Mobility scooters, enclosed disability vehicles and microcars

SWOV Fact sheet, March 2021

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Summary

This fact sheet concerns mobility scooters, enclosed disability vehicles (such as the Dutch Canta) and microcars. It describes the characteristics of and regulations concerning the different vehicles, their usage and users, the road safety aspects and possible improvement measures.

Mobility scooters and enclosed disability vehicles

In the Netherlands, the 2019 number of road deaths among users of mobility scooters and enclosed disability vehicles amounted to 42. The increase in the number of these road deaths in 2010-2019 is probably related to the increased number of these vehicles. The vast majority of road deaths involve older road users (more than 90% is older than 70), and men are also overrepresented. Most crashes with mobility scooters and enclosed disability vehicles are single-vehicle crashes involving a fall or collision with an obstacle. Research into mobility scooter crashes provides several starting points for measures relating to the vehicles, infrastructure and training. Research into crashes with enclosed disability vehicles is, however, rather limited, which makes it hard to determine which road safety measures could be effective. For these vehicles, recognisability and crashworthiness are the main concerns.

Microcars

A microcar is a (mostly) four-wheeled moped and has an enclosed body. In 2020, 18,000 microcars were registered in the Netherlands. Although a microcar can be used by anyone with an AM4 driving licence, it is mainly used by older road users. Over 40% of microcar owners is aged 65 or over and almost 75% is aged 50 or over. There is no reliable information about the number of road deaths among occupants of microcars, nor about crash circumstances. The crashworthiness of microcars is poor, a.o. because of its maximum weight of 350 kilos and the sometimes significant speed differences with other traffic. Moreover, some microcar models are hard to distinguish from ‘ordinary’ small city cars, and are therefore also hard to recognise.

1 What are the characteristics of mobility scooters, enclosed disability vehicles, and microcars?

Mobility scooters

A mobility scooter is a disability vehicle that is mainly used by road users with reduced mobility. It is electrically powered and it has three, four or five wheels. Most mobility scooters are open, but some are covered. Like a mobility scooter, an electric wheelchair is legally a(n) (open) disability vehicle.

Enclosed disability vehicle

Enclosed disability vehicles have an enclosed body. Most of them have a petrol engine, although more and more are electrically powered nowadays. They have four wheels and a maximum width of 110 cm. Examples of enclosed disability vehicles are Canta, Amica, Arola en Mini Cruiser City.

Microcar

According to the law, a microcar is a moped (and therefore not a disability vehicle). It has four wheels (sometimes three), an enclosed body, usually a diesel engine, and is generally wider than an enclosed disability vehicle, which makes it resemble a normal car.

The dimensions of the Birò (on the right) make it resemble an enclosed disability vehicle, but since early 2019 it has been classified as a microcar and the owners have to follow the corresponding rules, e.g. a ban on pavement parking and a ban on use of bicycle tracks ([1]; see the question *What rules apply to using a mobility scooter, an enclosed disability vehicle or a microcar?*).

2 What rules apply to using a mobility scooter, an enclosed disability vehicle or a microcar?

Mobility scooters and enclosed disability vehicles

Mobility scooters and other disability vehicles, such as electric wheelchairs and Canta-like vehicles, have their own legal status and corresponding rules [2]. Legally (Article 1.1 of the Dutch Regulation of Vehicles [3]), a disability vehicle is a vehicle "*that has been designed to be used by a disabled person, that is not wider than 1.10 m. and that is not equipped with an engine, or only with an engine that allows for a maximum construction speed of 45 km/h, not being a motor vehicle with a limited speed nor a farm or forestry tractor.*" Using a mobility scooter or an enclosed disability vehicle does not require a licence.

Microcars

Legally, the microcar is a moped, since the concept of a microcar is legally unknown and is therefore not included in the Regulation of Vehicles. Statistics Netherlands define a microcar as a "*motor vehicle with four wheels, not being a disability vehicle, with a maximum construction speed of 45 km/h and an unladen kerb mass of less than 350 kilos, not including the mass of the electric vehicle batteries, equipped with a spark ignited diesel engine with a cylinder capacity of not more than 50 cm^3* " [4]. Driving a microcar requires an AM licence (moped licence) and

passing a microcar practice test, resulting in an AM4 code. AM licences are not subject to medical fitness requirements.

