DEPARTMENT
OF PSYCHOLOGY
PHILOSOPHICAL FACULTY
PALACKY UNIVERSITY IN OLOMOUC
CZECH REPUBLIC

Road users

Traffic psychology 1
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Matus Sucha

Presentation 3

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I. Vulnerable road users

The definition of *a road user* according to Collins Dictionary (2013) is *"anyone who uses a road, such as a pedestrian, cyclist or motorist".*

Road users who have a **high casualty rate** and should therefore be given special attention in road safety policy are often referred to as **'vulnerable road users'**.

This group can be defined in a number of ways. In all cases, **the lack of external protection** is important and often the **task capability** also plays an important role (SWOV, 2012).

There are **three criteria** to distinguish *vulnerable road users* from other road users:

1. *the amount of external protection*
2. *the task capability*
3. *the resilience*

For the part "Vulnerable Road users" information from the SWOV Factsheet on Vulnerable road users (2012) was used.

I. Vulnerable road users

A subdivision based on *task capability distinguishes* road user groups who have *limitations* in performing one or more task aspects. In addition to *novice road users*, *disabled road users* and *road users who are less skilful* because of *social or cultural circumstances* are therefore also considered to be vulnerable road users.

Strict application of these criteria would also label novice drivers (limited task capability) or elderly car drivers (low resilience) as vulnerable; there is a supplementary criterion: **the vulnerable should not themselves be a threat to others**. For this reason neither young nor elderly motorists are considered to be vulnerable: their vehicles are a threat to others.

Besides the fact that vulnerable road users are often **unprotected because they have no 'shell'**, there is also often a difference in **speed compared** with other road users.

I. Vulnerable road users

In *Advancing Sustainable Safety* (Wegman & Aarts, 2006) **pedestrians** and **cyclists** are referred to as vulnerable road users because of their *unprotected state*.

Because **riders of motorised two-wheelers (motorcycles, mopeds, and light mopeds)** are also to a large extent unprotected, they are also referred to as vulnerable. On the other hand, (light) moped riders and motorcyclists are only regarded as vulnerable on *second thought*: they travel at much higher speeds than pedestrians or cyclists.

Where vulnerability is used for **specific age groups**, Wegman & Aarts mainly refer to **children** and the **elderly** when they are pedestrians or cyclists.

More specifically, they refer to **aspects of task capability** – the inexperience of children and a declining task capability (and physical vulnerability) of the elderly.

I. Vulnerable road users – who are most vulnerable in traffic?

Those who are most vulnerable are those **road users without a vehicle**, and thus without a shell (*pedestrians*) and those using a **vehicle without a shell** (*cyclists and light moped riders*). Moped riders and motorcyclists are only protected from head injuries if they wear the obligatory crash helmet.

When we take the **body** and not the vehicle as a starting point, *elderly road users* are at a disadvantage. From the age of *fifty years old* the bones get more brittle, the elasticity of the soft tissues declines, and so does the muscle strength. In a crash with equal collision energy, these age-related changes result in the elderly being more severely injured than the young.

I. Vulnerable road users

Crash severity

A measurement of the average crash severity for a specific group of road users is the lethality rate, which is the ratio of the number of deaths and the number of in-patients within this group of road users. In *Table 1 (SWOV, 2012, data 2005-2009)* the lethality rate is the number of fatalities per 100 serious road injuries.

Age	Pedestrian	Bicycle	(Light-)moped	Motorcycle	All vulnerable transport modes
0-14	8	11	4	0	9
15-24	26	13	6	20	9
25-64	25	9	6	17	12
65-74	22	20	15	21	20
75+	36	31	39	22	33
All ages	22	14	7	18	14

I. Vulnerable road users

Inequality

The difference in crash severity is often also determined by the difference in mass between the colliding parties (Van Kampen, 2000): the modes of transport are then unequal.

A good way of expressing this difference in crash severity is to use *the ratio of the numbers of casualties in the weaker party and those in the stronger party*: the *inequality (Table 2, SWOV, 2012, data 2005-2009).*

Transport mode of casualty	Crash opponent transport mode				
	Bicycle	(Light-) moped	Motorcycle	Car or van	Lorry
Pedestrian	1.7	4.1	2.0	43.3	-
Bicycle	1	1.8	2.0	32.1	45.4
(Light-) moped		1	0.7	24.0	33.8
Motorcycle			1	26.2	88.0
Van & Car				1	15.5
Lorry					1

I. Vulnerable road users

Casualty rate

A third measurement unit is **risk**, usually expressed as the *casualty rate,* which is defined here as the ratio of the number of casualties per distance travelled.

The casualty rate by **age is high for various types of young road users** (Wegman & Aarts, 2006) and **for the elderly** (Davidse, 2007).

For the **young** a high casualty rate as *pedestrians, cyclists, (light) moped riders, and drivers (*in spite of their high casualty rate young novice drivers are not regarded as vulnerable road users) as a result of **low task capability is notable.**

In the case of **the elderly** the high casualty rate is mainly a matter of increasing *physical vulnerability combined with a decreasing task capability*.

I. Vulnerable road users

Mode of transfer and the attractiveness of the car

The attractiveness of the car actually devalues other modes – walking and cycling are, globally speaking, less attractive when compared to the car. This is for many reasons (higher speed, more comfortable, higher social status etc.), but also because of the **environment and infrastructure** in cities, which is **mostly focused on cars** (e.g. maintenance of roads vs. pavements (in the winter, for example), missing pavements, dead-end pavements, missing facilities for crossing the road etc.).

