Is there a case for standards and guidelines for personal mobility devices in New Zealand?

Purpose: Alternative forms of motorised personal mobility device are becoming more common. Appropriate standards and speed limits for such devices, conflicts with other road and footpath users (especially handicapped pedestrians) and design of temporary works are issues identified as being where guidance could be valuable to road controlling authorities. The Research and Guidelines Steering Group of the Road Controlling Authorities Forum (NZ) Inc sought to establish the response to these devices in other jurisdictions.

Method: A review of international literature was undertaken to identify whether these resources tended to support development of local guidance documents related to mobility scooters.

Results: A body of frequently cited references was identified that tends to indicate significant variation in regulatory approaches to motorised mobility devices in different jurisdictions. In the majority of jurisdictions that address the issue, where a motorised mobility device or mobility scooter is used on, or able to be used on, the road, it is required to meet some minimum requirements for road-worthiness. Increasing recognition is being given to the need to balance the significant benefits to the elderly and disabled from improved mobility against the need to ensure that these groups, whether as mobility device users or as pedestrians, are not put at greater risk.

Conclusion: The international literature indicates that significant safety issues attach to such devices, particularly to mobility scooters used by elderly or disabled operators. These can be substantially heavier and faster than most pedestrians, and beyond the fitness or competence of some elderly or disabled operators to control effectively. Operators of mobility scooters appear to be at significantly greater risk of being in an accident, and of being seriously or fatally injured. Measures to ensure provision of safer infrastructure, safer mobility devices and safer device operators appear to be justified.

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A review of international literature on mobility scooters indicates a case exists for an altered regulatory stance towards such personal mobility devices in New Zealand and for a wider discussion of standards and guidelines for operators, devices and the infrastructure they use.

Introduction

New Zealand is facing broadly similar demographic trends to those faced by similar societies in Australia, North America and Europe. The population is aging and a large segment of the current population is moving towards being over 65. As a broad generalisation, mobility-related disability affects about one third of persons within the over 65 age group. Nevertheless, high personal mobility and personal independence are seen as being particularly important for this age group.

Personal mobility and personal independence are also seen as being particularly important for younger persons with injuries or disabilities that affect their mobility. Obesity-related mobility impairment is also an increasing issue. At the same time there is also a trend away from private car ownership, with increasing interest in alternative personal mobility solutions. For all of these reasons, there has been increasing interest in motorised personal mobility devices.

A powered mobility device can have between one wheel (the U3-X) and seven (some large 3-wheeled devices are stabilised by four outer wheels). It can weigh from 10kg to more than 150kg and travel at speeds up to 40kph (T3-Motion), although the great majority operate at speeds between 6kph and 15kph. At the moment in New Zealand all personal mobility devices are treated as pedestrians and expected to behave as pedestrians. They must use a footpath or the side of the road where no footpath is present. There is no maximum speed limit for such devices.

Two, three and four-wheeled devices are readily available in New Zealand. Over forty brands of mobility scooter are sold by retailers and there is a strong local second-hand market. A mobility scooter may be purchased new for up to $5,300 or a second-hand scooter can be bought for as little as $800. There are no regulatory requirements for either the device or the operator.

Legal status of personal mobility devices

A significant body of research has been developed around issues related to powered or motorised personal mobility devices. A recent review in Canada (Bruneau & Maurice, 2012) found that fourteen countries provide a legal status for ‘scooters’. Only in New Zealand and the USA, it found, are all scooters treated as pedestrians regardless of size or speed. Twelve countries treat mobility scooters as pedestrians, but also treat them as another class of road user in certain circumstances. In seven countries they can be treated as bicycles and in six countries they can be treated as road vehicles. In Ireland

and South Africa a mobility scooter is treated only as a road vehicle. Only Canada has a separate classification for a 'scooter'. Refer to Table 1.