Legal requirements and regulations

This table summarises the main legal requirements and regulations for the three categories in the Netherlands:

	Mobility scooter and electric wheelchair	Enclosed disability vehicle	Microcar
Allowed on trunk roads and motorways	No	No	No
Allowed on 50/80 km roads	Yes*	Yes*	Yes*
Allowed on bicycle tracks	Yes	Yes	No
Allowed on pavement or in pedestrian precincts	Yes	Yes	No
Parking on pavement	Yes	Yes	No
Minimum age	16 **	16	16
Driving licence	No	No	AM4***
Maximum vehicle speed	45 km/h****	45 km/h****	45 km/h
Official disability resource	Yes	Yes	No
Maximum width	1.10 m	1.10 m	2.00 m
Maximum height	2.00 m	2.00 m	2.50 m
Maximum length	3.50 m	3.50 m	4.00 m
Road tax	No	No	No
Mandatory seatbelts	No	No	Yes
Registration number	No	No	Yes
Liability insurance	Yes (insurance sticker)	Yes (insurance sticker)	Yes

* unless slow traffic is banned (Traffic Code sign C9);
** no minimum age if mobility scooter has a maximum speed of 10 km/h;
*** passing a microcar practical driving test to obtain an AM4 licence is required;
**** on the pavement and in a pedestrian area a maximum speed of 6 km/h applies, on moped and bicycle tracks in and outside the urban area the maximum speed is 30 km/h and 40 km/h respectively, on all carriageways a maximum speed of 45 km/h applies. Depending on the model, mobility scooters actually have a maximum speed of 7 to 20 km/h.

3 How many mobility scooters, enclosed disability vehicles and microcars are there in the Netherlands and how often are they used?

Mobility scooters and enclosed disability vehicles

The present number of mobility scooters in the Netherlands is unknown, but the 2013 number was estimated at 150.000 to 250.000 [5] [6]. This estimate is based on the number of mobility scooters supplied under the Dutch Social Support Act, and previously under the Handicapped Facilities Act, and on assumptions about privately acquired mobility scooters (see *Figure 1*). Because of demographic changes, we expect the number of mobility scooters to have risen in recent years and to continue to rise in the years ahead. According to an OdiN mobility study [7], 157 million kilometres were travelled by mobility scooters or enclosed disability vehicles in 2019 and about 152 million kilometres in 2018. This is probably an underestimate, as older road users are not well-represented in the OdiN sample. Since the number of casualties among users of mobility scooters and enclosed disability vehicles increases (also see the question *How many casualties are involved in crashes with mobility scooters, enclosed disability vehicles and microcars, and what is the risk?*), a better idea of (the development of) the number of these vehicles is needed.

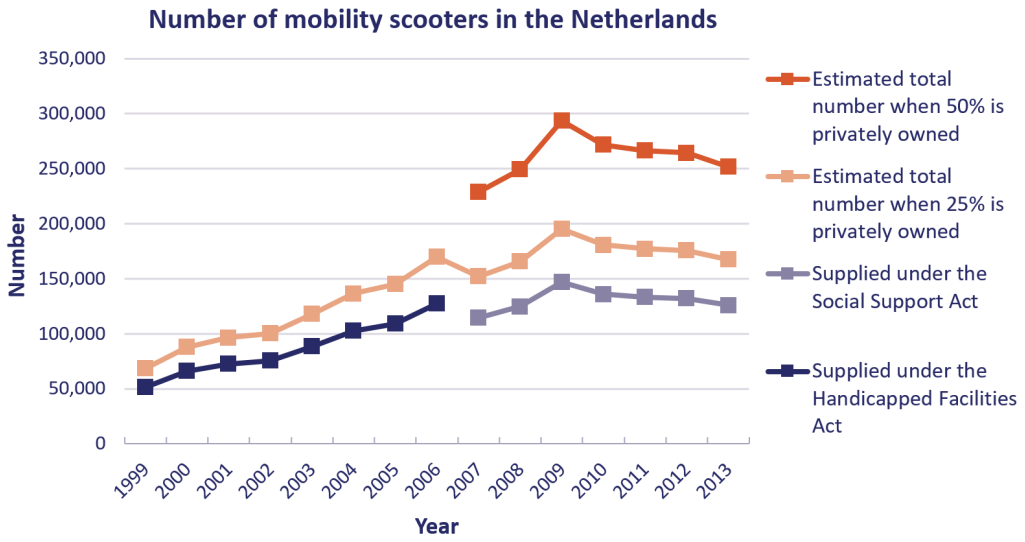

Figure 1. Number of mobility scooters supplied by Dutch municipalities between 1999 and 2013, and estimates of the total number of mobility scooters in the Netherlands (1999-2013). Source: [5].

Microcars

According to Statistics Netherlands, over 18,000 microcars were registered on 1 January 2020; in 2013 there were over 21,000 (*figure 2* [8]). Thus, the total number of microcars has passed its peak. It is unclear how many kilometres are travelled by microcar.