The design, promotion, and pricing of infrastructure (ownership and usage of the car should be the most expensive mode of transport, because in **real costs** it is) should support alternative modes of transport – especially those which are friendly to vulnerable road users.

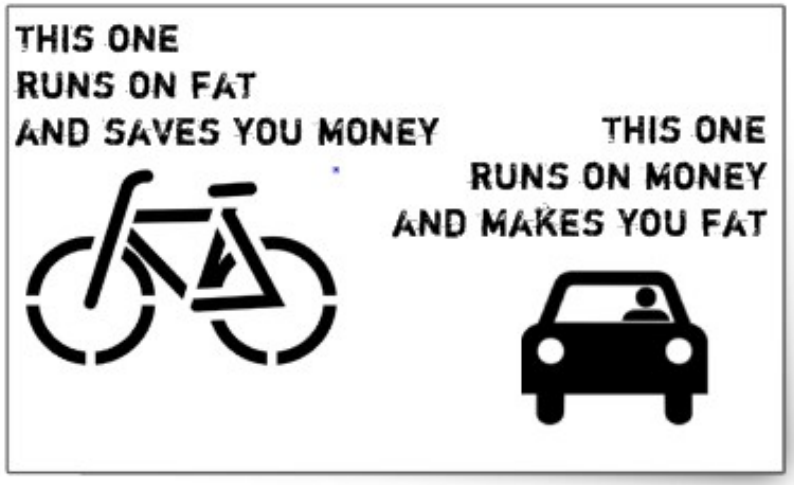
I. Vulnerable road users

Mode of transfer and the attractiveness of the car

In recent decades, young adults in many developed nations have become **increasingly less likely to acquire a driving licence.** If this trend continues, it could have significant impacts on transport futures.

There is a declining trend evident in 9 out of 14 documented countries; the average rate of decline is **0.6% per annum**, with the highest declines being documented in **Australia**.

A range of causal factors are documented from cross-sectional and longitudinal studies. **Changes in life stage and living arrangements, changes in the affordability of motoring, location and transport, graduated driver licensing schemes, attitudinal influences, and the role of e-communication** are documented (Delbosc & Currie, 2013).



I. Vulnerable road users

Measures and countermeasures

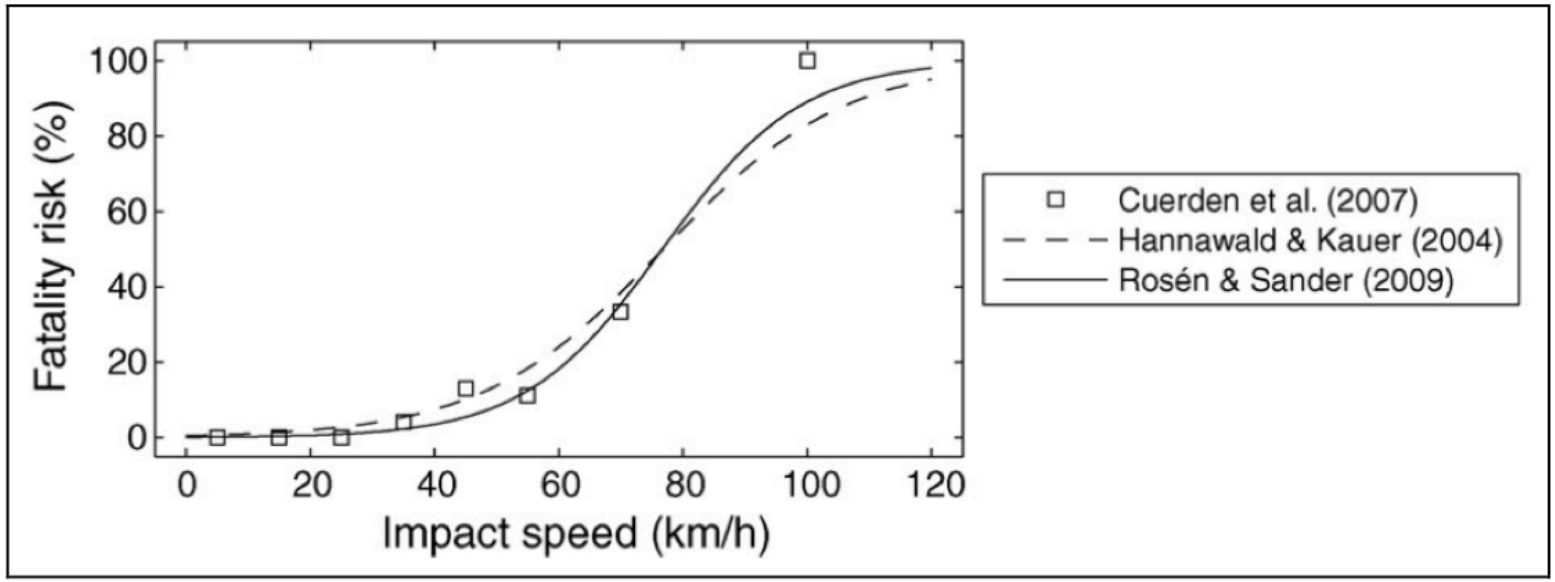
In a *sustainably safe traffic* system there is no place for large mass and/or **speed differences** because these strengthen the differences in vulnerability between the various types of road user. The idea is that in the event of a crash the driving speed should be limited in such a way that a safe collision speed remains (*homogeneity principle).*

Complete separation of unequal types of road user is, of course, the best solution. If this is not possible, the consequences of a crash should be such that pedestrians and cyclists cannot be severely injured (*forgivingness principle).* This solution requires both *special facilities for motorised vehicles* and a *reduction in the speed* of these vehicles.

