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SWOV Fact sheet

Seat belt reminders

Summary

Seat belts are an effective way of reducing the number of road deaths and severe road injuries in crashes. Seat belt reminders warn car drivers and passengers if the seat belt is not fastened. This can be done by a visual signal or an acoustic signal or by a combination of the two. Seat belt reminders are becoming more and more intelligent. Not only are they capable of ascertaining whether or not a seat is occupied, they now also take the driving speed and the distance travelled into account. The systems with a persistent and penetrating sound are most effective. On European level large safety gains could be achieved if all car occupants in all the Member States were to use a seat belt consistently. The EU has made it compulsory to install a seat belt reminder for the driver seat of passenger cars. Since 2002, Euro NCAP has awarded points for the driver seat being equipped with a seat belt reminder. Presently two points are given if all front seats have been fitted with a seat belt reminder and an extra point is given if this is also the case for all rear seats.

Background and content

Seat belts are the most effective and fundamental part of the safety equipment in every vehicle. Manufacturers continuously develop new and better seat belts that have a higher level of protection. A European Guideline¹ has made seat belt use mandatory. In most Member States the large majority of car occupants wear seat belts. The annual data of the Ministry of Transport indicates that in 2010 97% of front-seat occupants and 82% of the rear-seat passengers wear a seat belt (DVS, 2010; SWOV Fact sheet [Seat belts, air bags and child protection devices](#)). All the same, some people continue to drive without wearing their seat belt. This group is overrepresented in the statistics of serious or fatal injuries. Many of those who are not accustomed to wearing their seat belt would do so if a signal were to remind them. Research indicates that car occupants of vehicles that are equipped with a seat belt reminder (SBR) more often wear their seat belt than occupants of vehicles without such a signal. A seat belt reminder gives a warning signal if car occupants do not wear a seat belt when the car is in motion. A more or less penetrating signal reminds them that the seat belt must be worn. This fact sheet discusses the different types of seat belt reminders, how they work, what effect they have on seat belt use, how often they are present in cars, and whether or not they are accepted.

How do seat belt reminders generally work?

Initially only the driver seat was equipped with a seat belt reminder, then the passenger seat followed, and now there are vehicles that have seat belt reminders for all seats.

The reminder or warning system can consist of a visual signal (a blinking icon or text display) or an acoustic signal of varying pitch. A combination of both signal types is often used for the front seat belts, whereas only a visual signal is generally given for the rear seat belts. The warning signal switches off when the seat belt clip is fastened or the belt has been rolled off a specific length.

In the US, visual and acoustic warning systems are used that warn for more than 8 seconds. This type of system is called an Enhanced Seat Belt Reminder (ESBR; Farmer & Wells, 2009).

There are also systems that check whether a seat in the car is occupied and only give a warning signal if this is indeed the case. This requires an extra sensor for the passenger seats to determine whether there is a passenger in the seat. Furthermore, the more intelligent seat belt reminders only warn when it is relevant given the use of the vehicle, e.g. when a certain driving speed or distance is exceeded. This is done to avoid unnecessary hinder from the seat belt reminder when wearing a seat belt is less urgent, for example, when making a parking manoeuvre.

¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1991L0671:20030509:NL:PDF>

When was the seat belt reminder first introduced?

As early as 1973 a first attempt was made in the United States to stimulate the use of seat belts by making interlock systems in new cars compulsory. Such a system meant that the car could only be started if all those sitting in the front seats had their seat belt on. The public reacted extremely angrily at such a 'restrictive' system, and within a year it was no longer compulsory. In spite of this, a few car brands made a seat belt reminder a standard accessory, but only as a system that serves as a friendly reminder for the front-seat occupants to wear their seat belts.

