



UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

MSc Occupational Therapy

OT6054

Occupational Therapy Project 4

13006495

Dr Rosie Gowran

Word Count: 3,527

11th April 2016

To Explore the Efficacy of Wheelchair Skills Training

Background: There are millions of wheelchair users throughout the world, and it takes a lot of practice to become an efficient wheelchair user. However, formal wheelchair skills training is still quite uncommon despite the fact that it has been shown to be a safe and practical method of improving the wheelchair skills of wheelchair users, caregivers and clinicians. Poor wheelchair skills can result in decreased occupational performance, which makes this topic relevant to Occupational Therapy.

Aim: To explore the efficacy of wheelchair skills training.

Method: A scoping review guided by Arskey and O' Malley's (2005) framework.

Results: Nine studies were included in total. Key stake holders identified included wheelchair users, caregivers and Occupational Therapists. The results were presented in three themes which highlight the benefits of wheelchair skills training.

Conclusion: Wheelchair skills training is effective and results in benefits such as improved community access, reduced healthcare costs and a reduction in caregiver reliance.

Introduction and Literature Review

According to the World Health Organisation (WHO) (2013) there are over seventy million wheelchair users worldwide with 35,000 of those residing in Ireland (Central Statistics Office 2011). A wide range of people, of all ages, use wheelchairs, whether it be for a short term rehabilitation, or long term use. According to Kinross (2013), most children get their first wheelchair between the ages of two and four years, however, a person of any age can suddenly become a wheelchair user. According to Gowran et al (2012) the importance of appropriate wheelchair seating and provision cannot be underestimated. Poor wheelchair and seating provision can result in poor physical health, decreased social participation, increased healthcare costs and can also have a negative impact on occupational performance (Arthanat et al 2007). WHO (2013) highlight the importance of wheelchair training and education and note that it requires investigation. This makes this study relevant to a wide range of people, including children and adult wheelchair users, long and short-term wheelchair users, carers and clinicians.

Bennett (2013) notes the amount of practice it takes to become an efficient wheelchair user. There is a variety of skills to learn in order to operate a wheelchair effectively in a

community such as transfers, mobility skills, activities of daily living (e.g. toileting, dressing, bathing) and advanced skills such as wheelchair maintenance and housework and it takes time to master these skills. However, if some training is provided by a therapist, it could improve these skills greatly. If a wheelchair user can master the necessary skills required to operate a wheelchair effectively, it can greatly reduce the impact of their disability (Bennett 2013). Furthermore, if mobility and functioning are improved, this may reduce the user's reliance on others for assistance (Bennett 2013). Bennett (2013) also highlights that wheelchair skills training can improve a users' navigation skills, performance in activities of daily living, lessen future health costs and encourage participation in social activities. Wheelchair users and their caregivers would benefit greatly from being taught skills such as manoeuvring through doorways, up and down curbs or over uneven surfaces. This would allow them to access the community more effectively. If these skills are lacking, it may limit accessibility, participation and increase the risk of injury as suggested by Bennett (2013).

WHO (2008) highlights that although the wheelchair is one of the most important rehabilitation interventions, wheelchair users face a multitude of problems and barriers when it comes to mobility and participation. Wheelchair skills training attempts to tackle these problems. The Wheelchair Skills Training Program (WSTP) was developed in 1996 to formalise this training. The WSTP consists of a pre-training assessment (the Wheelchair Skills Test) followed by training sessions and then a post training assessment. Routhier et al (2012) state that formal wheelchair skills training is still quite uncommon despite the fact that the WSTP has been shown to be a safe and practical method of improving the wheelchair skills of wheelchair users, caregivers and clinicians.

This research is of value because wheelchair skills training could greatly benefit the key stakeholders involved in wheelchair provision (Routhier et al 2012). The literature suggests that a number of people could benefit from the WSTP, including adults and children who use wheelchairs, caregivers, student clinicians and practicing clinicians. To function effectively, wheelchair users need a variety of skills, these skills can be the difference between dependent and independent living according to Hoening et al (2003). This is a particular area of interest in Occupational Therapy as Occupational Therapists often deal with helping clients live as independently as possible. Occupational Therapists are also often involved in wheelchair and seating provision so the area of wheelchair skills training is also relevant to the profession

(Vining Radomski and Trombly Latham 2008). Hoeing et al (2003) also point out that untrained caregivers are vulnerable to psychological and physical harm when providing care so it is important to provide them with the skills they require, not only to improve the quality of care they provide but also to reduce their own risk of harm. These studies and many others suggest that the WSTP is safe, practical and valuable when used to improve the wheelchair skills of a range of people. This study aims to explore the efficacy of Wheelchair Skills Training.