I. Vulnerable road users

Measures and countermeasures – safe collision speed

In a crash between a passenger car and a cyclist or pedestrian, the survival rate of the latter two decreases dramatically when the car's collision speed increases. According to an overview of recent studies (Rosén et al., 2011) nearly all pedestrians survive a collision with the front of a car at a collision speed of 20 km/h (Figure *1).* For this reason, a road authority constructs raised junctions or 30 zones at locations with mixed traffic.



I. Vulnerable road users

Measures and countermeasures – education and training

In the first place, **education and training focused on drivers** is very important (because drivers are those who control the power – vehicles and high speed).

Drivers should be educated and trained with regard to vulnerable road users and their specific features and special needs.

Especially young drivers must understand that there are other road users besides themselves (and other drivers) and that these road users are much more vulnerable than they are, and respect them.

Often young drivers find pedestrians and cyclists disturbing and have no empathy for them. This should be tackled in education.

I. Vulnerable road users

Measures and countermeasures – vehicle facilities

With regard to facilities for motor vehicles and trucks, they must be equipped with **side-underrun protection** and **good side and rear view facilities so as** to limit the **blind spot** when turning right as much as possible.

Presently, a **collision-friendly front** for passenger cars is being considered, as cars are by far the commonest collision opponent of pedestrians and cyclists.

Recently, the development of an **airbag** which is to be attached to the front of the car is on its way. This type of airbag is expected to increase the chances of survival in crashes for pedestrians and cyclists.

I. Vulnerable road users

Measures and countermeasures – infrastructure

By the construction of **bicycle paths and pavements,** vulnerable road users on road sections can *be separated* from the other traffic. But crashes can also happen on pavements and bicycle paths. A study by Schepers (2008) found that in about *half of the single bicycle crashes the road design, layout, and maintenance played a role in the origin of the crash*. Common causes of the crashes that occurred on bicycle paths were steering off the road (against the kerb or the verge), cycling into a bollard, and a slippery road surface.

It is therefore important not only to provide facilities for a specific group of road users, but also to *pay attention to safe design and layout and good maintenance*.

Among pedestrians there are also fatalities and injuries in accidents *that did not involve a vehicle*. The statistics do not register these accidents as traffic crashes.

I. Vulnerable road users

Pedestrians and cyclists

Of all journeys, **20-40% are made by cycle or on foot**, with the highest percentage being in the Netherlands and the lowest in Finland. Trips on foot take place most frequently in Great Britain, whereas bicycle trips are most frequent in the Netherlands, Denmark, and Sweden.

Some groups of traffic participants walk or cycle more than others. These differences are also reflected in their involvement in crashes. **Walking** is particularly important *for children* below the age of 12 and adults aged 75 and above. The **bicycle** is used most frequently by *adolescents* (12-17 years of age).

Walking is a very important means **for children, school students, and the elderly to participate in traffic**. In sustainably safe traffic, these vulnerable road users should be separated from other traffic as much as possible. If this is not possible, there is the **"safe speed" of 30 km/h or less** (homogeneity). To limit severe injury, vehicle adaptations also remain important (forgivingness).

I. Vulnerable road users

Pedestrians and cyclists

Each year, more than **270,000 pedestrians lose their lives** on the world's roads (WHO, 2013). Many leave their homes as they would on any given day – to school, work, places of worship, the homes of friends – never to return. Globally, pedestrians constitute 22% of all road deaths, and in some countries this proportion is as high as two thirds.

Of all traffic fatalities in **EU countries**, the proportion of pedestrian fatalities is about **17% and the proportion of cyclist fatalities is about 6%**. The age groups that have the highest percentage of pedestrian fatalities are **children younger than 10 years** of age and **adults aged 65 years or older**.

Cyclist fatalities have the highest share among **children between 6 and 14 years of age**. The percentages for these age groups are about **twice as high** as the average percentages for all age groups.

In the Czech Republic in 2012 there were **146 fatalities** among pedestrians (*21.4% of all fatalities*). More than *90% of the fatalities occurred in urban areas, and 61% of the fatal accidents happened in the night.* In comparison to the year 2002 we can observe a 40% drop.

I. Vulnerable road users

Pedestrians and cyclists

Most fatalities and severe and slight injuries to pedestrians and cyclists occur in **urban areas**. Motor vehicles (cars, lorries, and buses) account for over **80% of the vehicles striking pedestrians and cyclists.** Crashes involving pedestrians and cyclists frequently occur at **facilities designed for pedestrians** and cyclists, such as pedestrian crossings, cycle tracks, and cycle lanes. This means that these facilities are not necessarily good enough to prevent crashes. However, pedestrian crossings might also be the location at which roads are most often crossed.

Factors that have been identified **as contributory factors** in the causation of pedestrian and cyclist crashes and injuries are the **speed of motorised vehicles**, the **weight and design of motor vehicles,** the **lack of protection of pedestrians and cyclists**, their **visibility**, **vehicle control**, and **alcohol consumption**.