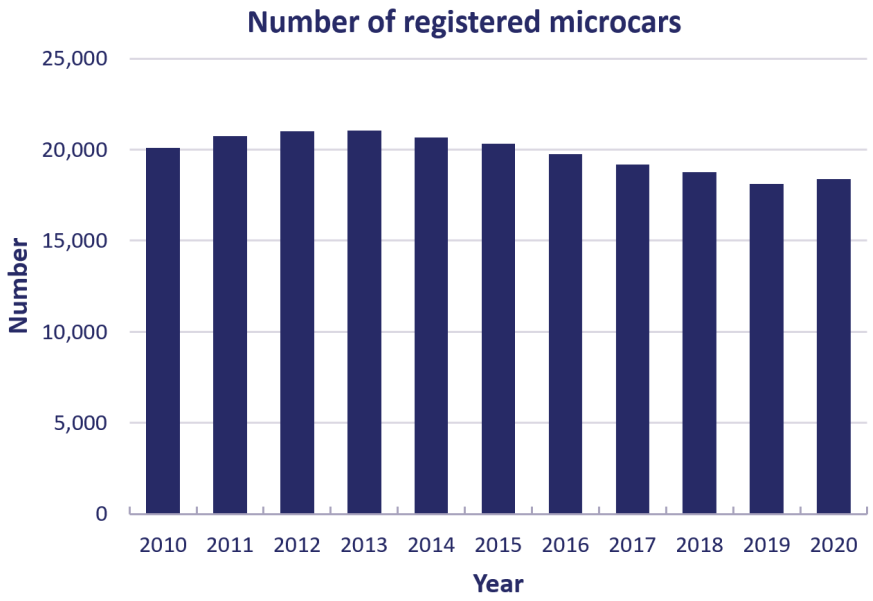

Figure 2. Number of registered microcars in the Netherlands, 2010-2020. Source: Statistics Netherlands Statline [8].

4 Who commonly use mobility scooters, enclosed disability vehicles and microcars?

Mobility scooters and enclosed disability vehicles

Most users of mobility scooters and enclosed disability vehicles are physically impaired. There are no centrally stored data about the users' ages.

Microcars

Microcar owners [9] are mostly older road users: in 2019, over 40% of the private owners were aged 65 or over, and almost 73% were aged 50 or over. About 4% of owners were younger than 25. It is, however, conceivable that some young drivers' microcars are owned by their parents.

5 How many casualties are involved in crashes with mobility scooters, enclosed disability vehicles and microcars, and what is the risk?

Mobility scooters and enclosed disability vehicles

In 2018 and 2019, the number of road deaths among users of mobility scooters and enclosed disability vehicles in the Netherlands amounted to more than 40. In 2010-2019 the number fluctuated but showed a marked increase (*Figure 3*).

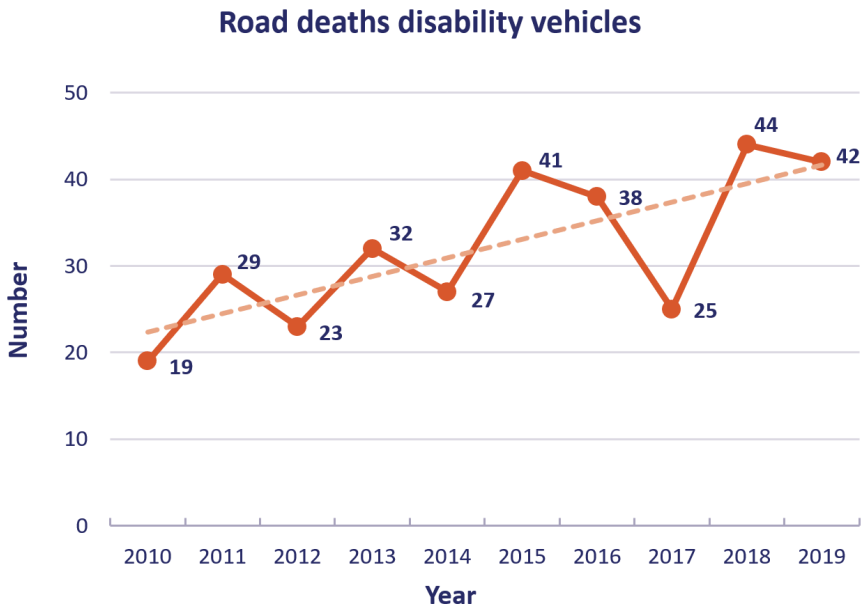

Figure 3. Development of the number of road deaths among mobility scooter users and occupants of other disability vehicles in 2010-2019. Source: Statistics Netherlands (Datalink).

There are no recent, reliable data about the number of (serious) road injuries among users of mobility scooters and occupants of other disability vehicles. The most recent information dates back to 2011 and is based on the Injury Information System of VeiligheidNL [10]. This shows that, in 2011, about 2000 road users were treated at emergency rooms after a mobility scooter crash. About one in three (36%) were admitted to hospital for treatment. Of the 115 casualties who completed a questionnaire for this study, almost half (48%) had sustained fractures during the crash and 46% superficial injuries [10]. Leijdesdorf et al. [11] also studied injuries after mobility scooter crashes. Their study concerned 242 casualties admitted to hospital in 2003-2013. Half of them (51%) were aged over 75. Half of them had sustained a single serious injury, 15% multiple serious injuries and 4% died during their hospital stay.

