all trips.

Although few countries have as high a proportion of bicycle trips as the Netherlands, data from other (European) countries show generally the same pattern: children and older adults walk most, whereas teenagers cycle most (OECD, 2010).

Women tend to walk more than men. For instance, in Germany on an average day, 37% of the women walk while 32% of the men do so. Women have access to a motor vehicle to a lesser extent than men and they make more use of public transport (which involves walking to and from the station for example). Among older people, where the share of kilometres travelled on foot is higher than for other age-groups, women constitute a larger part of the population because they live longer (Nobis & Kuhnimhof, 2018).

3 Pedestrians and Road Safety

3.1 Definition of a traffic-related crash

Not all incidents involving pedestrians are considered to be traffic-related. According to the UNECE definition, road crashes must include at least one moving vehicle (UNECE, Eurostat & ITF , 2019). Consequently, a pedestrian fall as a result, for example, of loose paving stones is not regarded as a road crash. The same applies when a pedestrian falls while boarding or alighting from a bus.

As a result of the above definition, incidents involving pedestrian falls are not included in crash statistics, and very little is known about them. The few available studies in OECD countries show that up to one third of pedestrian fatalities and three quarters of injuries are due to falls in public spaces (Methorst, 2021). Even pedestrian crashes with other vehicles – which do fall under the definition of a road crash - are disproportionally under-reported in police crash statistics compared to what hospital records and other studies show (WHO, 2013).

3.2 Crash and injury risk

For a pedestrian, the risk of getting killed in a road crash is approximately the same as that for a car driver if it is calculated *per minute* spent travelling. However, because cars travel much further in the same amount of time, the risk *per kilometre* travelled is more than nine times higher for a pedestrian than for a car driver (Haddak, 2016).

3.3 General trends in number of fatalities

Between 2010 and 2018 pedestrian fatalities in the EU fell by around 20%, while the *total number of fatalities* decreased by 21%. In almost all countries of the EU, the number of pedestrian fatalities has decreased over the past decade. (*Facts and Figures Pedestrians* EC, 2021). Although data on this are less reliable, it seems that the number of pedestrians who were *seriously injured* in road crashes has declined much less (by only 6%; ETSC, 2020).

It should be noted, however, that country-by-country reductions in the number of fatalities cannot be assessed without also looking at trends in mobility. The numbers of pedestrian fatalities are affected both by the number of pedestrians and the number of motorised vehicles with which crashes can occur.

3.3.1 Parties involved in crashes and their location

The fatalities in crashes involving pedestrians are virtually always the pedestrians themselves (98%). More than 70% of these crashes involved cars. Vans, motorcycles, and cyclists are each involved in 3% of the crashes in which pedestrians were fatally injured (*Facts and Figures Pedestrians* EC, 2021; CARE, 2020).

Most pedestrian injuries (of whatever severity) are sustained in urban areas. In European countries, 73% of all pedestrian fatalities occur in urban areas where also most pedestrian traffic takes place. While pedestrians account for 20% of all road deaths, this rises to 38% in urban areas (Facts and Figures Pedestrians EC, 2021).

However, in rural areas, crash severity is higher (OECD, 2010). Higher vehicle speed in such areas is a key factor. Other contributing factors are the absence of pedestrian footpaths and street lighting (ECMT, 2000).

3.3.2 Age and gender of pedestrian casualties

In the EU, the number of pedestrian fatalities increases with age, and very dramatically so from the age of 70 years on. Almost *half* of the pedestrians (50%) who died in a road crash in 2018 were *seniors* of 65 years or over (see *Facts and Figures Pedestrians*, 2021, EC 2021).

For most age-groups, only a relatively small share of road-crash fatalities were pedestrians. There are two exceptions to this (CARE 2020):

- Among *senior* fatalities, pedestrians form an ever-larger share: from just about one quarter of fatalities among the 60 to 64 year-olds to more than half the fatalities among the oldest seniors of 90 or over.
- Among *children* (aged 0-15), about one third of fatalities (35% in 2018) are pedestrians. Although the proportion is high, children nevertheless only account for a small share of pedestrian fatalities (4%).

The proportion of fatalities who are pedestrians is much higher for females (32%) compared to males (17%). Nevertheless men – who are more often involved in fatal crashes than women – account for 63% of the fatally injured pedestrians.