It was not until the mid-1990s that stimulating seat belt use with seat belt reminders was addressed seriously. This was done in reaction to publications of the research department of the Swedish insurance company Folksam, and the founding of a Swedish working group that formulated requirements for a well-functioning seat belt reminder. In the late 1990s, Saab and Ford introduced systems that were based on these requirements. One of the characteristics was that the warning became increasingly penetrating the more seconds the seat belt hadn't been worn. Their system only worked, however, if the car went faster than 15 km/h. The car manufacturers were rather careful in the seat belt reminder version they sold because they did not want to hinder their customers' car use unnecessarily.

What are the recent developments?

Early in the year 2000, the EEVC (European Enhanced Vehicle-Safety Committee) gave an advice on the subject of seat belt reminders. In 2002, EuroNCAP followed up this advice and began to 'reward' cars that had a built-in seat belt reminder, provided it met certain requirements. The reward consists of being awarded extra points which could result in an extra star in the final score (see also SWOV Fact sheet [Euro NCAP, a safety instrument](#)). EuroNCAP primarily focused on the vehicle occupants who forget to put on the seat belt and not so much on those who refuse to wear a seat belt on principle. The latter would need an intrusive warning, but EuroNCAP did not want to have a negative effect on the purchase of cars with built in seat belt reminders (or the systems being switched off) which could be the result of making warnings too aggressive or by making it impossible to drive off (as was the case with the American interlock system).

In 2006, the European Commission, supported by the European Transport Safety Council (ETSC, 2006) included the seat belt reminder in its road safety programme. This way the European Commission hoped to realize part of its ambitious target for 2010; 50% fewer road deaths than in 2001. At present, legislation is being prepared that makes it compulsory for all for driver seats. In 2008, 77% of all new cars in Europe were found to be fitted with one or more seat belt reminders (ETSC, 2009). Now Europe has decided on a mandatory seat belt reminder for the driver seat of passenger cars. For new type approvals this has been mandatory since 3 August 2009. Since 3 February 2014 this has been mandatory for all new passenger cars, also for those that have an earlier type approval. ECE Regulation 16² lists the requirements for a seat belt reminder.

In summary: the seat belt reminder must at least give a visual warning signal if the driver does not wear a seat belt and the ignition is on (level 1) and give a visual and an acoustic warning signal of at least 30 seconds (level 2) if one or more of the following conditions is met:

- the distance driven is longer than the distance threshold (500 metres maximum);
- the speed exceeds the speed threshold (25 km maximum);
- the time the engine has been running exceeds the time limit (60 seconds maximum).

The EuroNCAP protocol for Safety Assist systems³ describes which features a seat belt reminder must have to qualify for extra points. According to this protocol the reminder does not need to warn when the car is used for parking manoeuvres at speeds lower than about 10 km/h. Furthermore, the protocol requires both a visual and an acoustic warning signal for the front-seat occupants to remind the occupants of wearing the seat belt. To prevent unnecessary signals, the system must also be capable of detecting whether or not the front seat(s) are occupied. Of course this feature is not necessary for the driver seat. The new Euro NCAP protocol awards two points if all front seats are equipped with a seat belt reminder. An extra point is given if this is also the case for all rear seats (www.EuroNCAP.com).

² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:233:0001:0094:NL:PDF>, art. 2.39 -2.45, chapter 8.4 and appendix 18.

³ <http://www.euroncap.com/files/Euro-NCAP-Assessment-Protocol---SA---v5-6---0-198765b7-b3ee-4dde-9401-9b10d585dcce.pdf>

What is the effect of the seat belt reminder?

An American observation study among Ford drivers (Williams et al., 2002) showed that seat belts were used significantly more in Fords with a seat belt reminder than in Fords without one; 76% and 71% respectively. A similar study among Honda drivers several years later (Ferguson et al., 2007) confirmed this situation: the observed use in Hondas with a seat belt reminder was larger than in those without one; 90% and 84% respectively.