When setting off the number of road deaths among users of mobility scooter and occupants of other disability vehicles against the number of kilometres travelled according to the OdiN mobility study (for 2018-2019), we arrive at a risk of about 275 road deaths per billion kilometres. This is a far greater risk than that run by motorcyclists (50 road deaths per billion kilometres), (light) moped riders (42 road deaths per billion kilometres), cyclists (13 road deaths per billion

kilometres) and pedestrians (11 road deaths per billion kilometres) (in 2010-2019, [12]). It should, however, be noted that the number of mobility scooter kilometres travelled according to the ODiN data is probably underestimated (also see the question *How many mobility scooters, enclosed disability vehicles and microcars are there in the Netherlands and how often are they used*), which implies the actual risk will be lower.

It is plausible that mobility scooter users who are involved in crashes sustain serious injuries more often than other unprotected road users such as cyclists and light moped riders. This is due to their relative advanced age and to the fact that they are often less healthy than their peers who do not need to use mobility scooters. So, mobility scooter users are often physically vulnerable and a fall or collision will more often have serious physical consequences. The enclosed body of other disability vehicles will offer its occupants more protection during a collision, but still rather a great deal less than heavier 'ordinary' cars (see the question *What about crashworthiness?*).

Microcars

The actual number of road deaths among microcar occupants is unknown; when computing the actual number of road deaths, the data for microcars and (light) mopeds are aggregated. We do know that the Dutch police register an annual number of approximately three road deaths among microcar occupants (2010-2019), but is unknown how comprehensive the registration is. The actual number of serious road injuries among microcar occupants is also unknown.

As was the case for enclosed disability vehicles, the enclosed body of microcars offers significantly less protection in case of a collision than heavier 'ordinary' cars (see the question *What about crashworthiness?*).

6 What are the casualty characteristics in crashes with mobility scooters, enclosed disability vehicles and microcars?

This question can only be answered for crashes with mobility scooters and enclosed disability vehicles, since crash statistics do not have a separate category for microcar casualties. Nor are there recent studies specifically focusing on the road safety of microcars.

Age disability vehicle casualties

In the Netherlands, the vast majority of (deceased) casualties among users of mobility scooters and enclosed disability vehicles are older road users.
In 2017-2019, 92% of the road deaths in this group were aged 70 or over, and 68% were aged 80 or over (*Figure 4*). In 2011, 75% of the mobility scooter casualties treated at an emergency room (ER) were aged 65 or over, almost 50% were aged 75 or over, and 18% were aged 85 or over [10].

Set off against the age distribution of the entire population, the over-85s run the greatest risk of ending up at an ER after a mobility scooter crash.

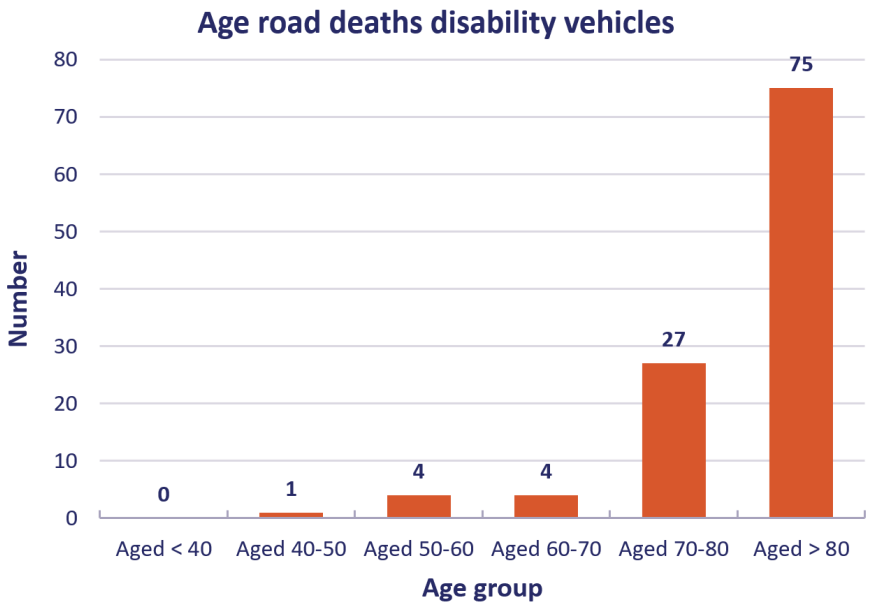

Figure 4. Number of road deaths among users of mobility scooters and other disability vehicles by age group in 2017-2019. Source: Statistics Netherlands (Datalink).

Gender disability vehicle casualties

Men are overrepresented in the number of serious outcome crashes; for less serious crashes there are hardly any gender differences.

In 2011, 55% of the mobility scooter casualties treated at an ER were women and 45% were men; considering the population structure, this implies that men and women run almost similar risks of being injured in a mobility scooter crash [10]. An in-depth SWOV study of mobility scooter crashes [5] shows that men are relatively often involved in serious mobility scooter crashes. Statistics Netherlands data confirm this: 77% of the road deaths among mobility scooter users and occupants of enclosed disability vehicles in 2017-2019 were men.

