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«Speed»

Talk by
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Talk

Introduction

When the first car was manufactured in 1891, it was not seen as a means of conveyance that might transport users faster than a horse and cart. Instead, it was intended to provide additional comfort. The speed at which a motorized vehicle could travel was equal to a person's walking pace or that of a workhorse. A Swiss law in force at that time stipulated that, for reasons of safety, a person should walk in front of the car carrying a flag to warn people of the dangerous vehicle. That was back in the days when, in France, wild horses caused 106 fatalities in the month of August 1900 alone while automobiles caused the death of 2 people (Fondin, 1968).

In the meantime, vehicle development has seen increasingly higher speeds while the road traffic system has improved continuously at the same time and - from a relative standpoint – has become safer. Nevertheless, we still have more than 1.2 million annual road accident fatalities worldwide today. This is 3,300 people a day or around 140 an hour! By 2030, this figure is expected to double.

Nowadays, excessive speed is one of the four main causes of accidents and near-accidents (alongside alcohol, inattention and aggression; Klauer et al., 2006), with the risk due to "speeding" even being placed slightly ahead of driving under the influence according to Australian studies (Kloeden, 1997). With a few exceptions, this also applies to most European countries (ETSC, 2008). In one in three road accident fatalities, excessive speed is at least a contributory factor. The European Transport Safety Council (ETSC) therefore consistently encourage and demand campaigns, programmes and measures to counteract this key accident factor.

Excessive speed is also in the front line where severe accidents in Switzerland are concerned (Allenbach et al., 2007). Although recent years have seen a decline in the extent to which severe injuries and fatalities attributed to this cause, speeding among young drivers and motorcyclists is a particular problem as it is in most European countries.

The role of speed in road traffic

The existence of a direct exponential relationship between speed and the severity of accidents has been proved many times over (q.v. e.g. Nilsson's power model on speed [2004]; Fig. 1). Energy exerted on the human body develops quadratically to the speed driven. According to the power model, the exponents vary in size dependent on the type of accident or injuries incurred.

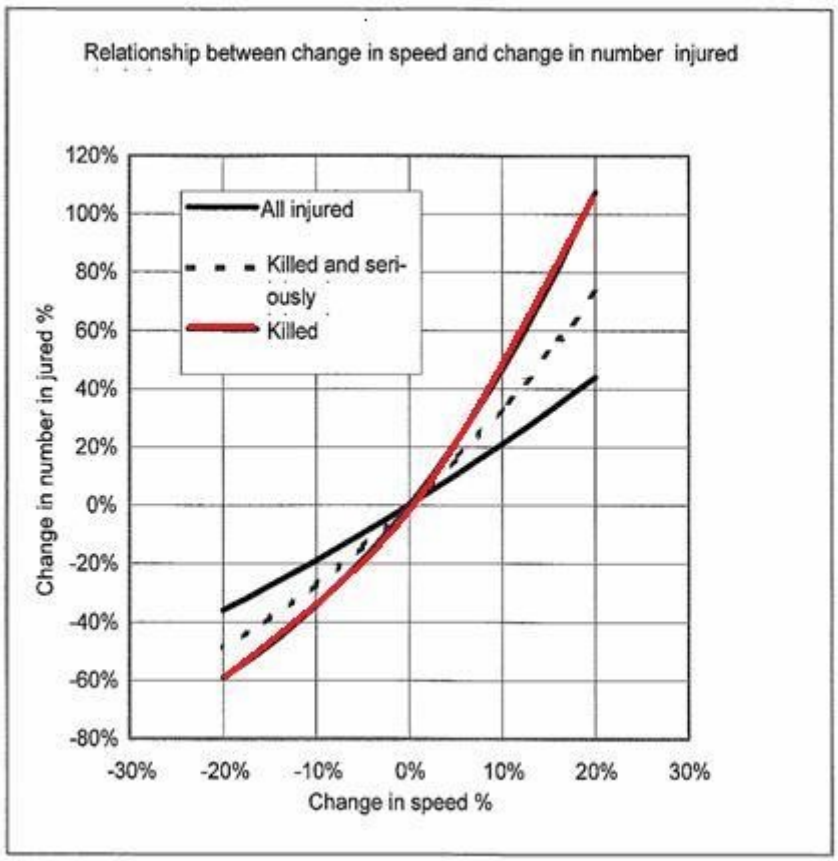

Fig. 1:
Power model: Relationship between a change in speed and a change in the number of people injured (according to Nilsson, 2004)