Krafft et al. (2006) published the results of an observation study among Swedish drivers, irrespective of car brand. A total of more than 3,000 drivers in five different Swedish cities were observed. The study showed that seat belt use was 99% in cars with a rather intrusive version of the seat belt reminder (the system proposed by Euro NCAP that has an acoustic signal with increasing volume which continues for at least 90 seconds), 93% for a 'friendly middle' version (a system that uses a visual signal and a less penetrating acoustic signal) and 83% for cars without any seat belt reminder. Therefore, seat belt reminders with an intrusive (more aggressive) acoustic signal are more effective. This is confirmed by an American study (Freedman et al., 2009).

The European Commission supports the seat belt reminder because seat belt use in the Member States of the EU is by no means 100%. Although there are various EU countries, including the Netherlands, where seat belt use in front seats is already higher than 90%, the percentage sometimes is much lower in other countries. Seat belt use in rear seats is still rather low in most countries. In 2010, the Netherlands scored a reasonable 82% (DVS, 2010). Therefore, at the European level there is a lot to be gained if the non-wearers become seat belt users. ETSC (2007) calculated that if the seat belt wearing percentage would be 99% in all European countries, there would have been 2,400 fewer road deaths in 2005 on European roads. In the Netherlands, a seat belt wearing percentage of 100% would save 10 fatalities (based on 2008 casualty data and wearing percentages; for the calculation method see Schoon, 1994)

Are seat belt reminders cost-effective?

In the past fifty years, the effectiveness of wearing seat belts has been proved beyond the shadow of a doubt. Seat belt reminders being extremely effective and eventually preventing much physical injury has also become sufficiently clear. This raises the question of whether the benefits of the seat belt reminder offset the costs. Most studies come up with a (very) positive answer. Seat belt reminders require a relatively small investment and have great potential to reduce injury and the accompanying social costs.

An Australian study (Fildes et al., 2002) calculated that most seat belt reminders in each of three types (from simple to intelligent) are cost-effective; only the most elaborate system for all car seats was just below the limit with a cost-benefit ratio of 1:0.7. The researchers expressed the benefits in terms of reduced social costs due to reduced injury severity (*HARM reduction method*). They estimated the costs to be less than €50 for a simple seat belt reminder just for the driver seat to about €100 for an intelligent seat belt reminder for all seats.

ETSC (2003) carried out a cost-benefit analysis for EU legislation for a compulsory acoustic seat belt reminder for car front seats. They assumed that 50% of all drivers and front passengers killed had not been wearing a seat belt and that an acoustic seat belt reminder can increase the percentage of seat belt use by front-seat occupants to 97%. Twelve years after the introduction of the seat belt reminder, the costs are estimated to have increased to € 11 million, but the benefits to € 66 million. This gives a clearly positive cost-effectiveness ratio of 1:6.

What do car occupants themselves think of seat belt reminders?

In the US, car manufacturer Ford held a telephone survey to accompany the introduction of its own system (the *BeltMinder*) and particularly to measure how well the customer accepted it. The acceptance was good; from 75% by SUV and pick-up truck drivers to more than 90% by car drivers. Of drivers with a *BeltMinder*, 80% said that in the future they would buy a vehicle with a seat belt reminder (TRB, 2003).

The study of Ferguson et al. (2007) among Honda drivers also showed a positive attitude. Particularly 'part time' users said they now used a seat belt more often.

Especially focusing on young drivers, the Australian Monash University carried out a study into different types of warning systems. The young drivers were especially positive about the seat belt reminder and the Alcolock (see also SWOV Fact sheet [Alcolock](#)). Systems such as a fatigue warning system, ISA (Intelligent Speed Assistance), and LDW (Lane Departure Warning), on the other hand, were judged a lot less positively (Young et al., 2004).

In Europe no recent data is available about seat belt reminder acceptance.

How many seat belt reminders are there in the Netherlands?