Table 1: Legal status of a mobility scooter (after Bruneau & Maurice)

Country	Pedestrian	Bicycle	Road vehicle	Scooter
New Zealand	✓			
USA	✓			
Australia	≤ 10kph		> 10kph	
UK	≤ 6kph	12.9kph limit	≥ 6kph	
Denmark	Walking speed	15kph limit	✓	
Sweden	≤ 5kph	≥ 6kph		
Norway	Walking speed	> walking speed	(uncertain)	
Belgium	Walking speed	> walking speed		
France	≤ 6kph	≥ 6kph		
Netherlands	✓	✓		
Switzerland	✓	✓		
Ireland			✓	
South Africa			✓	
Canada	✓		✓	✓

France, Switzerland, Belgium, Sweden, Denmark and UK require lights and reflectors as for bicycles, with tests for braking, turning, climbing capacity, dimensions and weight. Australia requires a mobility scooter capable of more than 10kph to be equipped as for a road vehicle.

Only the UK and the Netherlands have a minimum age for operating a mobility scooter: in the UK it is 14; in Netherlands it is 16. No country has a maximum age restriction.

New Zealand, Canada and USA restrict mobility scooters to footpaths. Only South Africa restricts mobility scooters from specific classes of road. Maximum speed limits for mobility scooters are imposed in Australia (Western Australia imposes a maximum speed for mobility scooters of 10kph), the USA (Delaware sets a maximum speed of 12.8kph), the UK (12.9kph) and Denmark (15kph). The UK requires devices classed as pedestrian to be fitted with a key limiting maximum speed to below 6.4kph within pedestrian areas.

The UK has two classes of mobility scooter, distinguished by speed and weight: a Class 2 "invalid carriage" is treated as a pedestrian and is not to be used on roads; a Class 3 device is a road vehicle, but able to travel on footpaths at less than 6.4kph. A Class 2 device has a maximum weight of 113.4kg. A Class 3 device has a maximum weight of 150kg and a maximum speed of 12.9kph. A Class 2 device needs no registration, whereas a Class 3 device requires registration and licensing.

In Queensland a mobility scooter with a maximum speed of less than 10kph is treated as a pedestrian and registered as a motorised wheelchair. A device capable of over 10kph is a road vehicle, and so must be registered and licensed, and the operator must also be registered.

Issues related to mobility devices

Mobility scooters have been seen to be comparable to cyclists and pedestrians in safety needs and functionality requirements: low-speed roads, cycle paths and footpaths. Provision of safe travel options that allow easy access to services and amenities is seen as a vital factor in maintaining mobility in the elderly and the disabled. This mobility remains dependent on access to private transport. The need, therefore, is for safer users, safer vehicles, safer infrastructure and innovative alternative personal transport options (Oxley & Whelan, 2008).

The same issues have been described as user competence, scooter design and environment design (Deverell & Pannier, 2011). There is a need to balance avoiding creating a barrier to greater independence of the elderly and disabled against putting them and the public at greater risk. Mobility scooter users have reduced mobility or a physical disability almost by definition. Vision, hearing, perception, reflexes, reaction time, balance, posture, strength, co-ordination, endurance, cognition, lucidity, memory and judgement are all likely to be potentially impaired in scooter users.

Mobility scooter users without prior driving experience can lack experience in planning a journey and the stages needed to reach an objective, reading traffic, making spatial judgements, assessing risk and hazards, using peripheral vision and reacting appropriately to hazards. Alcohol use and medications preventing operation of machinery have also been identified as issues for mobility scooter users (Deverell & Pannier, 2011, Cassell & Clapperton, 2011, Edwards & McCluskey, 2010).

The Canadian Council of Motor Transport Administrators (CCMTA, 2010) found that mobility scooters are a hazard for pedestrians with impaired hearing or vision, and concluded that mobility scooter speeds are too fast for footpaths and too slow for roads. The CCMTA also observed that mobility scooter users fail to maintain their scooters, and frequently fail to remember to charge the batteries or to calculate the distance able to be travelled on a charge, leading to heavy, awkward devices and their unprotected, often frail, users being frequently stranded in places where a suitable service vehicle cannot have ready access to them. The CCMTA also noted that mobility scooter users often fail to obey basic road rules.

User fitness and competence

Two studies of mobility scooter users in British Columbia (Steyn & Chan, 2008) and New South Wales (Edwards & McCluskey, 2010) quantify some of these issues. The Mobility Scooter Research Project, (University of Fraser Valley, British Columbia) found both increasing use and increasing accident rates for mobility scooters.