Methods

This study is part of a bigger project in the University of Limerick on wheelchair and seating provision across the life course. The overall project is following a Critical Theory paradigm of enquiry and this will also theoretically inform this research. A Critical Theory approach is inductive and involves a collaboration between the researcher and the researched. It specifically looks at power relations and generally aims to emancipate the oppressed (Tashakkori and Teddlie 2010). Other researchers are looking at the benefits of activity and leisure for wheelchair users but this study is exploring the efficacy of Wheelchair Skills Training.

There are a wide range of different approaches that could be used when carrying out this research but a scoping review was chosen as the most appropriate method for this study. The literature was critically appraised using the McMaster (2007) and CASP (2014) tools as a guide to ensure the selected papers were as reliable and trustworthy as possible. As there is little research available on the benefits of wheelchair skills training, it was decided that interviews or a survey were not adequate for this study as very little is understood to inform a survey. Petticrew and Roberts (2006) point out that a scoping review does not typically assess the quality of the studies included, however, it was decided that using the McMaster (2007) and CASP (2014) tools as a guide would be beneficial to strengthen the rationale for the inclusion of the selected papers. It was paramount to ensure that all of the papers used were treated in an ethical manner. All of the papers were required to have ethical approval and if the ethical standards of a paper were unclear, it was excluded. The use of an Excel spreadsheet aided transparency in any decisions regarding including or excluding papers. This researcher was conscious that a researcher must analyse data correctly and strive to remain unbiased when doing so (Flick 2007).

Scoping reviews are useful when an area has not been comprehensively reviewed before, where both scientific and grey literature are important and it can then be used to guide a systematic review according to Hunt and McKay (2015). Therefore a scoping review appeared to be an appropriate method for this study as it has not been comprehensively reviewed before. Arksey and O' Malley (2005) published the first methodological framework for conducting scoping reviews. They outlined five steps to guide researchers through the process: identifying the research question, identifying relevant studies, study selection, data charting and finally, collating, summarizing, and reporting the results. Arksey and O' Malley's (2005) five steps are outlined as follows;

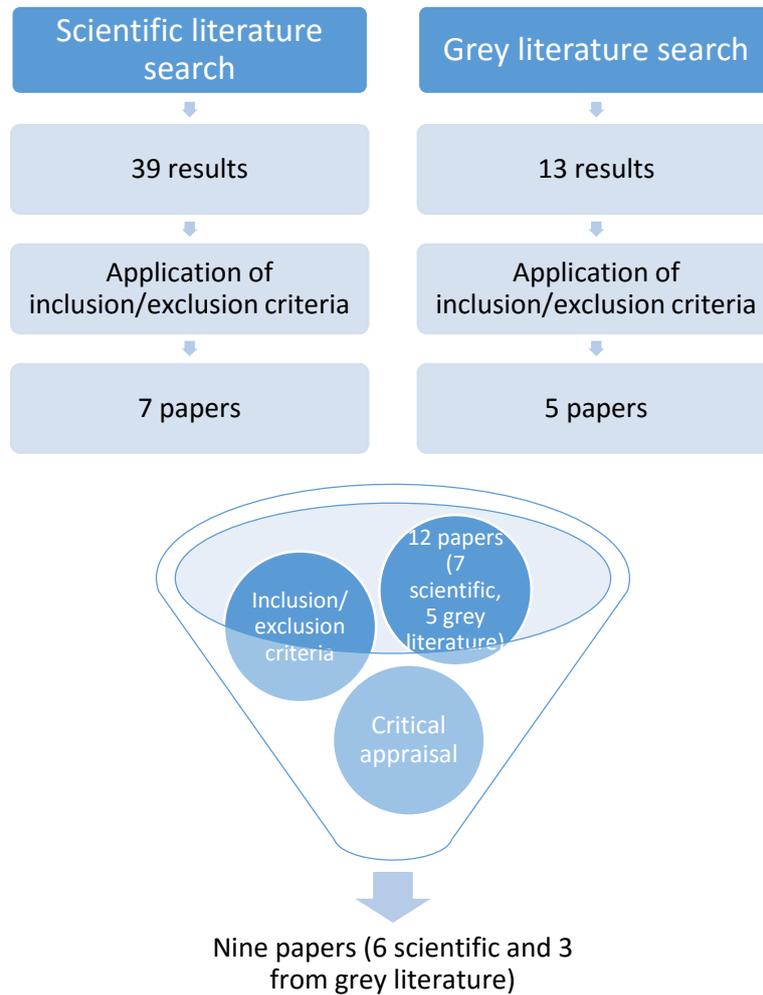
Identifying the research question

This research aims to explore the efficacy of wheelchair skills training.