Because of the pressure that Euro NCAP has put on car manufacturers and the position of the European Commission, the number of seat belt reminders in new cars has increased rapidly, also in the Netherlands (see *Figure 1*). Since the mid-1990s visual seat belt reminders (the 'warning light') saw an increase: nearly 70% of the cars sold in 2005 had one. From the late 1990s onwards, the number of acoustic seat belt reminders has also been increasing rapidly; about 50% of the cars sold in the Netherlands in 2005 had one installed. Because of this rapid increase and the new regulations, nearly all new cars in the Netherlands have a seat belt reminder.

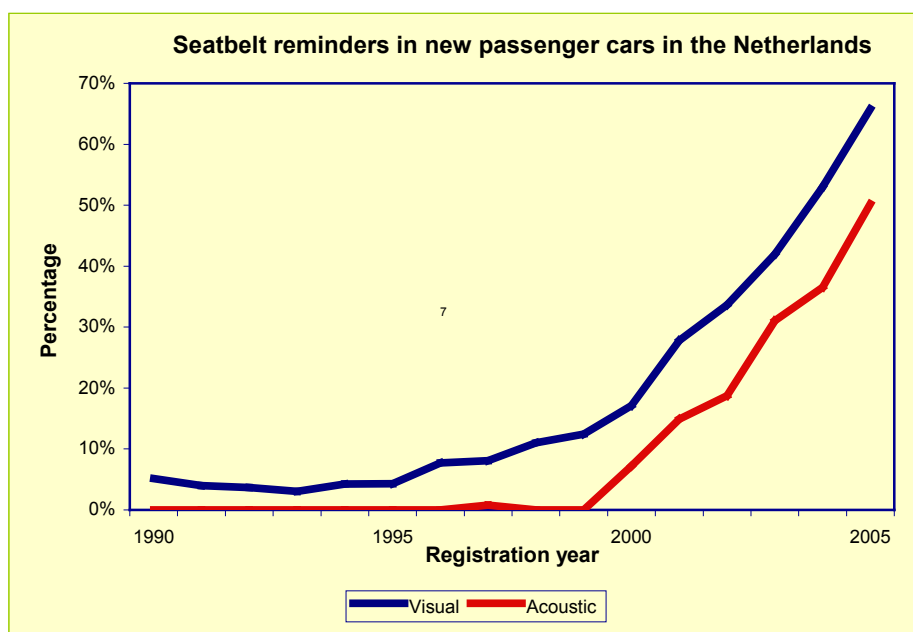


Figure 1.

Source: ECMD⁴.

Occupants of delivery vans and lorries wear the seat belt considerably less frequently than occupants of passenger cars. A seat belt reminder for these vehicle categories will increase seat belt use. No literature was found about the acceptance of seat belt reminders by drivers and passengers of these vehicle types, nor about their presence.

All new coaches (non-public transport buses) are now fitted with passenger seat belts. Legislation makes wearing the seat belts compulsory. Seat belt wearing percentages are not known, but general experience tells us that few coach passengers wear a seat belt.

Conclusion

A seat belt reminder reminds car occupants to use their seat belts. This increases wearing percentages, which results in fewer casualties and reduced injury severity in traffic crashes. Seat belt reminders are becoming increasingly intelligent. Not only can they establish whether a seat is occupied, these days they also take the driving speed and the distance covered into account. The systems with a continuing and persistent acoustic signal are the most effective.

Taking account of trend and legislation, nearly all new cars sold in 2013 were fitted with a seat belt reminder for the driver seat. Since 2002, EuroNCAP has awarded points for a seat belt reminder for

⁴ SWOV commissioned The European Centre for Mobility Documentation (ECMD) in Eindhoven to make an inventory of new cars sold, including the presence of seat belt reminders. Website: ECMD.nl

the driver seat. At present two points are given only if all front seats are fitted with a seat belt reminder and a third point if this is also the case for the rear seats. It is to be expected that in the longer term seat belt reminders will be fitted for all front seats and most rear seats of passenger cars and that seat belt reminders will also be introduced for other categories of vehicles.

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