Crash opponents in crashes with disability vehicles

The vast majority of crashes with mobility scooters and enclosed disability vehicles are single-vehicle crashes (falls or collisions with an obstacle). So, these crashes do not involve other road users.

An in-depth study of 35 mobility scooter crashes [5] showed that 21 of them were single-vehicle crashes: the mobility scooter user fell, ended up in the water, or collided with an obstacle such as a kerb.

In the run-up to the crash, other road users were sometimes involved, but through intervention of one or both road users a collision was prevented. However, since this involved a swerving manoeuvre the mobility scooter user took a fall and sustained injuries. In the other 14 crashes,

the mobility scooter user did collide with another road user. These crashes involved cars (5x), delivery vans (3x), trucks (3x) and bicycles or other mobility scooters (3x).

A similar picture emerges from the study by Poort et al. [10]. In 2011, 115 casualties treated at an ER filled in a post-treatment questionnaire and 19% of them said to have collided with another vehicle: a car (11%), a bicycle (7%) or a (light) moped (1%). Another 16% said to have collided with an obstacle (e.g. a kerb, tree, fence, wall, or door). The remaining 65% of crashes did not involve a collision.

A different picture emerges when only fatal road crashes are considered. Single-vehicle crashes make up about a quarter (25%) of them, almost half (47%) involve collisions with a car, and slightly less than one fifth (16%) involve a collision with a truck or delivery van (2010-2019; source: Statistics Netherlands).

7 What are the circumstances of crashes with mobility scooters, enclosed disability vehicles and microcars?

When looking at the registered fatal crashes with mobility scooters and enclosed disability vehicles, 94% of them occur in daylight, 86% in dry weather and 75% within the urban area (2010-2019; source: BRON). Mobility scooter crashes mainly occur in daylight during dry weekdays at a familiar location. There is no information available about microcar crash circumstances.

The information about mobility scooters originates from a survey among 115 casualties treated at an emergency room (ER) [10] and from an in-depth study into 35 crashes [5]. The survey showed that most crashes had occurred on weekdays (80%) between 9 am and 4 pm (72%), in the urban area (82%) and at a location familiar to the casualty (88%). The crash had often occurred in or around the house or living quarters (16%), on a road without bicycle lanes or tracks (15%), on a bicycle lane or track (15%) or on a pavement or footpath (11%) (see *Figure 5*). It should be noted that the largest crash category (in or around the house or living quarters) does not concern road crashes.

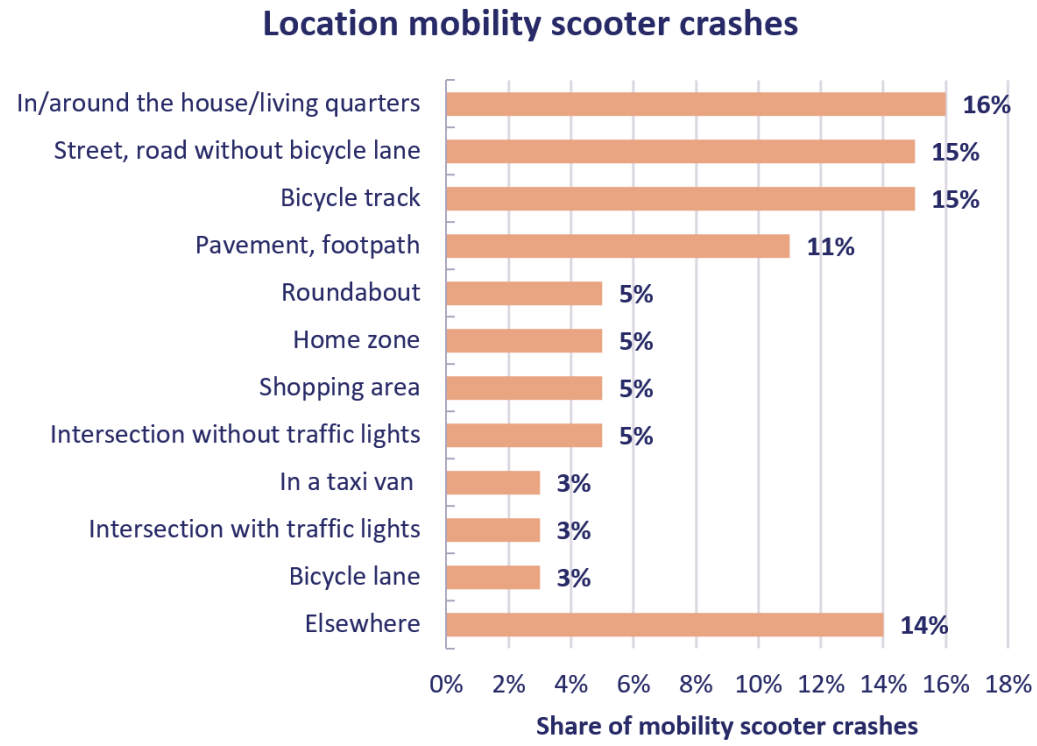

Figure 4. Location of mobility scooter crash (Source: [10]).