Most of the authors came to the conclusion that an increase in speed of 5 percent leads to approximately 10 percent more accidents with injured persons, 16 percent with severely injured persons and 25 percent with fatalities. The consequences of a collision are far more serious for pedestrians. If a car collides with a pedestrian at a speed of 30 kph, the likelihood of this person dying is 5 percent, at a speed of 65 kph it is as high as 85 percent (ETSC, 2008). Passive vehicle safety must therefore be put in perspective when it comes to selecting a speed.

One example of the link between safety and permitted speed can be seen on relatively safe motorways. In the Federal Republic of Germany (33 % of stretches with a permanent speed limit, 15 % with a temporary speed limit [DVR, 2007]), the death rate per billion kilometres driven on the motorway is 3.06, even though the stretches are fairly well developed, in France (speed limit: 130 kph), the figure is 2.66 and in Switzerland (speed limit: 120 kph) 1.13 (ETSC, 2007). The fact that it is not merely the permitted speed that plays a role goes without saying. Thus, there are also countries with higher death rates even though speeds are restricted.

The lower the speed, the less the likelihood of a collision. Proof of severe injuries at high speeds tells a much clearer story than any proof of the increased likelihood of an accident. This is also reflected in the results of the power model for speeds previously mentioned (Ewert, 2008).

Empirical or physical findings on the relationship between the speed and the effect of an accident have already been shown by Rumar in 1985 using a psychological model. In connection with the driving task (Fig. 2), he shows that speed versus risk is the main safety factor. If speed is adapted to the current situation, the driving task also changes. A sensibly chosen speed should accordingly be the independent variable (initial situation) in order to solve the dependent variable (consequence) “driving task” adequately.

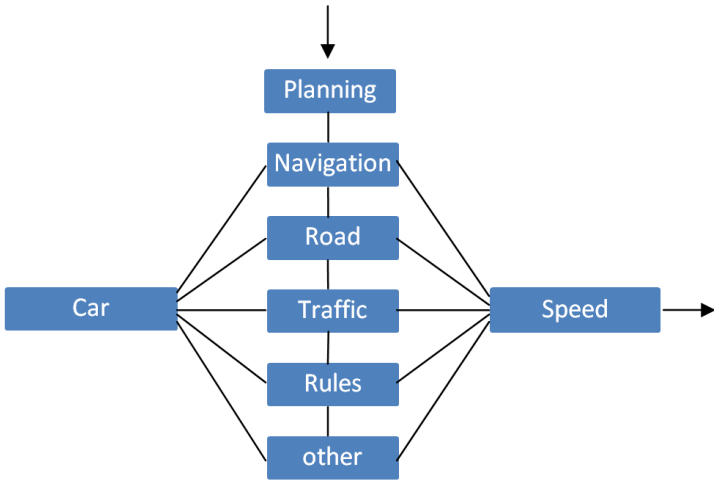

Fig. 2:
Driver’s task (according to Rumar, 1985)

This consideration contradicts the lies that occasionally border on the absurd when dodging the speed issue and which maintain that a speed of zero is the only safe solution. The argumentation goes along the lines that driving suitability, capacity and competence are the independent variables and high speeds can be chosen accordingly. Anyone who is suitable, capable and competent can drive at higher speeds. This standpoint corresponds to that of motorsports, but not to that where responsibility for the design of safe mobility is paramount. In the first instance - such as e.g. in Formula 1 racing - Vmax is sought as a starting point, whereas - in road traffic - the talk is of adjusting the speed to suit conditions. With accidents in motorsports, hardly any drivers are ever accused of driving too fast, instead the talk is of driving errors and material faults. In road traffic, the speed is not an end in itself but should be the appropriate measure for implementing safe mobility. That is why speed = zero is therefore absurd.

