

Motorcyclists

Summary

Riding a motorcycle brings a relatively high risk of death or serious injury due to a crash. The vast majority of the casualties are men. The lack of any protection by the vehicle means that a motorcycle crash often has serious consequences for the rider and his passenger. Motorcycle crashes are mainly caused by priority errors at junctions (often because a car driver has failed to notice the motorcycle) and by the motorcyclist losing control of the vehicle. Motorcyclist safety can be improved in various ways. These include making riders and passengers more visible and noticeable, extra training for motorcyclists and car drivers (focusing on their interaction), providing roads with adequate roughness and obstacle-free zones, and encouraging the wearing of protective clothing.

Background and content

A motorcycle is a motorised, two-wheeled vehicle. In the Netherlands, one must be 18 or over and in possession of a class 'A' driving licence to ride one. In comparison with drivers of motorised four-wheeled vehicles, a motorcyclist runs a high risk of death or serious injury due to a crash. In this fact sheet, we will discuss the scale of the problem, the causes, and the measures that can be taken.

How many people own and use motorcycles?

Compared to other European countries, the Netherlands ranks about average in terms of motorcycle ownership with 33 motorcycles per 1,000 inhabitants in 2005. Among European countries, Greece has the highest motorcycle ownership with 101 motorcycles per 1,000 inhabitants; Slovenia has the lowest, with 7 motorcycles per 1,000 inhabitants (ERSO, 2008).

In the Netherlands, the number of motorcycles has greatly increased over recent decades, from 100,000 in 1980 to over 500,000 in 2007. The new owners were mainly men in the 35-54 age group (source: CBS). By contrast, the distance travelled per motorcycle has declined in recent years. In 2008, 1 billion of the kilometres travelled were travelled by motorcycle. In 1993, the top year, the figure was 1.8 billion kilometres. Considering that car use just continued to increase in this period, the proportion of kilometres travelled by motorcycle has declined from 1,7% in 1993 to 0.6% in 2008.

Nearly half a million Dutch people have a motorcycle licence, but only half of them are active motorcyclists (AVV, 2003). According to AVV, active motorcyclists are mainly men in the 25–54 age group and they ride an average of 3,700 km per year. Because a motorcyclist travels relatively few kilometres per year, he hardly builds up routine.

What are the legal requirements for riding a motorcycle?

To ride a motorcycle, one must have a class 'A' driving licence. To gain this, one must pass the theory exam and two practical exams (vehicle control and participation in traffic). In the Netherlands, a motorcycle driving licence can be obtained from the age of 18. Until the age of 21, the exam must be taken on a 'light' motorcycle, i.e. the motorcycle must have a power output of less than 35 kW but a cylinder capacity of more than 120 cc. This leads to getting a class 'A restricted' driving licence, which permits the holder to ride a motorcycle with a power output of up to 25 kW. After two years, one can switch to a heavier motorcycle without taking further exams. From the age of 21, the exam can be taken on either type of motorcycle and the 'normal' class A licence is granted automatically on passing the exam. New European rules on the motorcycle driving licence will come into force from 2013. A light motorcycle category of up to 125 cc (the A1 category) will be added. The European minimum age for this category is 16 years. The European member states can decide for themselves whether to set the minimum age at 16, 17 or 18 – see also SWOV fact sheet [Category A1 \(up to 125 cc\) of the new motorcycle licence](#).

Motorcycles are subject to the same traffic rules as motorised four-wheeled vehicles. In traffic queues, motorcyclists are allowed to slowly filter past the queue. There is a code of conduct (not a legal obligation) which among other things states that this is only permitted if the cars are driving at less

than 40 km/h. The motorcyclist may then ride no more than 10 km/h faster than the cars he is passing. On roads with more than two lanes, the motorcyclist should opt for a position in one of the two leftmost lanes.

Since 1972, it has been mandatory for motorcyclists and their passengers to wear a (CE) approved helmet. Virtually 100% of motorcyclists in the Netherlands wear helmets. It has not been established whether these are always approved helmets (see SWOV fact sheet [Motorcycle and moped helmets](#)). Wearing protective clothing and eye protection is not mandatory, but is strongly recommended for safety reasons.

How do things stand with regard to motorcyclists' safety?

The number of fatal casualties among motorcyclists in the Netherlands fluctuates greatly from year to year (see Figure 1). Over the past 10 years, there has been an average of 80 deaths per year. This amounts to about 10% of all road deaths, a very high proportion in relation to the small share of road traffic accounted for by motorcyclists (1% of the total number of kilometres travelled). Each year there also are more than 1.100 serious road injuries among motorcyclists.