Identifying relevant studies

The following databases were searched: EBSCO, Medline, AMED, Cochrane library, PsycINFO, SAGE, ScienceDirect, Web of Science and google scholar was also used. As Lee Kirby (Atlantic Mobility Action Project 2013) appeared as the author on a number of relevant papers, his website was also searched. Key words entered included: Wheelchair skills, wheelchair training, wheelchair skills training, wheelchair mobility, wheelchair mobility skills, wheelchair skills program and wheelchair training program. Boolean operators and truncation were used. The search resulted in 52 papers in total, 40 of which were not relevant to this study when inclusion/exclusion criteria were applied. 12 papers were then critically appraised and 9 were deemed fit to include in this study.

Fig.1 Visual representation of Methodology.



Study Selection

Studies were selected using the inclusion and exclusion criteria outlined in Table 1 below.

Table 1. Inclusion/Exclusion Criteria.

Included	Excluded
Published within 1995-2015	Published before 1995
Written in English	Not written in English
Reports and peer reviewed journals	Books and chapters
Involving children/adults/power and manual wheelchairs/carers/occupational therapists	Involving clinicians other than occupational therapists
Obtained ethical approval	Did not mention ethics

A number of papers included research on clinicians from a wide variety of disciplines but, due to time and word count limitations, it was decided that was not within the scope of this

study. Therefore, the papers including clinicians were reduced to only those including Occupational Therapists, as mentioned before, this area is of particular relevance to the profession. Using the McMaster (2007) and CASP (2014) tools as a guide to critically appraise the papers, 9 papers were then included.

Data charting

A spreadsheet was created to chart the relevant data and to critically appraise the papers.

Categories included:

- Citation
- Purpose or Research Question
- Setting
- Sampling Strategy
- Ethical Issues
- Methods
- Participants
- Results
- Future Study
- Limitations

See Tables 2 and 3. for spreadsheet information.

Content analysis was then used to make sense of the material and this was used to summarise and report the results (Krippendorff 2004). The data was then summarised under three themes (Rumrill et al 2010).

Collating, summarising and reporting the results

The results were narratively presented and discussed the key stakeholders that were involved in the studies and the findings of the studies under three themes which highlight the efficacy of wheelchair skills training. Levac et al (2010) recommend applying meaning to the results by considering the implications of the findings of the scoping review within the practice context, therefore, this was highlighted in the results section.