The resultant question of an appropriate speed can be answered by criteria that permit the requisite amount of mobility and guarantee the desired level of safety. The answer is not to be found at individual level but on the basis of average and maximum speeds. It is obvious that this will engender conflicts between individual and collective requirements. The individual experience leads inevitably to wrong conclusions - higher safety is only given if the amount of the total individual experiences is evaluated.

The acceptance of the solutions has to be considered as well. In the end, the outline parameters will not make the task any easier either: the “road traffic” system must not only be safe but must be operational as quickly as possible while still remaining economical, ecological, convenient and reliable. To some extent, these demands interact in synergy.

Criteria for appropriate speed and mobility

If safety work is to be realistically implemented, in other words without resorting to the absurd, and if individual mobility is accepted, the question must be asked as to how the conflict between “fast” and “safe” is to be resolved. Tingvall (2004) states: “Road users should continue to remain mobile to a reasonable extent …”. What is needed is an ideal speed for individual means of transport. What is an appropriate - and what is an inappropriate - speed?

Various concepts can be used to answer this question dependent on discipline:

- In relation to road building, engineers talk of final and projection speeds, i.e. speeds for which roads or stretches of roads have been designed based on vehicle dynamics and physical aspects. For example, this influences the radius of curves, lane width, road shoulders, etc. Final or projection speeds are determined for ideal conditions, i.e. dry roads, in the daytime, good lighting conditions, etc. Drivers themselves are responsible for the speeds they choose under non-ideal conditions. The types of roads are categorized, in particular, by the functions they are intended to fulfil.
- Alongside this, there are the speeds driven that have been recorded in the field, whereby the V85 measurement, i.e. the speed not exceeded by 85 percent of drivers, serves as a basis. The speed limit posted is frequently geared towards the V85 (whereby V85 is once again dependent on the posted speed limit!).
- And lastly, the permitted speeds are determined; on the one hand, the general speed limits as stipulated by the legislators and, on the other hand, local speed restrictions in deviation from these to some extent, which are usually based on anomalies in the local traffic situation and are dependant on a variety of factors:
  - Traffic volume or density

- Traffic flow
- Road characteristics (construction standard, road conditions, straight stretch vs. bend, etc.)
- Manoeuvres required, e.g. sliproads, crossroads, etc.

However, the trend is towards a more flexible approach to the speed limit to meet the relevant conditions and this can either increase the degree of freedom for drivers or increase their safety in the corresponding situation.

Basically speaking, the speed limits permitted are only one criterion for drivers when choosing their driving speeds. Usually, changes in speed limit lead to fewer changes in speed. Figures vary according to the intensity of check-ups. Lowering the maximum speed limit in Switzerland in the 1980s led to a reduction in average speeds of around 50 percent of the limit change, i.e. of around 5 kph on motorways and 10 kph on roads outside built-up areas (Dietrich et al., 1988). In Denmark, the speed limit on motorways has been raised by 10 kph (Solund, 2007). In an initial phase, neither the average speed nor the number of fatalities changed significantly thanks to a strong police presence. The situation was the reverse in the United States: the number of accidents increased substantially in the states of Montana and Nevada when the 55 mph speed limit was lifted.

Ideally, final and projection speeds should be as close as possible to the posted maximum speeds and the speeds actually driven. In this way, drivers' assessments of possible speeds would harmonize well with the roads' final standards and with what is legally permissible. However, the maximum permitted, designed and driven speeds should be safe enough to prevent any severe or fatal injuries if accidents were to occur. It should not be forgotten that roads represent a network. If the speed limit is reduced (too) heavily on a specific stretch of road, this results in what is known as a spillover effect. Drivers switch over to another type of road (e.g. from a motorway to rural roads), that is possibly less safe overall despite lower speeds encountered there.

Therefore, the optimum must be aimed for dependent on location. The most striking example of this is wherever weak road users coexist in mixed traffic with motorized vehicles. Here, vulnerability plays an even greater role than on motorways. A speed limit of 30 kph as a dimension thus becomes comprehensible. The likelihood of a pedestrian suffering a fatal accident when colliding with a car driven at 30 kph is 1:10; conversely, the figure is 1:10 that the pedestrian does not become a fatality in a collision at 60 kph.

