

# A Scoping Review of Mobility Scooter-Related Research Studies

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## ABSTRACT

Mobility scooters are three or four wheeled powered mobility devices, which are commonly used by older adults. They differ from powered wheelchairs in terms of the manner in which they controlled, their cost, method of transfer and turning radius. Scooter drivers are frequently portrayed in the media as unsafe and a potential menace. Given the prevalence of scooters and anecdotal concerns about their use, a scoping review was undertaken to locate empirical research about power mobility scooters and identify the purpose and research methods of these studies. Twenty-nine empirical studies were identified. A cross-sectional survey was the most frequent type of study design. The most frequent purpose of the included studies was to describe scooter users' demographic characteristics, activities they did using their scooters, and frequency of accidents. In light of both the possible benefits of scooter use and potentially serious consequences of accidents, more research in this area is required to facilitate access and ensure their safe and effective use.

## INTRODUCTION

Mobility scooters are three or four wheeled powered mobility devices that tend to be less expensive than power wheelchairs. Scooters have a much larger turning radius than other wheeled mobility devices, and, therefore, are frequently used to facilitate the performance of more community-based instrumental activities living like shopping, banking and attending medical appointment. In 2006, a national survey in Canada estimated that there were over 60,000 scooter users (Statistics Canada, 2008). In contrast, a recent national survey in Australia found that 13 out of every 1000 adults used a scooter (231,000 individuals) (Australian Competition and Consumer Commission (ACCC) et al., 2012). Many people who need power mobility prefer scooters to power wheelchairs, because they believe the former are less stigmatizing, as individuals with a wide variety of abilities use these devices, whereas the latter are often used by those with greater functional impairments (Mortenson et al., 2005). For this reason, scooter users, who need more supportive seating, may resist transitioning out of their scooters.

In the media, however, scooter users are often represented negatively. Headlines like, "Police Crackdown on Mobility Scooter Mayhem as Drunk and Drug-driving Pensioners Become 8 mph Menace to Society" (Camber, 2010), "Are Mobility Scooters a Slow Motion 7mph Timebomb[...]" (Glover, 2014), and "The Trouble with Mobility Scooters (British Broadcast Corporation, 2014) portray users as primary older and often unsafe. Scooter-related deaths are frequently reported in the news (Yorkshire Evening Post, 2015). The Daily Mail (Camber, 2010) indicated that over 150 people are killed using mobility scooters each year in the United Kingdom. Because of such safety concerns, there have been calls for mandatory testing and licensing of these devices in the United Kingdom and Canada (Camber, 2010; Meiszne, 2013).

Given the prevalence of mobility scooters and the sensational manner in which they have been portrayed in the media, a scoping review was conducted to identify, empirical research about mobility scooters. Specifically this study was intended to identify and categorize any published empirical research (white or grey literature) about mobility scooters.

## METHODS

A scoping review differs from a systematic review in that it is broader in scope and frequently does not address the quality of included studies, whereas the latter addresses a focused research question and includes a narrow range of quality-assessed studies (Arksey & O'Malley, 2005).

To identify studies we used four electronic databases: Medline, Cumulated Index of Allied Health Professions (CINAHL), Embase and PsychINFO. We combined key word searches Scooter\* or power\* mobility with database specific Medical Subject Headings. In Medline we searched (Wheelchair/ or self-help devices/ or dependent ambulation/ or mobility limitation/) and (electric power supplies/ or electricity/). In CINAHL we searched "Ambulation Aids+" or "Wheelchairs, Powered" or "Wheelchairs+". In Embase we searched Electric wheelchair/ or powered wheelchair/ or [(walking difficulty/ or wheelchair/ or self help/ or physical mobility/ or assistive technology/) and (electricity/ or electrical equipment/)]. In PsychINFO we searched. (\*mobility aids/ or \*assistive technology/ or \*technology/ or \*medical therapeutic devices/ or physical mobility/). We

used the term mobility scooter in Google to identify grey literature in this area. Conference proceedings from the last 10 years of the International Seating Symposium and Rehabilitation Engineering Society of North America were hand searched. We reviewed the references of any included studies to identify other potentially relevant research.

Trained research assistants conducted the literature search. We included studies that had empirical data that could be attributed to scooter users that was published until December 2014. We excluded studies where data from scooter users was combined with data from other mobility devices users, and a sub-group analysis was not performed or less than 75% of subjects were scooter users. We used systematic reviews to identify primary studies for consideration. Data from each study was abstracted into a table of evidence. Data abstracted included citation, study design, description of participants, findings and limitations. The author conducted an inductive content analysis to identify the main topics of included studies (Krippendorff, 2004).