Authors	Purpose	Setting	Sampling strategy	Ethics	Methods	Participants	Results	Future study	Limitations	Include/exclude
Best, K.L., Kirby, R.L., Smith, C. and MacLeod, D.A. (2005)	To test the hypotheses that wheelchair skills training of community-based manual wheelchair users is effective, safe and practical.	Rehabilitation centre and community.	To recruit manual wheelchair users from the community, used posters, word of mouth, clinicians on the outpatient and inpatient services.	Ethical approval obtained. Informed consent obtained from each participant.	Randomized control trial.	15 men and 5 women (age range 21-77yrs).	The WSTP group improved to a significantly greater extent than the control group.	Replication with a larger sample size, more diverse community settings.	Small sample of convenience. Control group did not receive any placebo intervention. It is possible that the social interactions with the trainer accounted for the improvements in the WSTP group rather than the actual training.	Include.
Mountain, A.D., Kirby, R.L., Smith, C., Eskes, G. and Thompson, K. (2014)	Test the hypothesis that people with stroke who receive formal powered wheelchair skills training improve their wheelchair skills.	Rehabilitation centre.	Approached by clinicians involved in their care and screened by same.	Ethical approval obtained. All participants provided informed consent.	Randomised control trial.	17 participants with stroke.	Post intervention, the intervention group scored significantly higher in the WST.	Larger sample size to permit secondary analyses, using powered wheelchairs of different types, providing an opportunity to practice between sessions.	Small sample size, large number of dropouts, active control intervention not used.	Include.
Kirby, R.L., Miffelen, N.J., Thibault, D.L., Smith, C., Best, K.L., Thompson, K.J. and MacLeod, D.A. (2004)	Wheelchair skills training program is effective in improving the wheelchair-handling skills of untrained caregivers.	Rehabilitation centre and community.	Word of mouth through clinicians and screened by same.	Ethical approval, informed consent.	Within-participant comparisons. Caregivers underwent the WSTP adapted for caregivers.	24 caregivers of manual wheelchair users.	Caregivers improved in the WST by 22% and the skills were well retained.	To investigate if formal training more effective/safer than simple experience? Long-term benefits on safety, community participation, caregiver burden?	Inability to fully blind testers, effects of participant fatigue, confounding effect of assistance by the wheelchair users.	Include.
Mountain, A., Smith, C. and Kirby, R.L. (2009)	Present two case reports that shed light on whether routine periodic wheelchair-skills assessment and training are relevant for long-standing wheelchair users.	Rehabilitation centre.	Unclear.	Participants gave informed consent. Ethical approval not mentioned.	Cases presented.	A 60 year old man and 34 year old woman.	Even in long standing wheelchair users, wheelchair skills should be routinely assessed as part of a periodic functional assessment	Future research is needed to determine if such a process would be an effective way to improve the safety and participation of wheelchair users.	Only two participants.	Not included due to lack of information re: ethics.
Kirby, R.L., Crawford, K.A., Smith, C., Thompson, K.J. and Sargeant, J.M. (2001)	A multicomponent workshop about wheelchairs, tailored for undergraduate medical students, is effective in improving medical students' wheelchair-related knowledge, skills, and attitudes.	Unclear.	A total of 196 first- and second-year medical students were invited to participate through Email and classroom announcements. Twenty-six potential participants were screened by self-report regarding the inclusion/exclusion criteria and all were enrolled.	Ethical approval obtained, informed consent given by each participant.	A randomized controlled trial.	Twenty-six medical students (11 first- and 15 second-year students) volunteered to participate.	After the workshop, the mean scores on the written knowledge test and practical examination for the intervention group were higher than for the control group by 23.9% and 34.4% respectively.	The content of future workshops should be altered to reflect the participants' feedback (e.g., spending more time on transfers). Assessing the intervention group's knowledge and skill retention and the long-term usefulness of the workshop.	All participants were students of a single university, there is the possibility that although substantial improvements in wheelchair-related knowledge and skills were observed in ideal research conditions, this will not translate to other settings.	Not included due to participants being from an excluded category.

Table 2. Grey literature.

Authors	Purpose	Setting	Sampling Strategy	Ethics	Methods	Participants	Results	Future study	Limitations	Include/exclude
Sakakibara, B.M., Miller, W.C., Souza, M., Nikolova, V. and Best K.L. (2013)	To examine the effects of wheelchair skills training on confidence in older adults who are inexperienced wheelchair users.	Research laboratory in a rehabilitation hospital.	A volunteer sample was recruited from the research centre's participant database of individuals who agreed to be involved in future studies and advertisements in the community.	Ethical approval was obtained. Informed consent gained from each participant.	A parallel group, single-blind randomised control trial.	20 participants, 65yrs and older,	The WSTP had greater effects on confidence in areas related to manoeuvring around the physical environment, knowledge and problem solving, advocacy and managing emotions	Future trials should consider a control procedure to eliminate any changes that may occur because of the more frequent use of a manual wheelchair by the group receiving the WSTP.	As participants are not wheelchair users, motivation to master the skills may have been lower than that of a new wheelchair user.	Include.
Coolen, A.L., Kirby, R.L., Landry, J., MacPhee, A.H., Dupuis, D., Smith, C., Best, K.L., MacKenzie, D.E. and MacLeod, D.A. (2004)	To test the hypotheses that a brief formalised period of wheelchair skills training results in significantly greater overall improvements in wheelchair skills than a standard undergraduate Occupational Therapy curriculum alone.	Rehabilitation centre.	82 undergraduate students in an Occupational Therapy course. 40 second years and 42 fourth years.	Ethic approval obtained. All participants gave informed consent.	Randomised control trial.	82 undergraduate students in an Occupational Therapy course. 40 second years and 42 fourth years.	The WSTP is an effective way to improve wheelchair skills performance of Occupational Therapy students.	Future studies could assess which components of the WSTP contribute most to improving wheelchair skills (e.g. video, demonstrations, the practice, the feedback).	All participants were students of a single university.	Include.
MacPhee, A.H., Kirby, R.L., Coolen, A.L., Smith, C., MacLeod, D.A. and Dupuis, D.J. (2004)	To test the hypothesis that a brief, formalised period of wheelchair skills training is safe and results in significantly greater improvements in wheelchair skills than in a standard rehabilitation program.	Rehabilitation centre.	35 wheelchair users involved in an initial rehabilitation program in a rehabilitation centre were recruited within 10 days of admission. A care provider approached them.	Ethics approval obtained. Participants gave informed consent.	Randomised control trial.	35 wheelchair users admitted for initial rehabilitation.	The treatment group showed significantly greater improvements than the control group particularly for the gravel and high-curb descent skills.	Would be beneficial to gain a better understanding of the psychosocial effect that individual skill improvement has on wheelchair users.	Non-random sample used. Could not control amount of wheelchair experience prior to the study or wheelchair changes over the course of the study	Include.
Sawatzky, B., Rushton, P.W.,	Determine the effectiveness of a 2 day modified wheelchair skills	Unclear.	Recruited from local Spinal Cord Clinic using	Ethical approval obtained, one parent/guardian attended the	2 day wheelchair skills programme.	6 children (aged 6-19 years) with spinal cord	14% increase in skills based on WST.	COPM suggested to be used in addition with the ASK.	Variation in participant's previous wheelchair	Include.