Assuming that an accident must not lead to severe head injuries, bodily resistance is ultimately the criterion for selecting a speed, particularly since an accident can always happen within well designed outline parameters. There is accordingly the following interdependence between safety and speed: the "bio tolerance" determines the initial situation as an independent variable.

Intervening variables are the road and the vehicle. The dependent variable “speed” can be determined (Vägverket, 2008) based on design (crumple zone, forgiving road, etc.) and taking the physical fragility of vehicle occupants or pedestrians into consideration. Or conversely: at a given speed, the safety components of vehicle and road must be designed in such a way that energy is absorbed to such an extent when a human error occurs (accident) that no severe or fatal injuries are caused.

The Netherlands is a prime example in this connection. Their speed management takes the possibilities and limits of mixed traffic more into account than other countries (Koornstra et al., 2002). Their rate of pedestrian accidents is correspondingly low (4.6 fatalities/million inhabitants; Switzerland: 9 [TCS, 2008]).

Speed as a cause of accident

One third of all accidents in Europe are attributable to driving fast or too fast (EC, 2003; quoted according to Rössger, 2008). Most of the known data on the causes of accidents originates from police reports. Correlations exist between various relevant variables and the details on speed as the cause of the accident (Swiss figures; Ewert, 2008), in particular:

- Location (q.v. Table 1):
  The higher the speed limit, the more frequently the police cite speed as the cause of the accident, particularly for accidents on downhill gradients (30 %) and uphill gradients (25 %).

Speed limit	Percentage with speed as the cause of accident
30 kph	5.9
50 kph	9.9
60 kph	20.0
80 kph	33.9
100 kph	31.7
120 kph	37.0

Table 1:
Proportion of speed as the cause of an accident, in percent, dependent on the speed limit in force at the accident location, Ø 1992–2006 Switzerland (Ewert, 2008)

- Weather conditions and road conditions:
  The worse the weather conditions, the more frequently speed is cited as a cause of accident (64 % in snow, 24 % in rain, 15 % no precipitation).

- Time of day:
  A higher proportion is stated at night and at dusk/dawn.
- Type of vehicle:
  Motorcycles over 125 ccm are mentioned most frequently (21 %), light motorcycles up to 125 ccm and cars each with 13 %, people carriers in 11 % of cases.
- Drivers:
  As the cause of an accident, speed is cited less often as the age of the driver increases.
  - 26 percent among 18- to 20-year-olds
  - 20 percent among 21- to 25-year-olds
  - 15 percent among 26- to 30-year-olds
  - Less than 10 percent among drivers aged 35 and older
  - 5 to 6 percent among drivers aged 60 and older

  Failure to adapt to road conditions was less prevalent among young and older drivers than among middle-aged drivers (approx. aged between 26 and 60). Exceeding the speed limit is a particular problem among young drivers and diminishes even further with increasing age.
  The police cite speed as a cause of accident more among men than among women (14 % vs. 9 %). In terms of percentage, men exceed speed limits more frequently (+8 percentage points) and fail to follow the road more frequently (+5 percentage points). In contrast, women fail to adapt to road conditions more frequently (+13 percentage points).

Why do people drive so fast?

As Anatole France once said: “It is human nature to think wisely and act foolishly”. In relation to the choice of speed in road traffic, this means that, although people realize that a high speed is dangerous, their behaviour does not match up. Admittedly, there is also the other case: when the maximum speed on motorways and rural roads in Switzerland was reduced from 130 to 120 kph and 100 to 80 kph respectively, people’s opinions also changed. Before this was introduced, many people were against it, after being forced to change their behaviour, people’s attitudes were significantly more positive than before.

Steve Stradling will be taking a closer look at the psychological background to fast driving. At this point, here are a few basic considerations:

It is a fact that people are fascinated by speed. You only have to look at children who consciously try to go faster. Adults, too - whether they are constructing railways or aeroplanes - attempt to transport people faster while passengers for their part react positively to this, at least at an emotional level. It has been repeatedly shown in a large number of surveys that driving fast is

considered to be a pleasant experience (e.g. Silcock et al., 2000).