## RESULTS

The scoping review identified 28 relevant studies. As illustrated in Table 1 almost one-third of studies were cross-sectional surveys and approximately 20% of studies involved retrospective analysis of previously collected data (e.g., accident statistics and descriptive statistics about those who had been provided scooters in the past). Intervention studies examined the effect of scooter training, and outcomes associated with scooter provision.

Table 1 : Methods of included studies

Method	Frequency (Total = 29)*
Cross Sectional Survey	9
Retrospective data review	6
Intervention (pre/post)	5
Qualitative Interviews	3
Focus Groups	2
Product testing	2
Measurement evaluation	1
Expert panel	1

\*One study used two methods.

The main topics of included studies are described in Table 2. The majority of studies were quantitative descriptive studies that provided information about the demographic characteristics of users, descriptions of the activities they did with their devices and accident rates. For example, an Australian survey found that scooter users, in comparison to power-wheelchair users, were older (mean of 81 years vs. 57 years, respectively). Similarly, Hubbard et al. (2006) reported that the mean age of veterans who received scooters was 66 years, whereas the mean age of power wheelchair users was 62 years.

Studies have a reported a wide range of accident rates. Hoenig et al., (2007) reported an accident rate of 1.54 per person per year; however, scooter accident rates as high as 15 per person per year have been cited (ACCC et al., 2012).

Studies on training have reported mixed results. An exploratory RCT (with ten participants) by Jannink Erren-Wolters, de Kort and van der Kooij (2008) found that unspecified “conventional scooter training” twice per week for five weeks was no better than conventional scooter training supplemented with simulation training in a virtual environment. In contrast, a RCT by Niv, Weiss, & Ratzon (2009) found driving skills improved significantly for a group that received computerized cognitive training combined with driving practice, when compared to a group that received computerized cognitive training alone.

Other research has addressed a wide range of topics. Qualitative studies have explored perceptions of both users (May, Garrett & Ballantyne, 2011) and prescribers (Maywald & Stanely, 2014). Research on product testing has revealed how current Canadian building codes are not designed to accommodate the use of scooters (King, Dutta, Gorski, Holliday, & Fernie, 2011). One study sought to develop prescription guidelines for scooters (and power mobility) for individuals with spinal cord injury are brain injury (Lukersmith, Radbron, & Hopman, 2013).

Table 2. Topic of research

Topic	Frequency
Quantitative description users/activities/accidents	8
Accident statistics	5
Prescription/service deliver/provision	4
Training	4
Experiences of users	3
Environmental considerations	2
Outcomes of provision (pre/post)	2

## DISCUSSION

Despite the prevalence of these devices and safety concerns surrounding them, surprisingly little research has been done with this population in comparison with studies done among manual and powered mobility users. This may stem from the decreased amount of professional involvement in device prescription and procurement (ACCC et al., 2012).

Given different methods of reporting, it is difficult to determine whether scooter users have more accidents than users of other mobility devices. Among manual wheelchair users injury rates of between 5–15% per year have been reported (Berg, Hines, Allen, 2002; Gaal, Rebholtz, Hotchkiss, Pfaelzer, 1997). However, most of the scooter research tends to report accidents, which may or may not

involve injuries. Therefore, additional studies are necessary to answer this question more definitively.

Most of the research about scooter use is descriptive in nature. Given the limited empirical knowledge in this area, exploratory studies of this nature are definitely warranted. However, in light of the cost of these devices, accessibility barriers that users may encounter and potentially serious consequences of potential accidents, more research in this area is required. This research could include experimental studies that explore the effect of scooter training, not just on scooter skills specifically, but on broader, arguably more important outcomes like accident rates, mobility, social participation and quality of life. This research would enable these devices to be used to their full potential as both a means of mobility and a vehicle for social engagement.