3.4 Crash factors

About two thirds of pedestrians in severe road crashes were crossing the road (e.g., Carpentier et al, 2014; Hesjesvol & Hoye, 2019). Yue and colleagues (2020) identified the main scenarios in fatal pedestrian crashes in Florida (listed below with the most frequent contributing factors for each scenario):

- *Vehicle going straight and pedestrian crossing the road (51%).* Drivers distracted or did not expect pedestrian to suddenly turn into their lane. View obstructed by (parking) vehicle. Difficult viewing conditions: darkness or low sun.
- *Vehicle turning left and pedestrian crossing the road at the exit (17%) or the entry (3%) of the crossing*. Often at signalised intersection when left turn was not protected by the signal. Driver was distracted by oncoming traffic. Pedestrian was obstructed by other vehicles.
- *Vehicle turning right and pedestrian crossing the road at the exit (12%) or the entry (4%) of the crossing*. Often at non-signalized intersections. Drivers focussed on traffic coming from the left.
- *Vehicle going straight and pedestrian in (3%) or adjacent to (6%) the road*. Difficult lighting conditions. Unexpected manoeuvre of pedestrian. Driver fails to leave enough lateral space.

In two studies in Brussels, identifying the most frequent scenarios for pedestrian crossing crashes, the main contributing factors for signal-regulated crossings were non-compliance by the pedestrian (50%) and conflicting green-phases for pedestrians and turning motorists (25%) (Populer et al., 2018). For non-signalised crossings, the main factors were obstructions of view due to other traffic participants or parked vehicles. Crashes took place more often in the *far lane* than in the lane closest to the pedestrians' point of departure (Dupriez & Houdmont, 2009).

3.4.1 Crash factors with older pedestrians

Older pedestrians have a higher chance of being injured in a crash because of their greater physical vulnerability, but also because locomotive functions deteriorate with increasing age. As people age, functional limitations and disorders occur, such as reduced visual or auditory abilities, increased reaction times, difficulties with dividing attention, and dementia. The decline of motor functions in particular can increase the crash rate. In general terms, this decline consists of a slowing down of movement, a decline in muscle strength, a decline in fine motor skills, and a particularly strong decline in the ability to adapt to sudden changes in bodily position (SWOV, 2015).

An important cause of the high fatality rate among older pedestrians is the physical vulnerability of elderly people. Since their bones are more brittle and their soft tissue less elastic, they run a higher risk of severe injury, compared with younger road users injured with the same crash force (Ang et al., 2017).

Older pedestrians are over-represented in crashes at intersections, particularly at those without traffic signals, and in crashes involving a turning vehicle. They have greater difficulties in estimating the speed and distance of oncoming vehicles and tend to overestimate their own walking speed. Like children, they have the tendency to look out for traffic only in the near lane and ignore possible traffic in the far lane (Tournier et al., 2016). Consequently, older pedestrians are also over-represented in crashes involving the crossing of midblock road sections, particularly on wide multi-lane roads in heavy bi-directional traffic (Oxley et al., 2004, 2016). Although these are not road crashes according to the common definition (see Section 3.1), *pedestrian falls* also occur more frequently among older pedestrians, e.g. when boarding or exiting public transport, falls on footpaths, when stepping off kerbs, and while crossing the road (without being struck by a

vehicle). Although injuries resulting from pedestrian falls and other non-collision events are generally not as severe as those where a vehicle is involved, they nevertheless represent a significant cause of trauma for older pedestrians (Oxley et al., 2004, 2016). See also *Thematic Report Seniors, EC, 2021*.

3.4.2 Crash factors with young pedestrians

Most crashes involving children occur in the late afternoon, when they are either walking back home or playing outside. Several British studies have shown that most of the child-pedestrian fatalities featured running or not paying attention at the time of the accident (Sentinella & Keigan, 2005; Carole Miller Research, 1998; Tight et al., 1996).

Variations between countries in the proportion of child fatalities that were travelling as pedestrians reflect the country's residential and traffic infrastructure and, not least, typical national habits such as children walking to school on their own or adults accompanying or driving children to school (OECD, 2012).