What are the main determinants for fast driving in road traffic? The classification can be developed from various angles (according to Ruwenstroth et al., 1989):

Type of driver:

- Normal drivers who generally keep to the rules
- Fast drivers who generally tend to drive faster than is permitted
- "Speeders/speed merchants", who drive at highly dangerous speeds, at least sporadically

Gender:

- Women who drive more uniformly than men

Age:

- Young drivers who drive faster than other road users
- Middle-aged people
- Older drivers, who drive noticeably more slowly than the younger groups

Driving activity:

- Non-local drivers, who are not familiar with their surroundings and drive more slowly than local people
- Commuters who drive fast, particularly on the evening drive home
- Professional drivers who drive faster than average

Vehicle:

- Cars, whereby a vehicle's size and power correlates with the speed driven
- Motorcycles, which are used in many cases for fast trips on rural roads

Generally speaking, the speed chosen is based on its affiliation to one of the previously mentioned groups as well as a combination of these. It can generally be stated that people are fairly incapable of correctly assessing risks. In particular, this applies to artificial systems as well as to situations in which people actively intervene. However, in the current situation relating to choosing a speed, behaviour also differentiates both quantitatively and qualitatively according to the criterion of "consciously/subconsciously".

I: Consciously, intentionally exceeding the speed limits and/or unsuitable speed behaviour:

a) Habitual trait (always being that bit faster becomes a habit)
   - Habitual speeders (Herberg, 1983)
   - Machos among their peers
   - "Speed merchants"
b) Failure to assess hazards correctly
   - Distrust/lack of acceptance of road signs
   - Lack of experience in assessing situations

- Overestimation of the vehicle (“my car has better brakes”)

c) Overestimation of one’s own abilities

d) Rationalized choice of speed
   - Stress – being short of time leads to higher speed
   - Feeling forced to “speed up” because of the vehicle close behind
   - Qualifying limitations (e.g. you can drive faster at night and on Sundays)

e) Fun - the thrill of driving fast

f) Adapting to others driving over the speed limit

II: Subconsciously, unintentionally exceeding the speed limits and/or inappropriate speed behaviour:

a) Person-related (age, passengers)

b) Related to surroundings (e.g. in built-up areas, on wide roads, traffic situation, time of day, overlooking traffic signals)

c) Vehicle-related (vehicles with powerful engines; motorcycles)

Generally speaking, exceeding the speed limit is a mass crime. In Switzerland, speed limits in built-up area are exceeded by an average of 20 percent of car drivers. The figure is even higher if the 30 kph zones are also included (Austria: 73 % in 30 kph zones, 56 % in 50 kph zones; KfV, 2008). Outside built-up areas, around 25 % exceed the speed limit and 40 percent on motorways (surveys conducted by the Institute for Transport Planning and Systems at the Swiss Federal Institute of Technology ETH Zurich, measurements without any tolerance deductions, unrestricted manner of driving). 38 percent of Swiss people assume that they will rarely or never be caught in a speed trap (Siegrist et al., 2001). According to the EU’s SARTRE III survey (conducted in 2004), an average of 18 percent of the respondents interviewed internationally in 23 countries stated that they had been fined for speeding during the past 3 years. In France (lower extreme), the figure was 8 percent, in the Netherlands 46 percent (uppermost figure). In Switzerland, the figure was 36 percent (Buttler et al., 2004). Expectations of being checked are very low on the whole!

Many car drivers do not consider speed to be a key risk factor. Many believe that their mental and driving skills permit them to exceed the speed limit without increasing the risk of their having an accident. Everyday experience cannot conceal the fact that speeding is a decisive cause of accidents and advertising by the automotive industry leaves no doubt that sporty driving leads to social recognition.

Why do some drivers keep within the rules better than others? An English research group has determined that speeders frequently exhibit the following characteristics: they express positive

attitudes towards sporty and risky types of driving; they are convinced that circumstances force people to drive fast and they are of the opinion that exceeding the speed limit is generally acceptable. The fact that our behaviour is influenced by concepts of what is normal is shown by a Canadian experiment: a roadside poster tells passing motorists the proportion of drivers who are not driving too fast. After the stated percentage was raised, drivers increasingly kept within the speed limit (Van Houten et al., 1983).

Motorcyclists make up a special group of road users. Their main motive is not mobility but the driving experience. Driving is often an end in itself and is experienced largely by movement in the form of acceleration and lateral acceleration. Bends play a central role in order to savour driving to the full. Speed cannot be disregarded in this connection.

