Wheelchair skills training to improve confidence with using a manual wheelchair among older adults: A pilot study

Brodie M. Sakakibara, BSc, William C. Miller, PhD, FCAOT, Melanie Souza, OT (C), Viara Nikolova, OT (C), and Krista L. Best, MSc.

Graduate Program in Rehabilitation Sciences, Faculty of Medicine, University of British Columbia, Vancouver, BC, Canada (Sakakibara, Miller, Best); From the GF Strong Rehabilitation Research Lab, Vancouver, BC, Canada (Sakakibara, Miller, Best); From the Vancouver Coastal Health Research Institute, Vancouver, BC, Canada (Sakakibara, Miller, Best); From the Department of Occupational Science and Occupational Therapy, Faculty of Medicine, University of British Columbia, Vancouver, BC, Canada (Miller, Souza, Nikolova)

Abstract

Objectives—To examine the effects of wheelchair skills training on confidence in older adults who are inexperienced with using a wheelchair.

Design—Parallel group, single blind randomized controlled trial

Setting—Vancouver, Canada

Participants—Participants (N=20) who were community-living older adults at least 65 years old (mean = 70 years), 50% female, and who had no prior experience using a wheelchair were randomly allocated to an intervention (n=10) or control (n=10) group.

Intervention—The intervention group received two 1-hour training sessions that followed the Wheelchair Skills Training Program (WSTP) protocol. The control group received a single socialization contact.

Main Outcome Measure—The Wheelchair Use Confidence Scale-Manual (WheelCon-M) was used to evaluate confidence with using a manual wheelchair. The WheelCon-M is a self-report questionnaire comprised of 65 items in 6 conceptual areas.

Results—A 1-way between groups analysis of covariance revealed a significant difference in post-intervention WheelCon-M scores between the intervention and control groups [$F(1,17) =$

Corresponding author: William C. Miller, PhD, FCAOT, Department of Occupational Science and Occupational Therapy, University of British Columbia, T325-2211 Wesbrook Mall, Vancouver, BC V6T 2B5, Tel work: 604-714-4108, Fax: 604-714-4168, bcmiller@telus.net.

Material in this manuscript was presented in part at the Canadian Association of Occupational Therapists Conference, Quebec City, QC, June 6–9, 2012.

We certify that no party having a direct interest in the results of the research supporting this article has or will confer a benefit on us or on any organization with which we are associated AND, we certify that all financial and material support for this research (eg, NIH or NHS grants) and work are clearly identified in the title page of the manuscript.

The manuscript submitted does not contain information about medical device(s).

Reprints are not available from the authors

Clinical trial identifier: NCT01243164

10.9, $p = 0.004$] after controlling for baseline WheelCon-M scores. A large effect size was also observed (partial eta squared = 0.39). Secondary analyses revealed the WSTP had greater effects on confidence in areas related to maneuvering around the physical environment, knowledge and problem solving, advocacy, and managing emotions, than in areas related to performing activities and behaving in social situations.

Conclusion—Two 1-hour WSTP sessions improves confidence with using a manual wheelchair among older adults, inexperienced with using a wheelchair.

Keywords

aging; wheelchairs; mobility; self-efficacy

Older adults (65 years) are the largest consumers of wheelchairs in North America.¹ Prevalence data indicates that this population is 4 times as likely to use a wheelchair than younger individuals.¹ The most recent estimates suggest that 81,300 community living older adults use a wheelchair in Canada,¹ and 864,000 older adults in the United States.² Because the need for a wheelchair increases with age,¹⁻³ more older wheelchair users are expected in the future given the increase in the number of individuals 65 years and older and because older individuals are living longer.