4 Countermeasures

Long-term planning is needed to produce the fundamental changes that would improve the safety and mobility of vulnerable road users. Measures require a framework that takes the various needs of vulnerable road users into account, as set out in Sustainably Safe Traffic (SWOV, 2018), Safe Systems (ITF, 2016) or the EU Road Safety Policy Framework 2021-2030 (EC, 2019a). Road traffic casualties are no longer defined as a negative but as a largely accepted side-effect of the road transport system. However, road fatalities and severe injuries can and should be avoided. Where crashes still occur, the circumstances which determine the severity of these crashes should be addressed so that in time the possibility of severe injury is virtually eliminated. In the framework of Sustainable Safety (SWOV, 2018) a safe system is characterised by:

- A road structure that is adapted to the limitations of human capacity through proper design, and in which roads have a clearly appointed function, as a result of which improper use is prevented.
- Vehicles which are fitted with facilities to simplify the driver's tasks and which are designed to protect the vulnerable human being as effectively as possible.
- Road users who are adequately educated, informed and, where necessary, guided and restricted.

4.1 Land use planning

In the 20th century, cities were designed and constructed to allow vehicular access and encourage mobility. Initially, this implied access and mobility involving horses and carts, then omnibuses, 'horseless carriages', and finally motor cars.

In more recent times, however, there has been a shift back from motorised vehicles to vulnerable road users who are becoming a priority in the transport system. With the road network legacy, designed primarily for motor vehicles, it is not always easy to create room for pedestrians, but more and more cities are focussing on reducing motor

traffic and increasing the active transport modes (e.g., Vean, 2018; London; Kiviet, 2018; Amsterdam; Kvashilava, 2018; Tblisi; ITF 2020; Fortaleza & Buenos Aires).

The pedestrian safety measures which are most comprehensive and most closely associated with urban planning and policy philosophies include *area-wide speed reduction* or *traffic calming schemes*, and *integrated walking networks*.

4.1.1 Speed Management (area-wide)

Speed is the key factor in serious and fatal crashes involving pedestrians. Speed also affects injury severity, particularly for vulnerable road users such as pedestrians. A pedestrian who is hit by a car travelling at 65km/h is four times more likely to be killed compared with a car travelling at 50km/h (cf. *Thematic Report Speed*, EC 2021). At collision speeds below 30 km/h, collisions between motorised vehicles and pedestrians are much less likely and if they do happen, they do not usually result in a fatality.

Physical measures such as speed humps can force speed reduction (Schoon, 2004), but may meet with opposition from bus and emergency vehicle drivers as well as from residents if extensive ground vibrations occur. Speed reduction can also be achieved (although to a lesser extent than by speed humps) by narrowing the carriageway or by a raised crossing.

More and more cities in Europe have implemented a 30km/h zone in the city centre (including Munich, Helsinki, Bilbao, Brussels, Madrid and Grenoble). There is a trend for cities to extend these zones, with a 30km/h limit envisaged for all urban roads (cf. *Thematic Report Speed*, EC 2021). The benefits are well proven: several systematic reviews have looked at the effects of traffic calming and found that it reduces traffic collisions, (Elvik et al. , 2009), road injuries and fatalities (Quigley, 2017; Aarts & Dijkstra, 2018).

4.1.2 Safe walking routes

To encourage walking among *children*, many municipalities are acting to introduce safer schoolways (e.g., https://sicherzurschule.berlin/). In the Netherlands, many municipalities have implemented 'Kid routes', child-friendly routes with a playful layout and easily recognisable markings and signs leading children to their destination (De Jager et al., 2005; Wassenberg & Milner, 2008).

4.2 Road design

Area-wide traffic calming, reduction of motor traffic, and lowering of speed are arguably the measures which most increase pedestrian comfort and safety. The design of features such as footpaths and crossing facilities should ideally be integrated in these measures.

4.2.1 Footpaths

Footpaths must be physically separated from both motor and bicycle traffic. To ensure their useability, also to people with reduced walking abilities or vision, they must be well maintained without potholes and uneven paving stones to prevent falls and allow walk-

ers to focus on the traffic rather than on the ground. Crossing facilities should have levelled access to the street rather than a high kerb which can pose an important obstacle (Fournier et al., 2016).

4.2.2 Crossing facilities

In principle, there are four types of provisions for pedestrian crossings:

- Lowering the speed of motor vehicles; e.g., raised junctions, speed humps, axis offsets and 30 km/h zones.
- Separating motor vehicles and pedestrians in time; i.e., different kinds of traffic light control: reduced waiting time or a longer green phase, green phases for pedestrians separated from left- or right-turning vehicles.
- Physically separating motor vehicles and pedestrians; e.g., bridges, tunnels, viaducts, pavements and centre islands.
- Increasing visibility and conspicuousness: lighting, markings, signage, and relocation of lay-bys, parking spaces, and bus stops and other sight obstructions.