## REFERENCES

- Arksey, H. & O'Malley, L. (2005) Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8, 1, 19-32.
- Australian Competition and Consumer Commission, NRMA Motoring & Services, CHOICE, EnableNSW & Flinders University. (2012). Mobility scooter usage and safety survey report, 2012. <https://www.productsafety.gov.au/content/index.phtml/itemId/996221>. Accessed Aug 19, 2013.
- Berg, K., Hines, M., & Allen, S. (2002). Wheelchair users at home: Few home modifications and many injurious falls. *American Journal of Public Health*, 92(1), 48.
- British Broadcast Corporation** (2014). The trouble with mobility scooters. <http://www.bbc.co.uk/programmes/b047h98w>
- Camber, R. (2010, August 13). Police crackdown on mobility scooter mayhem as drunk and drug-driving pensioners become 8 mph menace to society. *Daily Mail*. Retrieved from <http://www.dailymail.co.uk/news/article-1302571/Police-crack-mobility-scooter-mayhem-pensioners-8-mph-menace-society.html#ixzz3PKEXZbv8>
- Gaal, R.P., Rebholtz, N., Hotchkiss, R.D., & Pfaelzer, P.F. (1997). Wheelchair rider injuries: Causes and consequences for wheelchair design and selection. *Journal of Rehabilitation Research and Development*, 34, 58-71.
- Glover, D. (2014, May 3). Are mobility scooters a slow motion 7mph time-bomb menace to society? *International Business Times*. Retrieved from <http://www.ibtimes.co.uk/are-mobility-scooters-slow-motion-7mph-time-bomb-menace-society-1447107>
- Hoenig, H., Pieper, C., Branch, L. G., & Cohen, H. J. (2007). Effect of motorized scooters on physical performance and mobility: A randomized clinical trial. *Archives of Physical Medicine and Rehabilitation*, 88(3), 279-286.
- Hubbard, S. L., Fitzgerald, S. G., Reker, D. M., Boninger, M. L., Cooper, R. A., & Kazis, L. E. (2006). Demographic characteristics of veterans who received wheelchairs and scooters from veterans health administration. *Journal of Rehabilitation Research and Development*, 43(7), 831-844.
- Jannink, M. J. A, Erren-Wolters V., de Kort, A. C., van der Kooij, H. (2008). An electric scooter simulation program for training the driving skills of stroke patients with mobility problems: A pilot study. *CyberPsychology and Behavior*, 11(6), 751-754.
- King, E., Dutta, T., Gorski, S., Holliday, P., & Fernie, G. (2011). Design of built environments to accommodate mobility scooter users: Part II. *Disability and Rehabilitation: Assistive Technology*, 6(5), 432-439. doi: 10.3109/17483107.2010.549898
- Krippendorf, K. (2004). *Content analysis: An introduction to its methodology* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage Publications.
- Lukersmith, S., Radbron, L. & Hopman, K. (2013). Development of clinical guidelines for the prescription of a seated wheelchair or mobility scooter for people with traumatic brain injury or spinal cord injury. *Australian Occupational Therapy Journal*, 60, (6), 378-386. DOI: 10.1111/1440-1630.12077
- May, E., Garrett, R., & Ballantyne, A. (2010). Being mobile: Electric mobility-scooters and their use by older people. *Ageing and Society*, 30(7), 1219-1237.
- Meiszner, P. (2013, August 23). Town of Sidney calls for riders of motorized scooters to be licensed. *Global News* <http://globalnews.ca/news/799377/town-of-sidney-calls-for-riders-of-motorizedscooters-to-be-licensed/> Accessed August, 26, 2013.
- Maywald, A. & Stanley, M. (2014). Prescribing mobility scooters in Australia: Occupational therapists' narratives. *Australian Occupational Therapy Journal*. Article first published online: 13 MAY 2014. DOI: 10.1111/1440-1630.12131. <http://onlinelibrary.wiley.com/doi/10.1111/1440-1630.12131/full>

Mortenson, W.B., Miller, W.C., Boily, J., Steele, B., Odell, L. Crawford, E.M. & Desharnais, G. (2005). Perceptions of power mobility use and safety within residential facilities. *Canadian Journal of Occupational Therapy*, 72(3), 142-152. PMID: 15988961

Niv, A., Weiss, P., & Ratzon, N. (2008). The effectiveness of combining occupational therapy intervention with computerized training for improved driving on the electric scooter. *Israeli Journal of Occupational Therapy*. 18(1), E14-15.

Statistics Canada (2008). Participation and activity limitation survey 2006: A profile of assistive technology for people with disabilities. Statistics Canada. Ottawa, ON: Statistic Canada;89-628-X-no.005.

*Yorkshire Evening Post* (2015, January 17). Mobility scooter man died in Leeds road 'tragedy', <http://www.yorkshireeveningpost.co.uk/news/latest-news/top-stories/mobility-scooter-man-died-in-leeds-road-tragedy-1-7056492>