

e-Scooter Safety



- e-Scooter use has increased globally in recent years due to dockless e-scooter schemes offered by private companies (e.g. Lime and Neuron).
- There are safety concerns for riders, due to the non-use of helmets, excessive riding speeds, and drink-riding, increasing injury risk.
- Pedestrians are also at risk, either by being hit by riders or tripping over parked on footpaths
- Like powered and unpowered bicycles, these devices have a lower carbon footprint than cars, and can overcome the last-mile limitation often associated with public transport.



State of the Road A Fact Sheet of the Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

THE FACTS

- e-Scooters are part of a rapidly expanding family of small electric devices for personal transportation including hoverboards, powered skateboards and Segways. Various terms for this class of devices include: e-micromobility, powered micromobility, personal mobility devices (PMDs), rideables, and Personal e-Transport Systems (PeTs)^{1,2}.
- Until now, the majority of e-scooter use has been through shared schemes and most of what we know about the use and safety of e-scooters relates to shared use. There is evidence that user behaviour may differ markedly between shared and privately owned e-scooters³.
- In 2018 in the US, there were 38.5 million trips by shared e-scooter, similar to the number of trips by docked bikeshare (36.5 million) and many more than by dockless bikeshare (9 million)⁴.
- In Australasia, dockless e-scooters first appeared in New Zealand in October 2018⁵. The most comprehensive Australian shared scheme began in Brisbane in November 2018 where more than 500,000 trips occurred in the first three months of operation⁶.
- In Australia and New Zealand, trip lengths for shared e-scooters average about one kilometre⁵.
- Share schemes for bicycles and e-scooters have the potential to decrease traffic congestion by replacing car trips⁷. However, in many cities e-scooter use often replaces walking, cycling or public transport and is for recreation, not commuting^{3,4}.
- Most shared e-scooters are made by the Chinese company Xiaomi/Ninebot/Segway. They vary in motor wattage, maximum speed, range, lock-to technology, handlebar adjustment, gyroscope sensors and accelerometer sensors⁸, which can

influence data sharing opportunities, consumer experience and safety.

The rules

- Often, rules relating to e-mobility device design and construction are set at the national level, user licensing and most road rules at the state level, and rules or agreements relating to the operation of shared schemes and where the devices can be used or parked are managed at the local level. The rules and conditions that the user agrees to in shared schemes comprise another level of regulation.
- e-Scooters are classified as 'non-road' vehicles under the Federal Motor Vehicle Standards Act 1989 and the Motor Vehicle Standards Regulations 1989⁹. As PMDs, e-scooters must have the following characteristics:
 - one or more wheels;
 - propelled by an electric motor;
 - an effective stopping system controlled by using brakes, gears or motor control;
 - when propelled only by the motor, cannot reach a speed of more than 25km/h on level ground;
 - not more than 1,250mm in length by 700mm in width by 1,350mm in height; or 700mm in length by 1,250mm in width by 1,350mm in height;
 - weigh 60kg or less when the vehicle is not carrying a person or other load; and
 - has no sharp protrusions.
- The National Transport Commission⁵ is currently reviewing the Australian Road Rules to identify any regulatory barriers to the safe use of innovative vehicles across Australia.
- The rules for the use of PMDs in Queensland can be found [here](#). Riders must:
 - Be at least 16 years of age, or 12 with adult supervision;

- Wear a securely fitted approved bicycle helmet at all times;
 - Not carry passengers;
 - Not use a mobile device while riding;
 - Not drink and ride; and
 - Use working front (white) and rear (red) lights when riding at night, or when there is low visibility.
- Most cities require that e-scooters are used on roadways, however in Brisbane and Adelaide their use is mainly on footpaths. In Queensland, they are restricted to footpaths and minor low speed roads¹⁰.