Denison, I. and McDonald, R. (2012)	programme for children.		advertisements at the clinic.	programme with their child.		injury or spina bifida. Manual wheelchair users, full or part-time.			skills training, variation in age, ASK proved challenging.	
Routhier, F., Kirby, R.L., Demers, L., Depa, M. and Thompson, K. (2012)	Users of manual wheelchairs who received the French-Canadian version of the WSTP would significantly improve their wheelchair-skills capacity and that these improvements would be retained at 3 months.	3 Rehabilitation Centres.	Sample of convenience. Potential participants approached by clinicians at the rehabilitation centres of hospital, screened by member of research team.	Ethical approval obtained, informed consent given by each participant.	Multicentre, single-blind randomised controlled trial.	39 manual wheelchair users, sample of convenience.	WSTP training improved wheelchair skills immediately after training, particularly at the community-skills level, but this study did not show statistically significant differences between the 2 groups at 3 months.	Studies with a larger sample size, better documentation of standard care, better blinding, a placebo intervention, longer retention period, assessment of training of caregivers.	Small sample, high dropout rate, not possible to blind the WSTP group.	Include.
Best, K.L., Routhier, F. and Miller, W.C. (2015)	To describe current practices for manual wheelchair (MWC) skills training in Canadian rehabilitation centers.	Rehabilitation Centres.	A representative from each facility was contacted by telephone.	Ethical approval obtained.	An online survey.	The majority of respondents were English speaking (52/68) OTs (42/68) with 55 years of experience in rehabilitation (32/68).	Basic MWC skills training (e.g. wheellocks) was consistently part of clinical practice (45/68), while advanced skills training (e.g. curb-cuts) was rare (8/68).	It is possible that the WSTP may not fit within existing clinical practice strategies, which highlights the need for further research on approaches to wheelchair skills training.	The anonymity of responses minimizes the ability to ensure there was only one response from each centre.	Include.
Giesbrecht, E.M., Wilson, N., Schneider, A., Bains, D., Hall, J. and Miller, W.C. (2015)	To evaluate the impact of providing intensive large-group training on wheelchair-specific self-efficacy and skill capacity among occupational therapy students.	Universities.	Invited OT students in 2 cities to participate.	Participants provided informed consent. No mention of ethical approval.	Intervention study using before-after trial.	Volunteer sample of MSc OT students (N=65).	Participants demonstrated an improvement in confidence and skills post intervention.	Consider the contribution of factors inherent in the boot camp approach (duration, intensity, range of skills, group size, etc.).	No control group, absence of follow up.	Not included due to lack of mention of ethical approval.

Table 3. Scientific Literature.

Results/Findings

The search resulted in 52 articles. Application of the inclusion and exclusion criteria found 12 to be relevant to this study and critical appraisal revealed nine articles suitable for this study. Of the included papers, eight studies involved manual wheelchairs and one looked at power chairs. Five studies involved adults, two studies involved Occupational Therapists, one study involved carers and one study involved children. The studies consisted of six randomised control trials, one within-participant comparison, one two day wheelchair skills programme and one survey. Krippendorff (2004) describes ten steps to completing content analysis, and these were followed to collate the information into three themes.