Not all these provisions are equally effective. By and large, provisions that lower driving speeds or physically separate transport modes are most effective (Retting et al., 2003). Pedestrian bridges and underpasses (the most ideal solution in terms of road safety) are, however, not very popular. English pedestrians would prefer walking an extra two and a half minutes to the next signalled crossing rather than use a pedestrian-bridge and more than 5 extra minutes to avoid using an underpass (Anciaes & Jones, 2018).

4.2.2.1 Non-signalled crossing facilities

In terms of the effectiveness of marked pedestrian crossings (zebra paths), studies do not all point in the same direction (Turner et al., 2006; Havard et al., 2012 and Gitelman et al., 2017). A *decrease* in crash risk has been established in particular for marked crossings on smaller roads with no more than two lanes, but for busy roads with more than two lanes risk has been found to *increase* after implementation of marked crossings (Hesjesvol & Hoye, 2019). Studies looking into the severity of pedestrian crashes at marked crosswalks have, however, consistently found a significant *reduction in the severity* of pedestrian injuries (De Ceunynck & Focant, 2017). The following are the measures that improve the safety of marked crossroads (Hesjesvol & Hoye, 2019):

- *Elevated walkway (or speedbump):* recommended where speed levels are too high and on roads with a speed limit of 40 km/h or more.
- A *centre island (refuge)* in the middle of the road can make it easier for pedestrians to cross. Shorter stretches that must be crossed one by one and where attention need only be directed to traffic from one direction at a time. At the same time, a refuge can make motorists more aware and mean a narrowing of the lane, thereby having a speed-reducing effect.
- *Extension of sidewalks*: Extensions of sidewalks (bulb-outs) reduce the distance that pedestrians have to travel, prevent parking cars and thus improve visibility conditions, and can also function as a speed-reducing measure.
- *Illumination* of pedestrian crossings draws the attention of the motorists and makes it easier for them to detect pedestrians in the dark.

- *Automatic warning signs* that are activated when a pedestrian approaches has been shown to increase compliance by motorists.
- *Guide fences :* Fences that lead pedestrians to crossings are suggested by Hesjesvol & Hoye (2019) because large numbers of pedestrians cross near but not with the street markings. In combination with moving the stopping line for motorists further away from where pedestrians cross, fences have been shown to reduce the number of serious conflicts (De Ceunynck et al., 2020, see Figure 2).

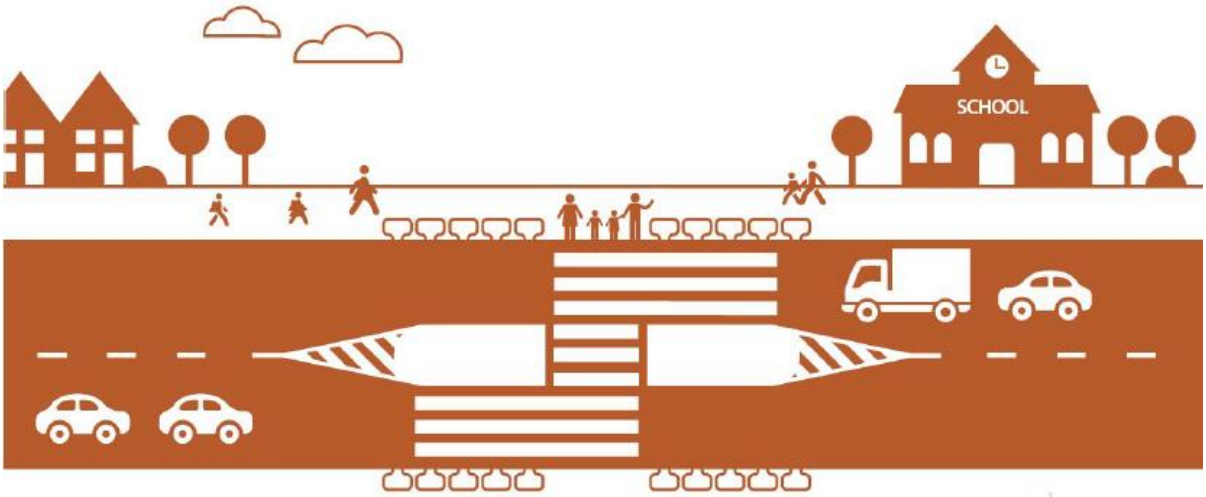

Figure 2 Moving the stopping line upstream in combination with guiding fences has been shown to reduce the number of serious conflicts (De Ceunynck et al., 2020)

Studies focussing on risky crossings by pedestrians did not find any indication that pedestrians are less careful when the crossing facilities are better (De Langen, 2003; Fu et al., 2018; Pulugurtha et al.; 2012). Fu et al., however, did show that pedestrians do not always fully take into account the speed and the distance of oncoming vehicles.