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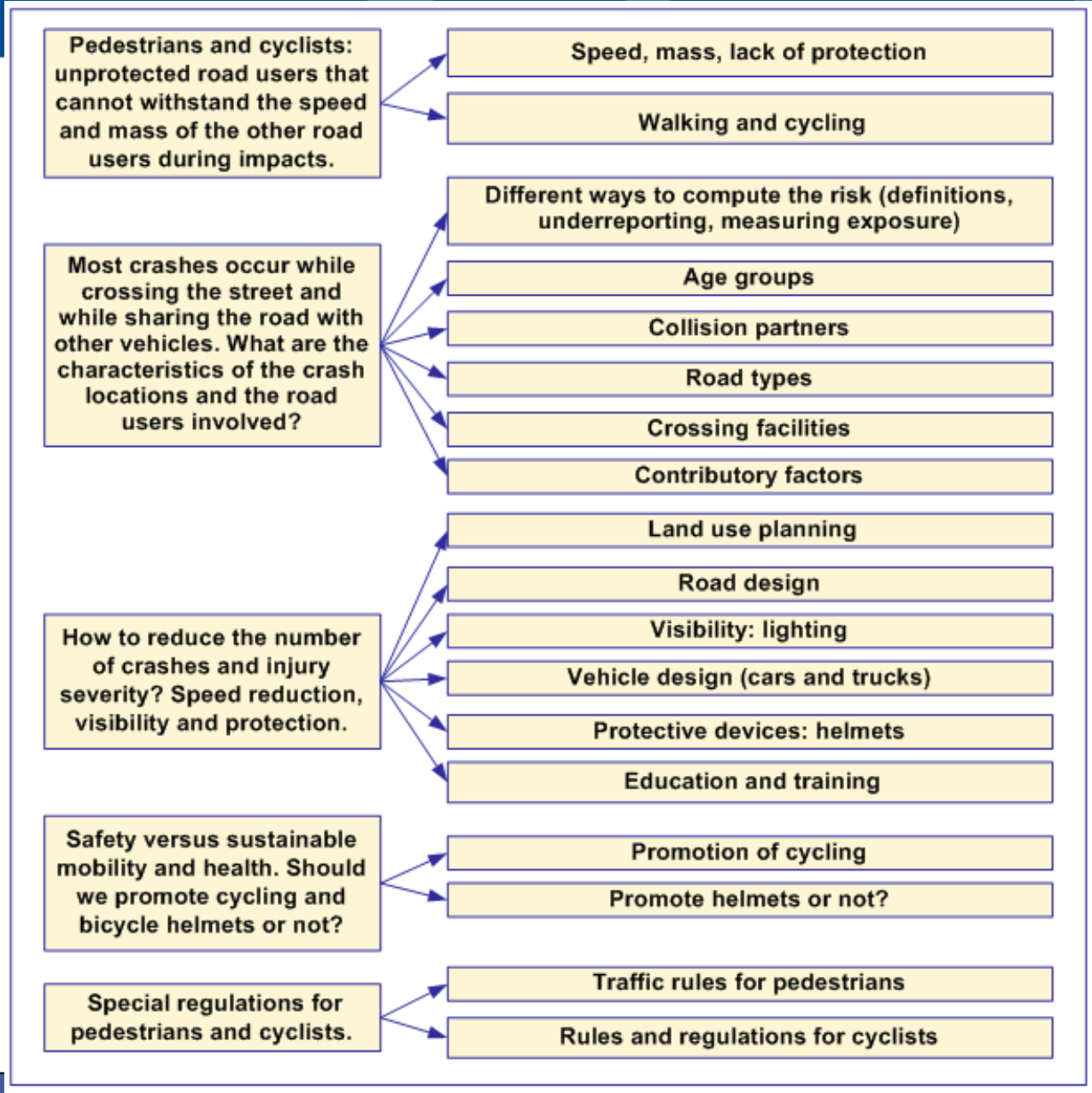
I. Vulnerable road users

Pedestrians and cyclists

Measures to prevent accidents

1. Education and training
2. Land use planning
3. Protective devices: helmets
4. Road design
5. Vehicle design of crash opponents
6. Visibility: lighting and reflecting devices

(ERSO, 2013)



I. Vulnerable road users

Pedestrians and cyclists

Push arguments for walking

Most natural mode
Freedom & independence
Is healthy and keeps you fit
Is silent and environmentally friendly
Cheap & efficient
Puts life into public spaces
Enhances communication among people
Supports & enhances trade
Democratic mode (everybody walks)
Safe for others, no harm to others

(Risser, 2013)

I. Vulnerable road users

Children and adolescents

Children are a vulnerable group of road users. After all, they are still developing the skills they will ultimately use to participate in traffic in a responsible way. Furthermore, as independent road users their role is limited to that of pedestrians and cyclists, which are the most vulnerable road users. Referring to children is specifically meant for 0-to-14-year-olds; 15-19-year-olds are adolescents.

Children in traffic:

- children as pedestrians
- children as bicyclists
- children as vehicle occupants
- children's travel

I. Vulnerable road users

Children and adolescents

As children grow and their world extends beyond the home and out onto the local roads, they are exposed to hazards and risks. Despite the fact that children use roads as pedestrians, cyclists, motorcyclists, and vehicle passengers, the road environment is **rarely developed** with consideration for their needs.

Some children work, play, or **live on the road**, and this exposure, along with other risk factors inherent to childhood, makes them particularly vulnerable in traffic. Road traffic injury is strongly associated with **poverty** in all countries, irrespective of income level.

In 2004, road traffic crashes resulted in more than **260,000 deaths in children and young people aged 0-19 years.** Globally, **road traffic injuries are the leading cause of death in 10-19-year-olds (teenagers). Children accounted for 21%** of all road traffic injury-related deaths worldwide. Low-income and middle-income countries (the South-East Asia and the Western Pacific regions), however Africa and the Eastern Mediterranean account for **93% of child road traffic deaths in the world**.