All studies found that wheelchair skills training improved the participants' wheelchair skills and was beneficial in a number of ways which can be discussed under three themes; Community Access, Financial Benefits and Caregiver reliance.

Community Access

Access to the community was mentioned in a number of studies and can become a barrier to community participation and occupational performance. An improvement in physical wheelchair skills resulted in an increase in community access in a number of studies. In the study by Best et al (2005), the participants reported that without the training, they would not have attempted some of the community skills and the study found that the participants' physical wheelchair skills, such as navigating gravel and descending a high-curb, improved following wheelchair skills training. Sakakibara et al (2013) noted that confidence improved in areas relating to manoeuvring around the physical environment, knowledge and problem solving which may also translate to increased confidence in the community. Sawatzky et al (2011) found that the participants demonstrated an increase in independence, improvement in wheelchair skills and a reduction of pain and fatigue following the wheelchair skills training. There was an improvement in skills such as opening doors, negotiating potholes, ascending and descending levels, turning and wheelies, which are all vital in negotiating community environments. Best et al (2015) note that having the capacity for safe and independent wheelchair use in environments that extend beyond the home could lead to increased community participation, participation in physical activity and a better quality of life. Finally, Coolen et al (2004) discuss how their study allowed the Occupational Therapy students to experience the challenges involved in learning to use a wheelchair. This will translate to their future practice and allow them to provide a higher quality service when dealing with wheelchair users. This in turn can result in Occupational Therapists encouraging wheelchair users to improve their wheelchair skills in order to improve their occupational performance and community participation.

Financial Benefits

As improving wheelchair skills has a positive impact on wheelchair user safety, wheelchair skills training has the potential to provide financial benefits that far outweigh the costs. Best et al (2005) highlighted the

potential for reduced incidence of injuries and increased incidence of returning to employment following wheelchair skills training. The ability to manoeuvre the wheelchair in a safe and effective manner results in less accidents and as wheelchair users become more aware of the risks and safety issues, they are less likely to take dangerous risks. They have the skills and knowledge to complete tasks such as ascending and descending curbs safely. Best et al (2015) also note that providing wheelchair users with skills and knowledge of associated risks could reduce the risk of injury and possible death associated with unsafe wheelchair use and, from an economic perspective, wheelchair-related hospitalisation costs would then be reduced.

Caregiver Reliance

Best et al (2015) note that the benefits of wheelchair skills training may also extend to caregivers, who are commonly relied upon to assist with mobility and facilitate engagement in social activities for wheelchair users. Best et al (2005) highlighted that investing in wheelchair skills training could reduce the need for caregiver support. If the wheelchair user is more confident and competent in engaging in occupations in their wheelchair, the caregiver burden would be reduced. MacPhee et al (2004) and Sawatzky et al (2012) also highlighted that the wheelchair skill training allowed participants to do more, with less pain and fatigue thus reducing caregiver reliance and promoting a more independent lifestyle. Furthermore, Kirby et al (2004) explained that carers are at risk of psychological and physical harm when providing care. When carers are provided with wheelchair-handling skill training, it could reduce caregiver stress and improve quality of life for both the carer and wheelchair user. Coolen et al (2004) also highlight the importance of training Occupational Therapists in this area as they are involved in prescribing, adjusting and training wheelchair users. As improved wheelchair skills resulted in increased community access and participation, it would suggest that investing in wheelchair skills training would result in reduced reliance on caregivers and clinicians.

Discussion

This study sought to explore the efficacy of wheelchair skills training. This scoping review suggests that wheelchair skills training can improve community access and participation, reduce health costs by increasing safe practice of wheelchair users and reduce caregiver reliance which benefits both the wheelchair user and the caregiver. This implies that wheelchair skills training is effective and worth investing in.

Many studies support the ideas suggested in this study. Buhse (2008) note that caregivers who experience burden are at a higher risk of experiencing depression and a lower quality of life. This mirrors the findings of this study which suggest that wheelchair skills training can be effective in reducing caregiver reliance and

therefore reducing caregiver burden. A cross-sectional survey carried out by Edwards and McCluskey (2010) pointed out that increased access to the community can have negative outcomes such as accidents resulting in injuries. This highlights the importance of improving wheelchair skills to increase safety awareness and safe practice when manoeuvring the wheelchair. Fostering community access and participation for wheelchair users supports the American Occupational Therapy Association's (AOTA's) commitment to inclusion and non-discrimination of all persons (AOTA, 2009).