Fitness to operate was identified as a significant issue. Mobility scooters are bought by people not competent, or no longer competent, to operate a

vehicle. Mobility scooter users are by definition operating heavy machinery. Mobility scooters are also highly responsive to any change in surface texture or gradient. Nevertheless, in most jurisdictions mobility scooters are exempt from most regulations applying to motor vehicles, even where they are treated as road vehicles, and have no requirement for proven fitness to operate on the part of the user.

Treating mobility scooters under the law as pedestrians means no regulatory barrier to fitness, whether for eyesight, mental faculties, physical abilities, or even drunkenness or drug use, can be argued to be appropriate, as no such imposition is placed on a person going for a walk.

The survey of 86 mobility scooter users in British Columbia suggests significant health and fitness issues need to be considered in addressing the operating abilities of this group. The average age was 77 years and 74 percent of the sample rated their health to be fair or poor. Within the general Canadian population, for seniors over 65 the comparable figure is only 23 percent. Specific findings of the survey were:

- 38% had impaired hearing;
- 34% had impaired vision;
- 19% had impaired memory;
- 17% had impaired balance;
- 28% of impaired vision group was severely impaired.

All chronic diseases were found to measure higher among mobility scooter users than in the general population in Canada for comparable age cohorts. The survey found 80 percent of mobility scooter users take four or more medications daily.

Of the survey sample, 47 percent had ceased to drive a motor vehicle and 15 percent had never driven. Failing health was cited as the reason for ceasing to drive for 80 percent of those who had given up driving. Despite this, the survey found:

- 34% used their mobility scooter on roads regularly;
- 53% used their mobility scooter on roads occasionally;
- 40% of users had no prior assessment of fitness; and
- 48% of users had no prior training before operating their device.

These proportions were noted as being significantly higher than were found in the UK (Barham, Fereday, Oxley, 2005), where only 18 percent of users had received no prior training. The difference was attributed to the higher incidence of purchases of second-hand devices in Canada, with 38 percent of mobility scooters having been bought second-hand, compared to the UK, where only12 percent of mobility scooters were bought second hand with little or no prior training provided. New Zealand could be expected to tend towards the Canadian experience, more than the UK model, with its robust second-hand market.

Steyn and Chan found that only 33 percent of mobility scooter owners had regular service checks of their device and 60 percent had no insurance of any

kind on their mobility scooter. They also found that 30 percent of mobility scooter users had had an accident with their scooter, with the breakdown of incidents with scooters suggesting significant competency issues:

- Tipped backwards -12.5%
- Tipped off kerb – 12.5%
- Hit stationary object – 18.75%
- Hit by car – 56.25%

A larger Australian survey of 149 adult mobility scooter users in Sydney by Edwards and McCluskey in 2010 found that 21 percent had been involved in an accident involving their mobility scooter within the previous twelve months. The survey also found that the average age was 81 years and only 33 percent consulted a health professional prior to purchasing their device.

The case for competency assessment was supported by a study undertaken in Queensland (Nitz, 2008). A group of fifty able-bodied adults with an average age of 34 years was tested on basic driver competency on motorised mobility scooters. Even with this relative advantage in age and level of impairment, 66 percent failed at least one test. The study concluded that driving skills needed to be taught and mobility scooter operators needed to be assessed for competency.

Accidents involving mobility scooters

Two studies have attempted to quantify the costs of accidents involving mobility scooters. A survey of 107 reported traffic collisions between electric mobility devices and motor vehicles in Michigan (LaBan & Nabity, 2010) found that 60 percent resulted in the death of the mobility scooter user. A study of Australian hospitalisation data and data extrapolated from hospital admissions in Victoria (and Queensland to a lesser extent) (Cassell & Clapperton, 2011) suggests there were 713 hospitalisations from motorised mobility scooter accidents between July 2006 and August 2008 for Australia as a whole comprising:

- 62% (442) falls from the devices;
- 15% (107) collisions with vehicles;
- 7% (50) collisions with stationary objects;
- 1% (7) collisions with unspecified objects;
- 6% (43) tipping events;
- 9% (64) unknown causes.

Data from Victorian hospital admissions from mobility scooter accidents in 2008/09 revealed 36 percent of admissions were for serious injury, which is significantly higher than the 16 percent admitted for serious injury for all unintentional injury causes in general population. This data showed:

- 50% were persons aged over 85 years;
- 50% were for fractures;
- 40% were for lower extremity injury;
- 23% were for neck injury.