I. Vulnerable road users

Children and adolescents

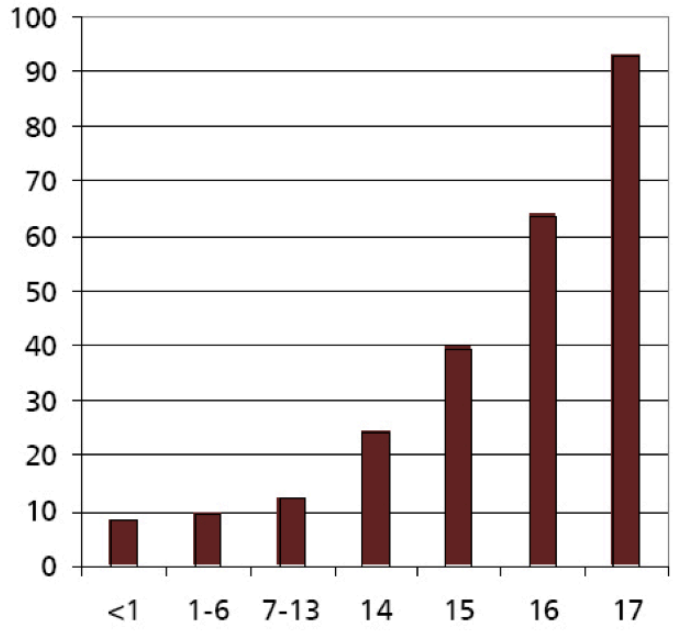
At least 1,219 children were killed in the EU in 2007, representing around **3.5% of overall road deaths**, while they make up almost **one sixth of the population**. Children are therefore **relatively safer** than other age groups, probably because of **lower exposure to road traffic**.

In **European Union countries**, road traffic injuries still account for **1 in 5 childhood injury deaths.**

Children are extremely vulnerable on roads because of their lack of experience, reduced visibility, and bodily fragility. Children are also often unaware of the risks they take unintentionally and more easily become innocent victims in road traffic collisions.

Therefore it is essential that the road system is adapted to account for their limited capabilities and for their limited access to alternatives.

Mortality increases dramatically after



Road safety
PIN, 2009

I. Vulnerable road users

Children and adolescents – safety measures

1. Improvement of road safety for children is most likely to be achieved through **combining measures to address the behaviour of all road users**, improve the **road environment**, **design vehicles** that **better protect** both their occupants and those at risk outside the vehicle, and promote the use of appropriate restraint systems by children.
2. **Traffic safety education** starting at 5-year-olds
3. Encouraging the **use of protective equipment in vehicles,** such as child passenger restraint systems, booster seats and seat belts, and a rear seating position for children. Compliance can be enhanced through the introduction of legislation and enforcement, public awareness campaigns, and strategies addressing issues of access and affordability.
4. Establishing and **enforcing reduced speed limits for vehicles around schools and** residential and play areas.
5. Establishing **infrastructure to separate road users.** For example, separate traffic lanes for cyclists and motorcyclists, and pavements for pedestrians.

I. Vulnerable road users

Riders of motorised two-wheelers

With two wheels in line, minimal bodywork, and a high power-to-weight ratio, PTWs are an **economical means** of transport. Riding a PTW gives a special **sensation** which is attractive to some groups of riders. Riding a PTW is also **much more dangerous than using another motor vehicle.**

The trends for numbers of motorcycles are quite different. With the **exception of Central European countries,** almost all EU countries have experienced an increase in the number of motorcycles. The increase is stronger for older motorcycle riders. Central European countries show an **ongoing downward trend** in the number of motorcycles. Most countries have a large proportion of **motorcycle fatalities among riders aged 25 years and older.**

The total number of PTW **fatalities** in 2005 in Europe (ERSO, 2013) was 7030, which is **15% of all traffic fatalities**. 50% of fatally injured moped riders were under the age of 25. 75% of the motorcycle riders killed in traffic were 25+. **In the Czech Republic** 79 motorcycle riders (accounting for 12% of all fatalities) and 3 moped riders were killed in 2012.

I. Vulnerable road users

Riders of motorised two-wheelers

Studies of moped and motorcycle accidents find large **proportions of collisions with a car** driver who should have **waited** for the PTW, indicating **problems with the perception** of PTWs. These problems are both physical, because of the small size of the PTW, and psychological: the presence and behaviour of PTWs is not expected by car drivers and sometimes is not given enough attention by them.

Some PTW riders contribute to the problems by **speeding**. A partial solution to the perceptual problems for both moped and motorcycle riders is the use of headlights during the daytime and the wearing of fluorescent/retroreflective clothing.

Age and experience are the main factors related to the PTW rider. Young PTW riders have much higher accident rates than older ones, even if corrected for lack of experience. The accident rates of **middle-aged PTW riders are still many times higher than those of car drivers of the same age.**

I. Vulnerable road users

Riders of motorised two-wheelers – safety measures

- Guard rails
- Helmets
- Leg protection and air bags
- Protective clothing
- Braking a PTW (e.g. ABS)
- Conspicuity devices (e.g. daytime running lights)
- E-safety (e.g. ITS systems, e-call)
- Enforcement of legislation
- Learning, testing, and licensing
- Promotional campaigns
- Road environment (the quality of the road surface is much more important for the safety of PTWs than for cars)

II. Drivers

According to a British dictionary (2013), a driver is "*a person who drives a vehicle or a specified kind of animal*".

For the purposes of this lesson we will deal only with drivers driving motorised vehicles.