WHO (2012) supports the idea that wheelchair skills training is important and effective. WHO (2012) have developed a Wheelchair Service Training Package aimed at the key stake holders identified in this study; wheelchair users, caregivers and clinicians. The main purpose of the training package is to develop the skills and knowledge required by personnel involved in wheelchair service delivery. An important aim of the training package is to get it integrated into the regular rehabilitation training programs, including Occupational Therapy. As mentioned previously, this study is relevant to Occupational Therapy as they are a key stakeholder in the provision, education and training of wheelchairs and wheelchair skills. Based on the randomised control trial conducted by Coolen (2004) it would be beneficial for Occupational Therapy students to receive wheelchair skills training during their degree to improve their future practice. This indicates that this study is relevant and supported by current literature.

Limitations and Future research

As with most research, this study has a number of limitations. The scoping review method, although appropriate for this study, is not as comprehensive and rigorous as a systematic review (Arskey and O' Malley 2005). However, it is hoped that this study could inform a future systematic review. Due to time and word count limitations, papers discussing clinicians other than Occupational Therapists, of which there were many, were omitted. These professions could be included in future work. The search strategy excluded non-English papers which also may provide a greater insight into this topic.

Conclusion

This study sought to explore the efficacy of wheelchair skills training. Through applying inclusion and exclusion criteria and critically appraising the articles, nine studies were included in the scoping review. Content analysis summarised the findings into three main themes; community access, financial benefits and caregiver reliance. Relevance to Occupational Therapy was also mentioned. This study suggests that wheelchair skills training is a relevant topic and is an effective, safe and practical method which can result in a number of benefits to the key stakeholders of wheelchair seating and provision, namely, wheelchair users, caregivers and clinicians.

American Occupational Therapy Association (2009) 'Occupational therapy's commitment to non-discrimination and inclusion', *American Journal of Occupational Therapy*, 63, 819–820.

Arksey, H. and O' Malley, L. (2005) 'Scoping studies: towards a methodological framework', *International Journal of Social Research Methodology*, 8, 19–32.

Arthanat, S., Bauer, S., Lenker, J., Nochajski, S. and Wu, Y. (2007) 'Conceptualization and measurement of assistive technology usability', *Disability and Rehabilitation: Assistive Technology*, 2, 235-248.

Atlantic Mobility Action Project (2013) Publications, [online], available:

http://www.amap.ca/index.php?option=com_content&view=article&id=64&Itemid=62 [accessed 10 April 2016].

Bennett, L. (2013) 'Wheelchair skills training in Canada', ICORD, (online), 23 Sept, available:

<http://icord.org/2014/09/wheelchair-skills-training-in-canada/> [accessed 05 March 2015].

Best, K.L., Kirby, R.L., Smith, C. and MacLeod, D.A. (2005) 'Wheelchair skills training for community-based manual wheelchair users: A randomized controlled trial', *Archives of Physical Medicine and Rehabilitation*, 86, 2316-2323.

Best, K.L., Routhier, F. and Miller, W.C. (2015) 'A Description of Manual Wheelchair Skills Training: Current Practices in Canadian Rehabilitation Centers', *Disability and Rehabilitation: Assistive Technology*, 10(5), 393-400.

Buhse, M. (2008) 'Assessment of Caregiver Burden in Families of Persons with Multiple Sclerosis', *Journal of Neuroscience Nursing*, 40(1), 25-31.

Central Statistics Office (2011) This is Ireland: Part 2, [online], available:

<http://www.cso.ie/en/census/census2011reports/census2011thisisirelandpart2/> [accessed 09 April 2016].

Coolen, A.L., Kirby, R.L., Landry, J., MacPhee, A.H., Dupuis, D., Smith, C., Best, K.L., MacKenzie, D.E. and MacLeod, D.A. (2004) 'Wheelchair Skills Training Program for Clinicians: A Randomized Controlled Trial With Occupational Therapy Students', *Archives of Physical Medicine and Rehabilitation*, 85, 1160-1167.

Critical Appraisal Skills Programme (CASP). (2014) Qualitative research checklist [online], CASP Tools & Checklists, available: <http://www.casp-uk.net/#!/casp-tools-checklists/c18f8> [accessed 10 November 2014].

Edwards, K. and McCluskey, A. (2010) 'A survey of adult power wheelchair and scooter users', *Disability and Rehabilitation: Assistive Technology*, 5(6), 411-419.