E-SCOOTER SAFETY ISSUES

- e-Scooter use can result in injuries to both riders and pedestrians – from collisions or falling over e-scooters parked on the footpath. Concerns about e-scooters blocking footpaths have been widespread, particularly among disability groups⁵.
- Currently, it is difficult to identify e-scooter users in emergency or crash data (separating electric from non-powered), the product type (personal or shared), and cause of crash (product failure, product misuse or user behaviour).
- While e-scooters are largely restricted to footpaths and shared paths in Australasia, footpath riding is banned in many other jurisdictions. This makes it difficult to compare safety outcomes with other countries. However, most e-scooter rider injuries result from falls, rather than collisions with motor vehicles, even in countries where most riding is on roads¹¹.
- Most e-scooter rider injuries result from falls, not collisions with motor vehicles, even in countries where most riding is on roads¹¹.
- Ambulance and emergency department data from Brisbane in early 2019⁵ showed that most injured riders were aged 20-34 years old and the numbers of males and females were similar. A comparison

with the CARRS-Q study of the number of riders in the Brisbane CBD³ led the Royal Australasian College of Surgeons to conclude that e-scooter riders were twice as likely to be injured as bicycle riders.

- Among the patients for whom injury data was available, 10% had minor head injury, 3% had major head injury, 21% had upper limb fractures and 6% had lower limb fractures. Fractures were commonly reported in New Zealand¹² and US studies^{5,11,13-16}.
- Inexperience appears to be a significant contributor to crash risk, particularly among riders of shared e-scooters. Use of alcohol, speeding and under-age riders have also been widely reported^{5,11,14-15}.
- Low rates of helmet wearing – even in Australia – among riders of shared e-scooters are contributing to frequent head injuries in crashes^{5,14-15,16}.
- The small size of the wheels on e-scooters has raised concern regarding their stability on uneven surfaces, particularly footpaths, but there is little scientific evaluation of their stability. The size of the wheels can vary considerably, with some shared e-scooters having larger wheels, and possibly better stability.
- Braking problems related to the electronic control systems have occurred on shared e-scooters in Australia^{17,18}, New Zealand¹⁹ and Switzerland²⁰.
- There have been issues with firmware security and integrity to bypass payment processes, as well as geofencing and speed controls for shared e-scooters¹⁷.

WHAT CAN BE DONE TO IMPROVE E-SCOOTER SAFETY

- Operating environments need to provide sufficient separation from higher-speed motor vehicles while minimising risks to bicycle riders and pedestrians. The level of safety depends on the maximum speeds at which the e-scooters can (or are permitted to) travel and the speed of motorised vehicles and bicycles in those locations.
- A recent trend in regulating e-scooter schemes is to require electronic speed control, with lower speeds or lockouts at high-risk locations (e.g. areas of high pedestrian activity). However, there is less opportunity to affect the way in which privately-owned e-scooters are used, and the number of these scooters may increase significantly.
- Submissions to the National Transport Commission's current review have suggested that mandatory comprehensive insurance be required for e-scooters and similar devices, and other organisations have called for speedometers to be fitted to allow users to comply with speed restrictions⁵.
- There is potential to require technological constraints on parking locations as part of permits for e-scooter schemes, and also to include penalties for operators who do not remove illegally parked e-scooters in a timely manner. Confiscation is a possible approach for privately owned e-mobility devices if they are illegally parked. Provision of dedicated parking is a possible solution to e-scooters blocking public space and causing trip hazards⁸. Virtual docks might be possible as a lower cost to

physical docks, with or without charging facilities.

CARRS-Q WORK IN THIS AREA

- International review of the safety of e-micromobility which has informed submissions and presentations to governments.
- Series of observational studies of the use and behaviour of shared and private e-scooters and bicycles in central Brisbane and how they interacted with pedestrians and motor vehicles³.

FUTURE DIRECTIONS

- Dockless e-scooters have considerable economic advantages over dockless e-bikes and are likely to dominate the shared e-mobility market.
- e-Mobility may be incorporated into Mobility as a Service (MaaS) as shared mobility companies are spreading across vehicle types.

Future research may focus on:

- The public health implications and extent of changes from cycling and walking to using e-scooters.
- The safety and amenity of e-scooters on shared paths and in bicycle lanes. Will bike paths or shared paths need to be widened to improve safety and reduce congestion?
- Will private use of e-scooters overtake shared use? Will currently observed differences in user behaviours between shared and private e-scooters continue?
- The skills needed for safe e-scooter use and how they can best be trained.

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