The in-depth study by SWOV [5] shows a partly similar picture. Of the 35 crashes studied, 30 occurred in the urban area, 34 in daylight and 33 in dry weather. There are some location differences: about half (n = 16) the mobility scooter users were using a bicycle lane/track, a quarter (n = 9) were using a pavement, footpath or shopping area, and 6 were using the carriageway. At the time of the crash, 10 mobility scooters were on marked crossings (pedestrian crossing, block marking or canalised lane), of which 7 had traffic lights. The location differences between the survey and the in-depth study probably stem from location definitions used by SWOV which are based on formal definitions and infrastructural knowledge, whereas in the study by Poort and others [10] the crash locations were indicated by the respondents themselves.

8 What are the causes of crashes with mobility scooters, enclosed disability vehicles and microcars?

Common causes and scenarios of mobility scooter crashes are: incorrect use of the throttle (squeezing instead of releasing), tipping of the often unstable mobility scooter because of unevenness of the road surface, bumping into a kerb or passing halfway across a kerb, a sudden swerving manoeuvre, or an intentional or unintentional priority error. There are no data available about the (concurrent) causes of crashes with enclosed disability vehicles and microcars.

The in-depth SWOV study of mobility scooter crashes [5] [6] distinguished four crash types which could describe 32 of the 35 crashes studied. They involve a combination of the conflict type and some decisive crash factors. The crash types are:

1.

Mobility scooter user squeezes the throttle to brake, whereas it should have been released, and ends up in the water (n = 5). The vehicle design is conducive to the crash: a different mode of operation might have prevented the crash.

2.

The mobility scooter gets out of balance after contact with an obstacle or bump, which causes the user to take a fall (n = 8). This crash type is caused by infrastructural factors combined with the instability of mostly three-wheeled mobility scooters: narrow bicycle tracks and sharp bends impede manoeuvring and contact with e.g. a kerb makes the mobility scooter tip over.

3.

Swerving manoeuvre of the mobility scooter user prevents a collision, but results in the user taking a fall (n = 8). User behaviour also plays a part here, in combination with the vehicle instability: the mobility scooter user tries to prevent a collision by an abrupt steering manoeuvre. A collision is indeed prevented, but the vehicle is so unbalanced that it tips over.

4.

A mobility scooter user crosses the road or continues straight on and collides with crossing motorised traffic regardless of who has priority (n = 11). Again, behaviourial factors are involved: either the driver of the car or the user of the mobility scooter wrongly denies right of way, for example because the other road user is overlooked (insufficient visibility, distraction?).

In a study by VeiligheidNL [10], 115 ER-treated casualties of mobility scooter crashes were asked to indicate which factors triggered the occurrence of their crashes which took place in 2011.

Figure 6 shows which of the 11 causes were chosen by what percentage of respondents (respondents could choose more than one factor; on average they chose 1.5 factors).

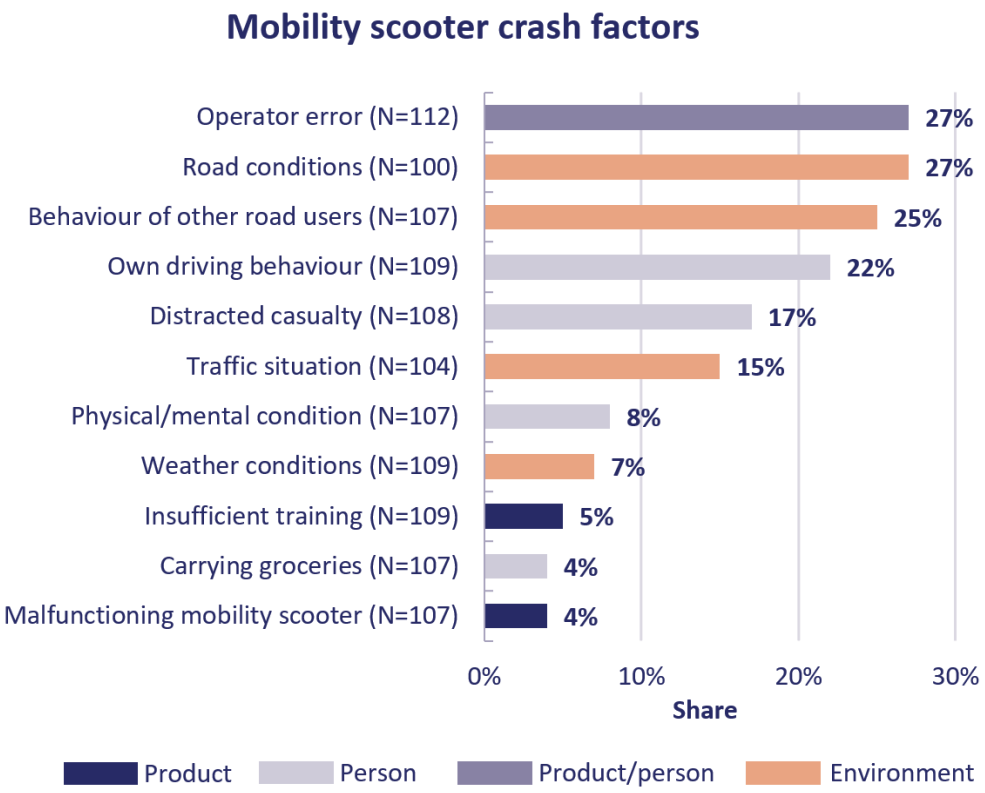

Figure 5. Factors that caused or contributed to the mobility scooter crash. Source: [10]