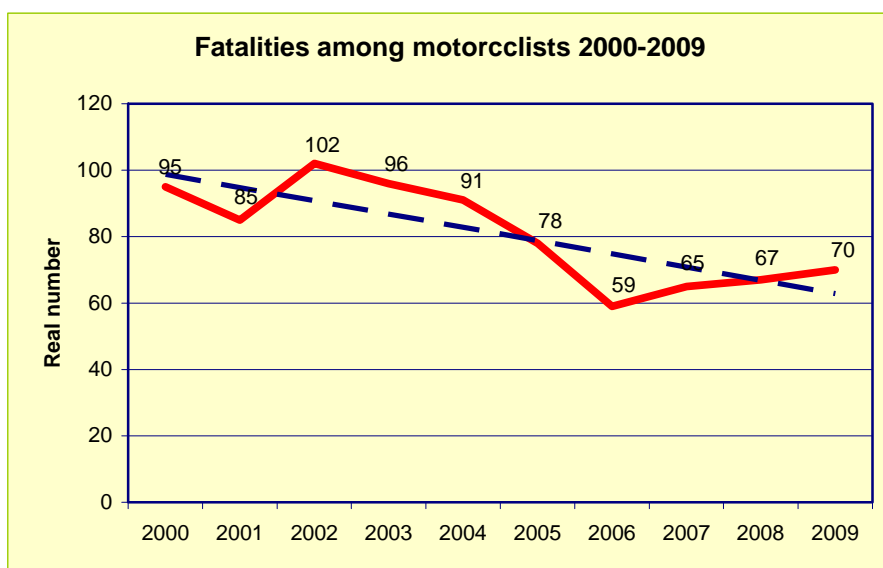


Figure 1. Number of fatalities among motorcyclists in the period 2000-2009 (Source: CBS/Dutch Ministry of Infrastructure and the Environment).

The vast majority of motorcycle casualties are men. The age of motorcyclists involved in crashes has changed considerably over the years. Around 1980, most of the casualties were young (18-30). By around 1990, the age had already shifted upward, a trend that has continued in subsequent years. We can see a similar trend (which is connected, of course, with a shift in motorcycle use from younger to older people) in most other European countries (SafetyNet, 2009). Virtually all the male casualties are the actual motorcycle riders. Of the female casualties, over one third are passengers.

Because of a lack of protection by the vehicle, the consequences of a motorcycle crash are relatively serious for drivers and their passengers. In crashes involving a motorcyclist, it is usually the motorcyclist who is injured or killed. This was the case in 91% of the serious crashes involving a motorcyclist in the period 2000-2007. Only in 11% of these motorcycle crashes were any casualties sustained by the other party to the crash.

The casualty rate, i.e. the number of fatalities and serious road injuries per kilometre travelled, is relatively high for motorcyclists (source: DVS-BRON; CBS-MON). In the period 2004-2008, the number of fatalities per kilometre travelled was around 20 times higher for motorcyclists than for car occupants. The relative risk of serious injury was even higher. In comparison with the situation at the end of the 1990s, the casualty rate for motorcyclists has declined somewhat, but it is still considerably higher than that for car occupants (SWOV, 2007).

What are the characteristics of motorcycle crashes?

The main type of conflict in which a motorcyclist becomes a casualty is a collision between motorcycle and car or light goods vehicle (around 50% of the crashes). Furthermore, almost 40% of motorcycle casualties is due to single vehicle crashes (i.e. not involving another party). In single vehicle crashes, over 81% of casualties are incurred in crashes on road sections, rather than on junctions. In comparison to car occupants, more casualties among motorcyclists are incurred in urban areas rather than on trunk roads and motorways. These figures are based on the averages over the period 2000-2007 (source: Dutch Ministry of Infrastructure and the Environment, BRON data file).

These crash characteristics are not unique to the Netherlands. According to the European Road Safety Observatory website (SafetyNet, 2009), the three most common crash scenarios for motorised two-wheeled vehicles (motorcycles and mopeds) are the following:

- Scenario 1: The motorcyclist/moped rider has a single vehicle crash while riding along a road section and losing control at a bend.
- Scenario 2: The motorcyclist/moped rider approaches a junction and is hit by a car driver who fails to see the two-wheeler in time.
- Scenario 3: A car driver turns left and fails to see the motorcyclist/moped rider coming in the opposite direction.

What causes the lack of safety for motorcyclists?

As was mentioned earlier, an important cause of crashes involving motorcyclists is failure to give priority (scenarios 2 and 3). In the period 2000-2007, the police report this as the cause for almost a quarter of motorcyclist casualties in the Netherlands. According to a large-scale European study (MAIDS, 2004) the main reason being that the two-wheeler is not seen. In that study, over 900 crashes in five countries (France, Germany, Italy, Spain and the Netherlands) involving a motorised two-wheeled vehicle (motorcycle/moped) were analysed in depth. In over 36% of the cases the occupant of the other vehicle did not see the two-wheeler; in 12% of the cases, the rider of the two-wheeler failed to see the other vehicle. On the one hand, these visibility problems are caused by the (small, narrow) appearance of the motorcycle. On the other hand, it is often reported that car drivers do not expect the behaviour or presence of a motorized two-wheeler, so that there is less attention for these vehicles. In addition, some motorcyclists enhance the problems by driving at excessive speed (SafetyNet, 2009).