At locations with many pedestrians, motorists pay more attention to them. This effect is called "*safety in numbers*": when more pedestrians cross the road the number of pedestrian crashes increases, but not proportionately to the number of pedestrians (Elvik, 2013). This is also true for other vulnerable road users: combining crossing facilities for pedestrians and cyclists can be effective in increasing protection in numbers (Ryley, Halliday & Emmerson, 1998). The advantage of a combined crossing is that it is more visible for fast-moving traffic travelling on the major road.

4.2.2.2 Signal-regulated crossing facilities

For signal-regulated crossing facilities, the two largest problems are pedestrians failing to obey the traffic lights (50%) and conflicting traffic light phases for turning vehicles and pedestrians at their exit approach (25%; Populer, et al., 2018). Smart signalisation, that can count the numbers of pedestrians and cyclists crossing, can achieve a fairer distribution of waiting times for fast and slow traffic, and they often produce shorter waiting cycles, which increases compliance and ultimately safety (Ryley, Halliday & Emmerson, 1998). Increasing crossing times for pedestrian or increasing the phase lengths has been shown to reduce the crash risk for pedestrians (Chen 2012, Retting, 2002).

The design of signalised pedestrian crossings should follow the following principles (Populer, 2018; SWOV, 2020):

- setting traffic light intervals to accommodate the walking speed of older pedestrians;
- setting traffic lights differently to avoid conflicts between turning cars and pedestrians.

4.3 Visibility: lighting and reflecting devices

20% of crossing accidents happened in the dark (Ewert, 2012). While many actions are being taken to improve young people's visibility, this is not yet really the case with older people. The Swiss BFU recommends the use of reflective gear, especially applied to the legs, because this is where motor vehicle light beams are most concentrated and where reflective gear is most noticeable due to leg movement (Ewert, 2012).

4.4 Vehicle design of crash opponents

The new EU Regulation on type approval requirements for motor vehicles (EC 2019) makes Automatic Emergency Breaking (AEB) mandatory for cars and vans. Chauvel and colleagues (2013) estimate that the number of pedestrians killed could be reduced by 15% and the number of pedestrian injuries by 38% if all passenger cars were equipped with *Automatic Emergency Breaking for Pedestrians* (AEBP).

Moreover, vulnerable road user detection and warnings on the front and side will be mandatory for busses and lorries, because these vehicles have large blind angles (EC 2019b). The problem with these systems is a relatively high rate of false alarms. Therefore, they must be combined them with improved vision from the driver's position (EC, 2019b). This can be realized with lowered windows that allow the driver to check visually when there is a warning (e.g., Edwards et al., 2018 for busses) or with artificial intelligence that can predict pedestrian behaviour (e.g., Ruf et al, 2019 for lorries).

For *active protection systems for pedestrians* like pop up bonnets and *pedestrian airbags* it is expected that these can reduce can severe pedestrian head injuries at speeds up to 60 km/h (Reed, 2017).

Intelligent Speed Assistance (ISA) can effectively contribute to the safety of pedestrians and cyclists by limiting drivers' speed, particularly in zones with 30 km/h speed limits.

4.5 Education and training

Automobilists and other drivers have to learn how they can safely interact with pedestrians, for example by incorporating hazard anticipation training with an emphasis on vulnerable road users in basic driver training and testing (Vlakveld, 2011).

Pedestrians need to learn by formal and informal education how to walk safely. Hoekstra & Meskens (2010) have suggested giving more information to parents and carers that emphasize the importance of walking in traffic together with children and setting a good example rather than only explaining what the correct behaviour should be.

4.6 Legal Framework and Enforcement

Laws and – where necessary - penalties are important in providing protection for vulnerable road users and influencing driver behaviour. They also indicate government commitment to road safety and show that the government is taking pains to balance road safety, mobility and freedom. Laws that are particularly relevant to the safety of pedestrians are those governing speeding, compliance at pedestrian crossings, and dangerous driving.

5 Further reading

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