Basically we can distinguish between several types of drivers:

1. *According to legal status and/or time spent behind the wheel:*
    1. *professional drivers (or commercial)*
    2. *private drivers*
2. *According to type of vehicle:*
    1. *bus drivers*
    2. *lorry drivers*
    3. *taxi drivers and others*
3. *According to sex, age, and experience:*
    1. *young drivers*
    2. *elderly drivers*
    3. *novice drivers and others*

II. Drivers

Professional drivers and private drivers

Criteria to distinguish a private driver from a commercial driver are defined (The Canadian Cardiovascular Society, 2009) on the basis of the **number of kilometres driven per year, hours per year behind the wheel, weight of the vehicle, and whether the vehicle is used to earn a living.**

Specifically, a **private driver** was defined as one who drives < 36,000 km per year or spends < 720 h behind the wheel per year, drives a vehicle weighing < 11,000 kg, and does not earn a living by driving.

A **commercial driver** was defined as any licensed driver who does not fulfil the definition of a private driver.

In Europe, a Council directive (80/1263/EEC) on 4 December 1980 proposed the establishment of a common European driving licence. A further directive of 29 July 1991 (91/439/EEC) formulated details that have been adopted in most countries of the European Union.

Two groups of drivers are defined. **Group 1** comprises drivers of ordinary motorcycles, cars, and other small vehicles with or without a trailer. **Group 2** includes drivers of vehicles over 3.5 metric tonnes or passenger-carrying vehicles with more than eight seats, excluding the driver.

II. Drivers

Professional drivers and private drivers

Drivers of taxicabs, ambulances (vehicles with priority), and other vehicles for professional purposes belong to **Group 2.**

Drivers in Group 2 have to undergo a medical and psychological examination before a driving licence is issued and should undergo periodic examinations afterwards (this varies greatly between different EU states).

Drivers in Group 1 have to undergo a medical examination only if they have certain medical disabilities. The European Council Directive delegates the decision on the minimum standards of fitness for driving for the intermediate category to the national legislations of the different countries.

In the Czech Republic a professional driver is defined as a driver whose main work-related activity is driving (according to his/her labour contract) and drives a vehicle over 3.5 tones.

II. Drivers

Professional drivers and private drivers

Professional drivers make a significant contribution to road traffic accident statistics (Taylor & Dorn, 2006) at an extraordinary human and financial cost. A number of studies have shown that workers who drive as part of their occupation have **a higher accident risk** than does the general driving population, even when a **greater exposure to risk is factored out.**

Commercial drivers were found to have an accident liability between 29 and 50 per cent higher than private drivers who were otherwise similar in terms of age, sex, and annual mileage (Broughton, 2003).

Driver stress and **fatigue** appear to be major contributors to at-work road traffic accidents. A number of other factors, including **stress and emotions, fatigue, sleep deprivation, and health status,** have been independently linked to an increased risk of at-work accidents.

Over a quarter of long-distance lorry drivers reported **falling asleep** at the wheel at some time during the previous 12 months of driving (McCartt, 2000).

II. Drivers

Professional drivers and private drivers – safety measures

The risk-related aspects of company driving are, in particular, that the highest-risk drivers (those with very high proportions of work-related mileage) drove more often:

1. in situations known to make drivers susceptible to fatigue and drowsiness (e.g. driving on long journeys (more than 50 miles) after a full day's work;
2. when under time pressure to reach a destination;
3. when conducting potentially distracting in-car tasks such as mobile phone conversations, eating, and drinking.

Safety measures:

- a need to change the conditions under which employees drive, so that time pressure and fatigue are reduced and attention-demanding in-car tasks such as mobile phone conversations are strongly discouraged.

II. Drivers

Professional drivers and private drivers – safety measures

Suggested policies:

Requiring drivers to retrieve telephone messages once they have stopped for a break, rather than have telephone conversations while driving.

Examining work schedules to ensure that drivers are not pressured by time.

Ensuring that people do not drive long journeys after a full day's work. This could mean encouraging employees to work from home. It could also mean ensuring that there is a policy within the company to encourage employees attending distant meetings to stay in a hotel overnight rather than drive back the same evening.

Issues connected with private drivers are discussed at length at other places in this series of presentations.

II. Drivers

Young drivers

Traffic crashes are the **single greatest killer of 15-to-24**-year-olds in OECD countries, and, although data are not always available, the situation appears to be no better in other, non-OECD countries.

We focus on young and novice drivers in the 18-24 age group.

In every crash and fatality statistic, 16-24 year old drivers are greatly over-represented, with risks a factor of **2 to 3 times higher** than those of more experienced drivers.