Another important cause of motorcycle crashes is loss of control of the vehicle. In the period 2000-2007, this was reported as the cause in 18% of motorcycle crashes. Loss of control is mainly caused by road surface characteristics (slippery because of rain, oil patches, road markings, etc.), excessive speed, or a combination of both. In some cases, the motorcyclist loses control of the vehicle when trying to avoid another road user.

Finally, lack of motorcyclist safety also depends on (a combination of) various factors (Morsink, 2007; Sexton et al., 2004):

- The nature of the motorcycle: the motorcycle is a vehicle that requires balance and has low stability, especially when braking hard, but also when the road surface is suboptimal;
- Larger vulnerability of the driver; this not so much influences the occurrence of crashes, it rather affects the severity of the outcome;
- Lack of routines and automatic behaviour (riding experience) on the part of the rider, due to selective use of the motorcycle;
- A tendency to use a motorcycle like a sports vehicle, which can result in high speeds and rapid acceleration and deceleration;
- High acceptance and faulty perception of risks by the rider;

How can the safety of motorcyclists be improved?

Improved visibility and conspicuousness

Road safety of motorcyclists is expected to improve with increasing visibility and conspicuousness. However, the effect of increasing visibility on road safety has not (yet) been investigated. Improved visibility and conspicuousness can be promoted by means of advice and education for car drivers to make them more aware of the presence of motorcyclists. Also, technological developments (ITS) can contribute to an increased visibility of the motorcycle, for example by informing drivers, by means of a

signal in the car, of the presence of a motorcycle on a junction. Also, the motorcyclists themselves can contribute to their own better visibility and conspicuousness. In addition to using daytime running lights, the motorcyclist can contribute to this by adopting a road position that ensures he *can* be seen. The motorcyclist can also make sure he stands out by wearing conspicuous clothing and a light-coloured helmet, and by applying light colours and retroreflective material to the front of the motorcycle (especially if it has a fairing).

Safer riding behaviour

The motorcyclist must be aware that he frequently cannot be seen by other road users. This calls for anticipatory riding, such as:

- moderating speed, especially at locations with intersecting traffic;
- anticipating dangerous situations and dangerous behaviour by others;
- learning emergency manoeuvres; the number of special actions has been expanded as of 1 April 2004 in the new exam requirements for motorcyclists.

Better training for both motorcyclists and car drivers is often mentioned as the measure most likely to improve safety. However, the real effectiveness of a training for motorcyclists and/or drivers can only be determined after a thorough evaluation study.

Vehicle measures

Advanced braking systems, such as the Anti-lock Braking System (ABS), Combined (or Integrated) Brake System (CBS) and Dual CBS (dCBS) System, make braking simpler and more efficient. An American study (Teoh, 2010) found that motorcycles equipped with ABS were involved in fatal crashes 37% less often than motorcycles without ABS. Long-term measures could include improving the secondary safety of the motorcycle and its rider, and that of the other party. In this respect, airbags and leg protection are the main research topics.

Infrastructure measures

The sensitivity of motorcycles to slippery or poorly maintained roads makes it important for road managers to (Morsink, 2007):

- ensure that the road surface (material) provides adequate grip, especially at road works and at critical locations such as bends;
- take account of motorcycle characteristics when planning markings, speed inhibitors and such;
- provide obstacle-free zones at the roadside and non-aggressive road furnishings, such as motorcycle-friendly guide rails.

Protective clothing

No objective data is available on the use of protective clothing by motorcyclists. However, one has the impression that there is room for improvement. Wearing protective clothing can reduce the risk of injury (especially minor injury) by 33-50% (Elvik et al., 2009). It would seem a good idea to provide targeted advice and information to make more motorcyclists aware of the need for protective clothing.

What are the developments in policy?

Fall 2010, the Dutch minister of Infrastructure and the Environment offered Dutch parliament an action plan which presented a number of measures to improve motorcyclist road safety (IenM, 2010). These measures focus on improving the visibility and conspicuousness of the motorcyclist, stimulating safer driving behaviour (among other things through a voluntary advanced riding training for higher-order skills), optimizing the infrastructure and informing drivers of the presence of motorcyclists on the road.

Conclusion

Motorcyclists are vulnerable on the road. The risk, per kilometre travelled, of dying in a road crash is around 20 times higher for motorcyclists than for passenger car occupants; the risk of sustaining serious injury is even higher. On the one hand, this relatively high risk is related with the characteristics of the vehicle. Being two-wheeled, the motorcycle is less stable than a car. It offers hardly any physical protection and, due to its smaller size, a motorcycle is less conspicuous to other road users. On the other hand, the high risk also has to do with the behaviour in traffic of the motorcyclists themselves; for example where speed versus vehicle control is concerned. In addition, many motorcyclists get relatively little practice and so do not gain sufficient experience.

In order to improve motorcyclist safety, several factors can be considered; improved visibility and conspicuousness of the motorcycle, extra training for motorcyclists as well as car drivers focussed on dealing with each other's presence, ensuring that the road surface provides adequate grip, obstacle-free zones, and encouraging motorcyclists to wear protective clothing. In the future, ITS applications (for example informing drivers of the presence of a motorcycle on a junction) may make a positive contribution to the motorcyclists' road safety.

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