The extreme group of notorious speed merchants also shows exceptionally little desire to accept standards and their driving style is marked by their self-image as a sporty, superior type. Speeding, road races or dangerous overtaking cannot be explained among this group solely by the thrill or the buzz they get from risk-taking or by short-term situations on the road or in their lives. Their identity and self-confidence are closely linked with dangerous driving. In this situation, rational risk considerations play a subordinate role and their behaviour takes on its own dynamism. While normal drivers who speed underestimate the risk, some of the notorious speed merchants do not even take this into consideration, while others see the appeal in experiencing going beyond the limits. However, in each of these cases, their behaviour is based on emotion.

Speed Management – Speed Reduction

In view of the connections between speed and hazards, recommendations can be made at various levels. (For Speed Management - Infrastructure part, please refer to the talk by Klaus Machata; cf. also the excellent manual published by the WHO et al., 2008, as well as the report by the OECD/ECMT, 2006)

I: Speed limitations

a) Average speed is the most important risk factor in terms of fatal consequences in road traffic. Reducing it by 1 percent has a corresponding effect: According to the estimation for Switzerland up to 3 percent fewer people with severe injuries and 5 percent fewer fatalities (cf. ETSC, 2008).
b) In built-up areas, the speed limit should be set at no more than 50 kph on traffic-oriented streets. In residential neighbourhoods, a 30 kph speed limit can be recommended with large stretches of 30 kph and design elements (bfu model).

c) Roads with a high level of safety, particularly motorways, should be optimised where speed limitation is concerned so that they remain safe and yet attractive to prevent traffic from switching to roads that are less safe. Differentiated speed limits adapted to the relevant situation have proved valuable.
d) In view of the constant increase in cross-border traffic in Europe, a harmonization of speed limits should be attempted without any loss of safety on the various types of roads (ETSC, 2007).
e) Speed limits should be "credible", i.e. on the one hand they should correspond to the risk situation and, on the other hand, correspond to the visual impression (Goldenbeld et al., 2007) or at least be explained with supplementary information.

II: Infrastructure

a) Roads should indirectly determine the appropriate speed based on their design and layout. In many cases, this will require the structural redevelopment of accident blackspots as well as, if necessary, the removal of fixed roadside obstructions to at least reduce the consequences of accidents.
b) When planning roads, particularly in rural areas and in bends (Petermann et al., 2008), particular attention should be paid to the visual impression (of hazards). If the two elements correspond, risk can be reduced.
c) Signals and road signs should be clear and unmistakeable. The task of driving is made more difficult with excessive changes of speed limits and a lack of uniformity at regional and (inter)national level.

III: Traffic monitoring

a) A guarantee of penalties as well as checks of various types will support compliance with speed limits. The tendency to make victims (fined) of wrongdoers (speeders) must be counteracted. Experience with radar systems at dangerous locations has been good. "Experience has shown that compliance with speed regulations and the resultant reduction in average speeds by 5 kph ..." would reduce the number of fatalities by 60 (out of a total of more than 400) in Switzerland alone (Siegrist, 2008). Every year in Switzerland, 188 million vehicles are checked for speed with permanently installed radar and 14 million with mobile equipment (BFS, 2008); this results in an average of 37 checks per year and vehicle. Despite stepping up monitoring in recent years, the subjective aspect of control perception has not changed (Fink et al., 2006).
b) If checks are combined with campaigns, with the campaign content serving to explain the controls, the effect of the latter is decisively increased.
c) Frequent checks not only increase the willingness to adapt of those drivers who drive intentionally fast, but also back up those drivers who behave correctly. (Counteracts the

attitude of: “Why should I bother to drive correctly when those who violate the rules fall through the net?”).

IV: Penalties and administrative measures

a) Licence suspension and penalties should be - as it is realized in several countries - more severe for repeat offenders. The distinction between intentionally driving (too) fast and occasional lack of attention (e.g. missing a signal) should be taken into account. The driver’s decision differs here from driving under the influence of alcohol.
b) Vehicle confiscation as a measure against notorious speed merchants is justified from the bfu’s standpoint. It reduces driving despite having a suspended licence and could have a limited generally preventive effect.