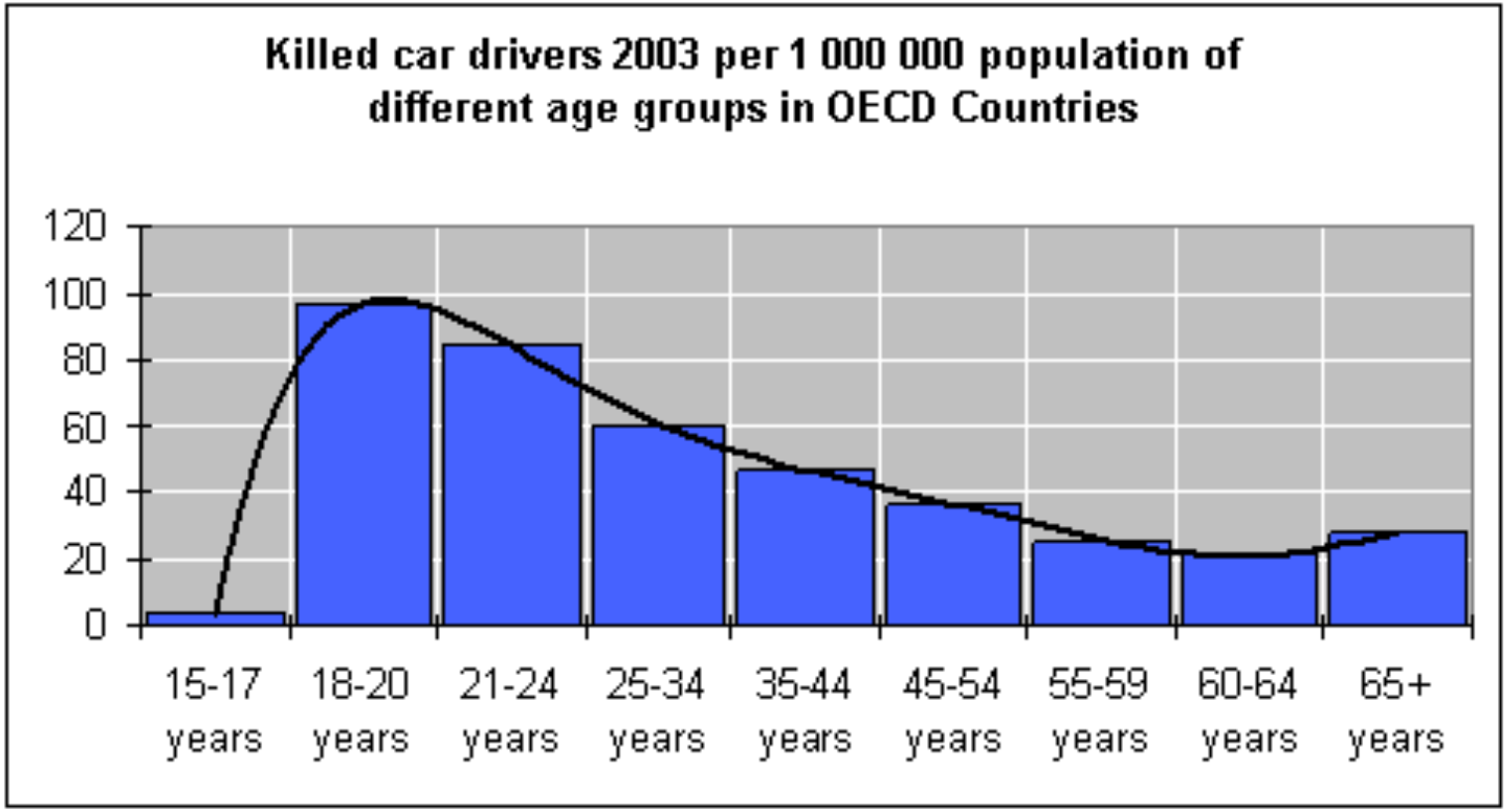
They pose a greater risk to themselves, their passengers, and **to other road users** than other drivers do. In young driver crashes, for each young driver killed, **about 1.3 others also die** (e.g. passengers and other road users).

Young driver crashes **differ** from those of more experienced drivers in that more young driver crashes **happen at night and are often single vehicle crashes** (with no other vehicles involved), frequently as a result of **'loss of control' and high speeds**.

Even **alcohol consumption in low quantities** has a greater impact on youngsters than on experienced drivers.

II. Drivers

Young drivers



Car drivers killed in 2003 per 1,000,000 members of the population of different age groups in OECD countries (ERSO, 2013).

II. Drivers

Young drivers

Young drivers' high crash rates primarily result **from immaturity, lack of experience, impairment, and lifestyles** associated with their age and their gender. Young men in particular are often **over-confident about their driving skills.**

Biological research shows that at the age of 18 areas of the human brain which are responsible for the **integration of information and impulse control are still developing**. Not only in physiological terms, but also in **social terms,** youngsters are still maturing. An example is their getting away from their parents' influences and gaining more independence. As part of this process **peers** become increasingly important to them, particularly in lifestyle-related choices.

Young drivers **drive more frequently during high-risk hours** and under high-risk circumstances. Examples are night-time driving, speeding, carrying passengers, a less frequent use of safety belts, and driving older cars with fewer safety features.

II. Drivers

Young drivers

Lack of experience – learning to drive demands a lot of practice before expert levels are reached. In comparison, vehicle handling skills are relatively easy to master in only a few hours, while skills such as anticipation of potentially hazardous traffic situations require years of practice. Young and inexperienced drivers tend to choose safety margins which are too small. To a large extent, this phenomenon is a consequence of the fact that this age group tends to overestimate its skills and to underestimate the complexity of the traffic situation. This is particularly the case for young males.

Impairment – young novice drivers are often impaired while driving. This impairment results from alcohol and drug use, fatigue, and distraction. Compared to expert drivers, alcohol causes the young driver's driving task performance to deteriorate to a greater extent. Distraction as a cause of driving errors is more prominent in novices than in experts. Furthermore, youngsters are frequently distracted by, for instance, passengers or mobile phone use, which lessens the attention paid to the traffic situation.

II. Drivers

Young drivers – safety measures

Specific measures must be taken to counteract and eliminate the bad effects that immaturity and inexperience may cause.

First of all, measures that raise the overall safety level of the traffic system, such as adequate enforcement (alcohol, speed, and safety belt), safe roads, and safe cars, will also increase the safety levels of inexperienced and young drivers.

Apart from these general measures, specific measures for novice drivers are also called for. Effective measures aim to **increase the amount of driving experience before solo driving** and to protect against high-risk situations in the first phases of solo driving. Pre-licence experience can be increased by **supervised driving**. Protection during the first stages of solo driving can be provided by measures such as **low alcohol limits and restrictions on night-time driving and driving with peer passengers.**

These measures will only be effective when compliance rates are high. Therefore **compulsory measures are preferred,** in combination with strict enforcement of these measures.