9 What about the crashworthiness of mobility scooters, enclosed disability vehicles and microcars?

Mobility scooter users are virtually unprotected, and the crashworthiness of enclosed disability vehicles and microcars is also much worse than that of cars. This implies that, in case of a collision with another vehicle or an obstacle, or in case of a single-vehicle crash, the users of these vehicles run a higher risk of getting (seriously) injured. Their injury risk is often even higher due to their age or medical ailments. Therefore, a fall or collision often results in more serious physical consequences than would be the case for a younger, healthier person.

In addition to their limited crashworthiness, mobility scooters, enclosed disability vehicles and microcars also contribute to speed and mass differences between vehicles on the road. Because of the Sustainable Safety principle '(bio)mechanics' this diversity is undesirable. Also see SWOV fact sheet *Sustainable Road Safety*.

Mobility scooters

As far as we know, there are no studies that have specifically looked into the 'crashworthiness' of mobility scooters. It can, however, be discussed in terms of general principles. Mobility scooter users are unprotected, like cyclists or light moped riders for example. They are not protected by the body of their vehicle. Like cyclists and light moped riders in the Netherlands, they are not obliged to wear a helmet either. In case of a collision, they therefore run a higher risk of (serious) injury than road users driving a heavier and shielded vehicle.

Enclosed disability vehicles and microcars

Compared to mobility scooters, the enclosed body of disability vehicles and microcars offers slightly more protection in case of a collision, but still much less than (small) cars. The results of EuroNCAP tests of several microcar models in 2014 en 2016 also clearly shows this [13]. The models scored poorly and were awarded only one out of five stars, due to their bodies having fewer crumple zones that can absorb the released collision energy. The potential for more vehicle body protection is limited since the weight of a microcar or enclosed disability vehicle may not exceed 350 kilos.

The low weight of a microcar has an additional disadvantage. When a lighter and a heavier vehicle collide, the occupants of the lighter vehicle are generally more seriously injured than the occupants of the heavier vehicle (also see SWOV fact sheet *Speed and speed management*). Compared to car occupants, the microcar occupants are thus seriously disadvantaged. Moreover, especially outside the urban area, the speed of a microcar will differ greatly from that of other road users, which will result in the release of more energy in case of a collision, and therefore in more serious injuries.

Microcar occupants are obliged to wear seatbelts or helmets (in case of missing seatbelts). This does not apply to occupants of enclosed disability vehicles that normally do not have (properly functioning) airbags either.

10 Is a microcar a safe alternative to an ordinary car?

Older drivers sometimes hand in their B driving licences to make the car-to-microcar switch. The idea is that a microcar drives at a lower speed, is not allowed on motorways or trunk roads and is therefore safer to drive. This line of reasoning is not altogether justified, however.

There are no comparative studies of crash risk among older drivers set off against older microcar drivers. But experts think that when driving a car is no longer safe, driving a microcar is not safe either [14]. Driving a microcar is very similar to driving an ordinary car, particularly when driving in the urban area. Schepers [15] adds that driving a microcar is even harder, since the road environment, the traffic situation and the vehicle characteristics make higher task demands on microcar drivers.

Moreover, in case of a crash, the physical consequences for older drivers of the less crashworthy microcars are much more serious than if that same driver had driven an ordinary car (also see the

question *What about the crashworthiness of mobility scooters, enclosed disability vehicles and microcars?*)

11 What training courses are available and how effective are they?

There are several skill-training courses for users of disability vehicles. No information is available about the effectiveness of these courses. What we do know is that older road users are a hard-to-reach target group when it comes to educational road safety measures [16].

Mobility scooters

There are several training courses for users of mobility scooters. Suppliers of mobility scooters often offer (their own) short courses. The courses mainly focus on basic operating skills (accelerating, braking, steering) and not on safe traffic participation. Occupational therapists also offer training courses [17] which are generally paid for by health insurers. The Dutch Traffic Safety Association (DTSA) also offers mostly free Mobility scooter refresher courses [18] which are held at different locations in the Netherlands. Some regional road safety institutions organise mobility scooter courses too, often based on the DTSA course. On the DTSA website, users of mobility scooter can find an online road safety test and practical advice for safe use of their vehicles [19]. The effectiveness of mobility scooter training courses is unknown.