The average length of hospitalisation was 11.2 days and the average cost was Aus$5,665. The severity of injury in a significant number of cases was likely to cause persisting health problems.

The study identified 62 certain and 14 probable fatalities for mobility scooter users in Australia between July 2000 and August 2010. The most common cause of death was head injury after collision with a motor vehicle. A subsequent Australian study (Deverell & Pannier, 2011) has advocated mandatory helmet use for mobility scooter operators, as well as regular assessment of operational competence.

The Michigan study of 107 reported incidents involving mobility scooters and other vehicles on the road (LaBan & Nabity, 2010) raised the possibility of mental fitness being a factor. The study suggested, "when an electric mobility device operator openly challenges busy traffic by attempting to traverse it in the middle of the block at an unmarked crossing, predisposing psychosocial factors must also be considered." This study found that 50 percent of incidents occurred at night, or at dusk or dawn and involved males to females at a rate of 3:1. The average age of the mobility scooter operator was 56 years.

Fitness of devices

A review of Class 2 and Class 3 powered wheelchairs and powered scooters in the UK (Barham, Fereday & Oxley, 2005) found that 18.5 percent of Class 2 devices, which are restricted to use on footpaths only, were being used on roads on a daily basis. They concluded that the distinction in security and safety features required on Class 2 and Class 3 devices should be ended. They also concluded that third party insurance should be required for all mobility scooters.

The majority of mobility scooters (60%) travel at speeds greater than 7kph and are used on the road either regularly or occasionally (87%) (Steyn & Chan, 2008). In these circumstances the conclusion of successive studies was that mobility scooters should meet basic fitness requirements for roadworthiness.

Mobility scooters have been found to have excessive speed as pedestrians. Walking speed is 3-5kph, with elderly and disabled pedestrians generally walking at 3-4kph. Every speed restriction placed on mobility scooters operating in a pedestrian environment exceeds the walking speed of the most vulnerable pedestrians. The Australian limit of 10kph on a footpath is significantly higher.

The legal status of pedestrians for these devices leads to clashes with cyclists, other pedestrians and traffic. Pedestrians are required to travel against the flow of traffic on the roadside, but mobility scooter users prefer to travel with the flow. Successive studies have concluded that a mobility scooter on the road being operated as a motor vehicle should meet the same

minimum standards for security and safety equipment, basic fitness and certification as other motor vehicles on the road.

Although no country has set minimum standards for wheel diameter, tyre width, ground clearance or stability, France, Switzerland, Belgium, Sweden, Denmark and the UK require lights and reflectors, and apply tests for braking, turning, climbing capacity, dimensions and weight. Australia requires a scooter capable of more than 10kph to be equipped and registered as a road vehicle. The high incidence of injuries from falls from mobility scooters tends to suggest that operators should be restrained by seat belts.

Fitness of the environment for safe mobility scooter use

The majority of personal mobility devices are mobility scooters and are four-wheeled (87%), although a proportion are three-wheeled (13%) (Steyn & Chan, 2008). Despite the claims of some advertisers (New Zealand advertisements tend to portray all mobility scooters in external settings, often on slopes), the ability of mobility scooters to safely negotiate changes in gradient and surface level can be quite limited. This limitation is particularly relevant to the design of infrastructure used by mobility scooters, including temporary footpaths and detours around worksites.

Crossfall gradients on paths and vehicle access crossings on paths were identified as a significant issue for mobility scooter users in surveys. Mobility scooters are highly responsive to changes in surface texture or gradient, and a user without the strength, alertness or reactions to avoid or respond to a sudden change can easily lose control (Cassell & Clapperton, 2011). A crossfall of 1:40 is recommended as the maximum, with 1:50 suggested as an ideal.

Use of footpaths by mobility scooters also has implications for the safe design of these. For mobility scooters to safely pass each other without risk of collision and without risk of tipping off a path or colliding with a wall or stationary object requires a path width of 2.0m (King et al, 2010). The minimum width needed for a mobility scooter to turn 90° is 1.3 m and for a scooter to turn 180° is 1.7 m. The Canadian Standards Association calculated the minimum turning area for a mobility scooter as 3.15 m (Accessible Design for the Built Environment, B651-04, 2004).