To facilitate their acceptance, **information campaigns** are needed in order to increase awareness of the problem in society and in the group of youngsters and their parents (and community) in particular.

II. Drivers

Young drivers – safety measures

Possibilities for improvements can be found **in driver instruction** and in **the application of technologies** to control access to the traffic system and to monitor actual driving behaviour.

For the improvements in driver instruction the focus should shift from vehicle control and traffic participation to higher-order skills such as hazard perception. A complex area in this respect is the training of how to recognise personal skill limitations and how to 'manage' safety margins in accordance with this recognition.

With respect to technology, the application of electronic car keys that hold information about the privileges of the driver, alcohol interlocks, and black boxes may reduce the exposure of young drivers to high-risk conditions. Other technologies, such as ESC (Electronic Stability Control) and Advanced Driver Assistant Systems, may be beneficial to young novice drivers.

II. Drivers

Elderly drivers

Older drivers are **not so much a risk to others**, but they are at risk **themselves.** This means that older drivers are not a risk to others' transport safety, but they are frailer, making them vulnerable to personal injury or the risk of fatality in the event of a crash.

As a result, older drivers have a **relatively high fatality rate**, but their **injury rate is much lower.** Taking the distances travelled into account, the fatality rate for car drivers is more than 5 times higher for those aged 75 years and over than for the average for all ages, whereas their injury rate is two times higher.

Not all drivers are sufficiently safe to **continue driving**. It depends on the physical and mental condition of the individual.

Older drivers are **over-represented** in crashes occurring while **turning off at intersections**, where typically the older driver **turns against oncoming traffic** with a right of way on the main road. Older drivers are **"under-represented"** in crashes **involving loss of control or collisions resulting from speeding**, **risky overtaking, or driving under the influence of alcohol.**

II. Drivers

Elderly drivers

The road safety of older road users is, to a large extent, determined by two factors: **functional limitations** and **physical vulnerability**. Both factors contribute to the relatively high fatality rate for older road users as a result of crashes.

Functional limitations can increase the risk of a crash, whereas **higher physical vulnerability** increases the severity of injuries. A third reason for the high fatality rate of older adults seems to be **their low annual mileage**. In general, drivers travelling fewer kilometres have increased crash rates per kilometre compared to those driving more kilometres.

These three explanations for the **high fatality** rate for older drivers are most probably connected, with the **physical and mental condition** of the driver having the biggest influence on the other two factors.

Drivers who have a **medical condition** are also likely to be more fragile than other (older) drivers and will also drive less frequently or at least drive shorter distances.

II. Drivers

Elderly drivers

As people age – a process that does not start at the same age for each and every individual – **functional limitations and disorders occur** which may increase the crash rate of road users. This is particularly the case in the **decline of motor functions** such as *muscle strength, finely tuned coordination, and the ability to adapt to sudden changes in bodily position.*

There are few indications that a decline in **visual and cognitive functions**, which is part of normal ageing, also has road safety consequences.

Functional limitations and age-related disorders **do not automatically lead** to unsafe traffic behaviour. Other characteristics of older road users can prevent safety problems. Among these are the **insight into one's own limitations, driving experience, and compensatory behaviour,** such as driving when the roads are less busy or when it is daytime and dry.

If, in spite of behavioural compensation, a crash occurs, the **older driver is more vulnerable than younger drivers**: his/her injuries will be more severe given an identical collision impact.

II. Drivers

Elderly drivers

Increases in the number of people aged 75 years and above, of the driving licence rates for older people, and of the mobility per older driver will increase the future number of fatalities among older drivers. The latter increase will, however, be toned down by reduced fatality rates resulting from future older drivers being more vital and experienced than those of today. Road safety measures can further reduce the fatality rate of older drivers in the future.

Taking into account the causes of the **high fatality** rate among older drivers, a set of measures which is aimed at reducing the fatality rate of older adults should at least include measures that are aimed at reducing the severity of the injuries suffered, such as **improvements in active and passive vehicle safety.**

Measures that can reduce the **crash involvement** of older adults also contribute to a reduction in their fatality rate. Examples of such measures are **providing education and training, infrastructural adaptations, and driver assistance systems.**

In the case of a **progressive decline of functions**, training and adaptations of the infrastructure and the vehicle can **no longer compensate** for reduced fitness to drive. Therefore, in addition, a procedure is needed that will lead to a **timely cessation of the driving career**. Possible measures are **licensing procedures and consultation with doctors**.

II. Drivers

Elderly drivers

A test procedure which results in people losing their driving licence when **they can still drive** a car safely is undesirable for a variety of reasons. First of all, the **fatality rate for older cyclists and pedestrians** is many times greater than that for older car drivers. Consequently, they are safer in a car. In addition, older people have often already stopped cycling, partly because of a loss of balance. Saying farewell to their car is often also a farewell to part of their **social lives**. As a result, the loss of driving privileges can cause considerable distress and a lowering of self-esteem and dignity, as well as creating difficulties for daily activities, shopping, and social contact.

The availability of means of transport **other than the car is one of the most important ways to maintain older people's mobility**. However, no single form of transport provides mobility for all people under all circumstances. Therefore, a family of services is needed that enables travellers to select the one that best suits their requirements for a particular journey. These services include: **public transport services, bus service routes, taxis, a Dial-a-Ride service, and an accessible pedestrian infrastructure for journeys on foot or by wheelchair or scooter**.

Thank you for listening!