Enclosed disability vehicle

Training courses for driving an enclosed disability vehicle (such as a Canta) are often equated with microcar courses. However, for driving an enclosed disability vehicle no driving licence is needed and regulations sometimes differ (also see the question *What rules apply to using a mobility scooter, an enclosed disability vehicle or a microcar?*). Yet, the operating mode of both vehicle types is similar.

Microcars

For driving a microcar a licence for four-wheeler mopeds (AM4) is required. Driving lessons are optional. The Dutch driving test organisation does however require drivers to pass a theoretical moped test and a practical microcar test. Regular driving schools offer driving skill courses. Their effectiveness is unknown. In addition, the book 'Wegwijzer in het verkeer brommobiel' (Traffic guide microcar) [20] is available at bookshops.

12 How to (further) improve safety of mobility scooters, enclosed disability vehicles and microcars?

Mobility scooters

An in-depth SWOV study of mobility scooter crashes [5] suggests a number of measures to improve road safety for mobility scooters. They mostly involve vehicle and infrastructure measures, in combination with training courses. The preferably combined measures should help prevent 'typical' mobility scooter crashes (see the question *What are causes of crashes with mobility scooters, enclosed disability vehicles and microcars*?):

Vehicle measures

- Equip mobility scooters with brakes so that users can actively use these instead of having to release the accelerator when they want to decelerate;
- Improve the stability of mobility scooters by adjusting the vehicle design and provide more stable mobility scooter types under the Social Support Act;
- Provide steering angle protection.

Infrastructural measures

(which will also favourably affect road safety for cyclists and light moped riders)

- Widen narrow bicycle tracks and redesign tight curves to (at least) comply with the present Dutch guidelines;
- Remove kerbs along bicycle tracks or mark and flatten them;
- Increase the conspicuity and visibility of crossing facilities;
- Schedule conflict-free phases of traffic lights.

Customising mobility scooters and training

Considering the nature of the users and the absence of fitness-to-drive requirements, mobility scooters should be so user-friendly that anyone can use them after a short instruction period. When delivering mobility scooters under the Social Support Act, the user's capacities should be taken into account (customised delivery) and appropriate practical training should be ensured. However, a growing number of mobility scooters is privately purchased and they could therefore be less suitable to its users. Practical training sessions will not compensate for this lack of customisation.

These measures largely correspond to measures suggested by previous studies [10] [21] [22]. The study by Jonkhoff et al. [22] elaborates on the vehicle-related measures that could make mobility scooters structurally safer, and discusses the way in which they could be realised by e.g. legislation or standard requirements. They mention:

- a logically controlled and separate brake;
- emergency stop in the middle of the steering console;
- logical acceleration control;
- improving sensitivity of acceleration control;
- minimum requirements for illuminance level (lux) of headlights;
- rear and (possibly) wheel reflectors;
- minimum height for rear lights;
- seatbelt or airbag.

Enclosed disability vehicles and microcars

For their occupants, enclosed disability vehicles and microcars are inherently unsafe vehicles due to their poor crashworthiness a.o. on account of their maximum weight of 350 kilos, and to the sometimes large differences in speed between them and other traffic. Because of their appearance, microcars in particular are almost indistinguishable from 'ordinary' small city cars, which makes it hard for other road users to recognise them. These general, inherent characteristics and the lack or scarcity of information about the crash circumstances of these vehicles make it hard to define effective safety measures.

Publications and sources

Below you will find the list of references that are used in this fact sheet; all sources can be consulted or retrieved. Via Publications you can find more literature on the subject of road safety.

[1]. Kruyswijk, M. (2019). *De Birò wordt aan banden gelegd*. Het Parool. Accessed on 27-11-2020 at https://www.parool.nl/nieuws/de-biro-wordt-aan-banden-gelegd~bc63eff9/?referer=https%3A%2F%2Fwww.google.com%2F.

[2]. Rijksoverheid (2020). *Vraag en antwoord. Bijzondere voertuigen*. Rijksoverheid. Accessed on 27-11-2020 at https://www.rijksoverheid.nl/onderwerpen/bijzondere-voertuigen/vraag-en-antwoord/wat-zijn-de-verkeersregels-voor-een-gehandicaptenvoertuig-met-een-motor.

[3]. Rijksoverheid (2020). *Regeling voertuigen*. Overheid.nl. Accessed on 27-11-2020 at https://wetten.overheid.nl/BWBR0025798/2020-01-01.

[4]. CBS (2020). *Bromfietsenpark*. CBS. Accessed on 27-11-2020 at https://www.cbs.nl/nl-nl/onze-diensten/methoden/onderzoeksomschrijvingen/korte-onderzoeksbeschrijvingen/bromfietsenpark.

[5]. Davidse, R., Duijvenvoorde, K. van, Louwerse, R., Boele-Vos, M., et al. (2018). *Scootmobielongevallen: Hoe ontstaan ze en hoe zijn ze te voorkomen?* R-2018-15. SWOV, Den Haag.

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