V: Vehicle and traffic telematics

Vehicles should be equipped with electronic aids for the selection of appropriate speeds and speed reduction (ISA) as well as with ESP and other devices to correct any excess speed and to prevent accidents.

VI: Education, training and influencing

a) Pedagogical measures are meaningful and necessary as a basis or to supplement those already mentioned, especially traffic education which supports the development of basic values and operation schemes. However, the limitations of these tools must be acknowledged. Acceptance of speed restrictions cannot be unreservedly achieved through education, training, information, campaigns or marketing. A combination of all measures is what is needed. In addition, it has been demonstrated that drivers’ willingness to keep within speed limits could be increased precisely by introducing them.
b) Campaigns conducted in isolations have a limited effect. Their added value is mainly the result of being combined with other measures, namely police checks. It must not be forgotten that information campaigns are frequently too simple in their design and thus have little effect for that very reason. They are usually based on the concept of influencing people’s attitude. The assumption that
   - Campaigns influence attitudes and that
   - Attitudes change behaviour

   should, however, be put into perspective. The correlations between attitudes and behaviour are still very low even after careful methodological analysis (q.v. for example, Huguenin, 2005). Moreover, success also depends on the appeal being made. Goldenbeld et al. (2007) demonstrated that appealing to people’s fear in connection with speed limitation as is often demanded was not only ineffective but actually contraproductive among men who, as is well

known, drive fast more frequently than women.

c) In order to change attitudes on a lasting basis, at least four rational or emotional anchor points are required. It is not enough to merely propagate the safety argument. Energy problems, environmental pollution, cost increases, likelihood of penalties, loss of convenience and stress are further approaches that can be linked with speed reduction to convince drivers and (perhaps) get them to act differently via this approach.

d) Alongside general preventive measures, special preventions are also needed. Well designed retraining courses to rehabilitate traffic offenders should also have a positive influence on speeders' attitudes.

Prospects

Excessive speed on the roads is a problem that cannot be totally eliminated. However, a large percentage of fatalities and severe injuries incurred on the roads can be reduced if everyone simply kept within the applicable limits. This must be noted against a background in which drivers generally drive above the permissible speed limit. Van Schagen (2007) talks of half of all drivers.

However, a more central problem than keeping within speed limits is that of adapting to the prevailing conditions (Ewert, 2008). Condition-oriented and behaviour-oriented prevention measures should be planned to tackle this:

Condition-oriented prevention measures:

- Determine the appropriate speed for a specific stretch of road
- Ensure that drivers are aware of the maximum speed permitted on this stretch of road
- Implement technical measures to make dangerous stretches or locations safer
- Segregate traffic wherever high vehicle speeds prevail
- Install ISA and ACC in motor vehicles

Behaviour-oriented prevention measures:

- Provide for traffic monitoring
- Intensify traffic education in order to improve the acceptance of safety measures
- Treat in-depth the problems of speed during driving lessons
- Provide information/conduct campaigns to raise awareness for the significance of the other measures
- React to high-risk groups with follow-up training courses or special penalties

These, as well as further measures, correspond to the keyword of "best practice" that can and should be applied nowadays. Priority in terms of our need to act must be given to ensuring that existing and tried-and-tested measures are enforced. However, in order to increase safety even

further, what is needed is “next practice”. The population is aging – both as pedestrians and as drivers. It is questionable whether people will drive more slowly and/or more safely in future than they do now. There is no doubt that both worldwide and in most countries more people will become individual road users. Safety must therefore be maintained and expanded in the sense of sustainable safety as in the Dutch vision (Wegman et al., 2006) (Table 2). Developing from this, a strategy must be devised that also includes the subject of speed. In Switzerland, Vision Zero served as a guideline, Via sicura (2005) was the strategic base aimed at making a contribution to improving both conditions and conduct.

Functionality of the road (hierarchically organized network)
Homogeneity of mass, speed and/or direction (particularly at medium und higher speeds)
Predictability of road course and road user behaviour based on road design
“Forgivingness” of the environment and road users (to limit injuries in the case of errors)
State of awareness by road user

Table 2:
Principles of sustainable safety [Source: SWOV, 2006]

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