Flick, U. (2007) *Designing Qualitative Research*. USA: Sage.

Gowran, R.J., McCabe, M., Murphy, N., Murray, E. and McGarry, A. (2012) 'Wheelchair and seating service provision: exploring users perspectives', *Irish Journal of Occupational Therapy*, 39(2), 3-14.

Hoeing, H., Landerman, L., Shipp, K. and George, L. (2003) 'Activity restriction among wheelchair users', *Journal of the American Geriatrics Society*, 51, 1244-1251.

Hunt, E. and McKay, E.A. (2015) 'A scoping review of time-use research in occupational therapy and occupational science', *Scandinavian Journal of Occupational Therapy*, 22(1), 1-12.

Kinross, L. (2013) 'What you should know about the first wheelchair', Answers4Families (online), 2 Jan, available: <http://www.answers4families.org/family/special-needs/assistivetechonology/what-you-should-know-about-first-wheelchair> [accessed 21 March 2015].

Kirby, R.L., Miffelen, N.J., Thibault, D.L., Smith, C., Best, K.L., Thompson, K.J. and MacLeod, D.A. (2004) 'The manual wheelchair-handling skills of caregivers and the effect of training', *Archives of Physical Medicine and Rehabilitation*, 85, 2011-2019.

Krippendorff, K. (2004) *Content analysis: an introduction to its methodology*. USA: Sage.

Levac, D., Colquhoun, H. and O'Brien, K.K. (2010) 'Scoping studies: advancing the methodology', *Journal of Implementation Science*, 5, 69.

MacPhee, A.H., Kirby, R.L., Coolen, A.L., Smith, C., MacLeod, D.A. and Dupuis, D.J. (2004) 'Wheelchair Skills Training Program: A Randomized Clinical Trial of Wheelchair Users Undergoing Initial Rehabilitation', *Archives of Physical Medicine and Rehabilitation*, 85, 41-50.

McMaster University (2007) Critical review form-qualitative studies (Version 2.0) [online], available: http://www.srs-mcmaster.ca/Portals/20/pdf/ebp/qualreview_version2.0.pdf [accessed 10 November 2014].

Mountain, A.D., Kirby, R.L., Smith, C., Eskes, G. and Thompson, K. (2014) 'Powered Wheelchair Skills Training for Persons with Stroke: A Randomised Control Trial', *American Journal of Physical Medicine and Rehabilitation*, 93, 1031-1043.

Petticrew, M and Roberts, H. (2006) *Systematic Reviews in the Social Sciences: A Practical Guide*. USA: Blackwell Publishing.

Routhier, F., Kirby, R.L., Demers, L., Depa, M. and Thompson, K. (2012) 'Efficacy and retention of the French-Canadian version of the wheelchair skills training program for manual wheelchair users: A randomized controlled trial', *Archives of Physical Medicine and Rehabilitation*, 93, 940-948.

Rumrill, P.D., Fitzgerald, S.M. and Merchant, R. (2010) 'Using scoping literature reviews as a means of understanding and interpreting existing literature', *Journal of Prevention, Assessment and Rehabilitation*, 35(3), 339-404.

Sakakibara, B.M., Miller, W.C., Souza, M., Nikolova, V. and Best K.L. (2013) 'Wheelchair Skills Training to Improve Confidence With Using a Manual Wheelchair Among Older Adults: A Pilot Study', *Archives of Physical Medicine and Rehabilitation*, 94, 1031-1037.

Sawatzky, B., Rushton, P.W., Denison, I. and McDonald, R. (2012) 'Wheelchair Skills Training Programme for Children: A Pilot Study', *Australian Occupational Therapy Journal*, 59, 2-9.

Tashakkori, A. and Teddlie, C. (2010) *SAGE Handbook of mixed methods in social & behavioural research*, 2nd edition. USA: SAGE Publications, Inc.

Vining Radomski, M. and Trombly Latham, C.A. (2008) *Occupational Therapy for Physical Dysfunction*, 6th ed. USA: Lippincott Williams and Wilkins.

World Health Organisation (2008) *Guidelines on the provision of manual wheelchairs in less resourced settings*. Switzerland: WHO Press.

World Health Organisation (2012) *Wheelchair Service Training Package; Reference manual for participants*. Switzerland: WHO Press.

World Health Organisation (2013) 'Disability and Health', [online], available:
<http://www.who.int/ageing/about/facts/en/> [accessed 09 April 2016].