A more recent UK study found that the turning circle of a 1500x695mm mobility scooter is 4.35 m, however, and a 90° turn needs 2.2 m (Schoon, 2010). This is possibly a reflection of the increase in size of mobility scooters and the increased proportion that are four-wheeled, rather than three-wheeled. The study noted that a mobility scooter must be aligned as closely as possible to 90° to the road edge to negotiate the gradient of a crossing without risk of tipping. This applies at both sides of the road, entering and leaving the crossing, with implications for the layout and width of footpaths at crossings.

This study also observed that a mobility scooter user's eye position will not only be lower, but can be up to 2 m back from the kerb edge at a crossing, as many users prefer to wait behind the slope of the kerb-cut. This significantly reduces visibility both for the mobility scooter operator of approaching traffic and for approaching traffic of the presence and intentions of the mobility scooter.

Schoon found that adequate vision for a person within the road environment, including mobility scooter users, requires not just an ability to focus, but an ability to be able to rotate the angle of vision to be aware of potential or approaching hazards not only to each side, but also to the rear. This can be a significant challenge for many mobility scooter users. The time taken for a mobility scooter user to look both ways and commence crossing a road can be up to 8 seconds.

The time taken for a mobility scooter to cross a 7 m road can be up to 12.7 seconds. The standard time allowed in the UK for a pedestrian to complete a crossing of a 7 m road is 8.7 seconds (Schoon, 2010). A mobility scooter can, therefore, be up to 46 percent slower crossing a road than a pedestrian, despite being generally 40 to 45 percent faster than a pedestrian on a level path, as a result of the care needed to negotiate the gradient of the crossing and any edge onto and off the carriageway.

Issues to be considered

Issues to be considered in any approach to determining the status of mobility scooters have been addressed in several studies (particularly Steyn and Chan, 2008) and have included:

- Classification of devices
- Regulatory approaches
- Assessment of operator competency
- Limits based on age, health or weight for operators
- Requiring certified mobility impairment for use
- Registration and licensing of devices or operators
- Conditions on use, and where a device can be used
- Limits on speed
- Direction of travel on the road
- Requiring minimum levels of insurance
- Requiring extra safety equipment

The appropriate classification and regulatory approach towards personal mobility devices has been recognised to have significant implications for the extent to which other issues can be addressed. Treatment of mobility scooters as pedestrians raises philosophical and potentially legal issues of consistency of treatment if any barrier to use is considered that would not apply equally to a person walking, rather than using a mobility device.

Classification of essentially similar devices as being pedestrian, bicycle or motor vehicle depending on the speed environment in which they operate,

and applying the appropriate regulatory approach for each class, has been the most widely adopted approach. The literature suggests that this is confusing and potentially contributing to higher accident rates amongst mobility device users, however, as devices classed as pedestrian and not equipped with suitable safety and security equipment are nevertheless being taken onto roads. The weight of the international literature tends towards classification of mobility scooters and similar personal mobility devices as a class of motor vehicle.

Conclusion

In the majority of jurisdictions that address the issue, where a motorised mobility device is used on, or able to be used on, the road, it is required to meet minimum requirements for road-worthiness. The literature indicates that significant safety issues attach to such devices. Increasing recognition is being given to the need to balance the benefits to the elderly and disabled from improved mobility against the need to ensure that these vulnerable groups are not put at greater risk.

Mobility scooters cannot be considered equivalent to pedestrians. They are motorised devices that tend to be substantially heavier and faster-moving than pedestrians, with steering that can be highly responsive to changes in surface texture or gradient, or the balance of the user. The literature suggests that operating a mobility scooter can be beyond the fitness or competence of some elderly or disabled operators and that prior assessment and training is necessary. Operators of mobility scooters appear to be at significantly greater risk of being in an accident, and of being seriously injured or fatally injured as a result, than the general public or other road users. The significant risk of injury from falls from these devices indicates a need to consider requiring restraints to be fitted, while the high incidence of head injury as a cause of death would indicate that mandatory helmet-wearing should be considered.

A national working group to address measures for standards and guidelines to ensure provision of safer infrastructure, safer mobility devices and safer device operators appears to be worthwhile.

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