Individuals with mobility disabilities are often prescribed manual wheelchairs to promote independence with their mobility and social participation.^{4,5} Ineffective use of the wheelchair, however, often compromises independence, and leads to the perception that the wheelchair itself is a barrier to doing things.^{6,7} Therefore, treatment strategies that facilitate effective wheelchair use are increasing in importance. This is especially true for older adults who have been reported to more frequently lack independence using their wheelchair.¹

In order for individuals to effectively use their wheelchair they must possess a variety of wheelchair skills.⁸ Training to improve wheelchair skills is often employed to promote an individual's ability to use their wheelchair. For example, the Wheelchair Skills Training Program (WSTP)⁹ was developed to provide an evidence-based, standardized approach to increase the likelihood of improving an individual's ability to use his/her wheelchair safely and effectively.⁹ The WSTP has had positive results among wheelchair users undergoing initial rehabilitation,¹⁰ and those living in the community,^{11,12} in addition to non-wheelchair users attending university.¹³ Despite evidence suggesting the WSTP enhances ability to use a wheelchair, ability alone has been shown to have limited importance in determining behaviour.^{14,15}

According to Social Cognitive Theory, confidence (for purposes of this paper we use confidence and self-efficacy interchangeably) is the belief individuals have in their ability to achieve desired outcomes.¹⁶ Confidence is postulated to be equally, if not more, important as ability in determining behaviour.¹⁶ In fact, empirical evidence in many areas of health has shown that individuals with low confidence are less likely to pursue an activity despite having the ability to do so, and vice versa.^{17,18} Research in the area of confidence with using a manual wheelchair has shown similar results. For example, a recent study has established that confidence with using a manual wheelchair, as measured by the Wheelchair Use

Confidence Scale (WheelCon-M),¹⁹ is a positive and significant determinant of frequency of participation, as measured by the Late Life Disability Instrument,²⁰ of older wheelchair users.²¹ This finding is significant because it was observed after controlling for ability to use a wheelchair, thereby suggesting that low confidence may be a barrier to participation among older wheelchair users regardless of their ability to use their wheelchair. The authors concluded that because the confidence-participation relationship was moderated by sex, treatment strategies to address low confidence may be especially important for older male wheelchair users when attempting to increase their frequency of participation in social and personal roles.²¹

Therefore, efforts to foster realistic perceptions of ability may help prevent the negative consequences of low confidence. One of the most influential strategies believed to have an effect on confidence is performance accomplishment.¹⁶ That is, if individuals experience success in performing a task, their associated confidence will increase. While support exists for the use of the WSTP to improve ability with using a wheelchair by means of skills training, it seems probable that it may have similar effects on confidence. The purpose of this pilot study is to examine the effects of wheelchair skills training on confidence with using a manual wheelchair in older adults.

Methods

Study design

A parallel group, single blind randomized controlled trial was used to address the primary hypothesis that older, inexperienced manual wheelchair users receiving the WSTP will report greater improvements in confidence with using a wheelchair, as measured by the WheelCon-M, than those receiving a socialization contact. A secondary hypothesis was that individuals in the WSTP group would report greater improvements in all conceptual areas of the WheelCon-M than those in the control group.

Participants

In order to take part in this study, participants had to: be at least 65 years old; live in the community; have no experience using a manual wheelchair (to simulate new wheelchair users); and be able to independently propel a wheelchair at least 10 meters. Individuals were excluded from participating if they: were unable to communicate in English; had a Mini Mental State Examination²² score less than 23; had an upper extremity injury or pain; and/or had a heart condition that could be exacerbated by physical activity, or a self-reported physician diagnosis of osteoporosis or osteopenia.

A volunteer sample (n=20) was recruited from the research centre's participant database of individuals who agreed to be involved in future studies (n=13), and advertisements in the community (n=7). Participants completing the study were given a \$5 gift card for their participation. Ethical approval for this study was obtained from the local university and health authority.

Study protocol

After obtaining informed consent, participants were scheduled to meet with a researcher for baseline data collection, which included gathering demographic information, assessing wheelchair skills, depression and anxiety symptoms, risk taking behavior, and confidence with using a manual wheelchair. The confidence measure was administered after the objective evaluation of wheelchair skills so that participants would report their confidence after having some exposure to a wheelchair.

Upon completion of the baseline measures, participants were randomly allocated to either the intervention (n=10) or control (n=10) group. A member of the research team not involved in the recruitment, data collection or intervention used a random number table to allocate participants to one of the groups. Each participant received a sequentially numbered, opaque sealed envelope that contained his/her group allocation. For those participants in the intervention group, the first of two 1-hour training sessions began immediately, and the second session was scheduled 2 to 4 days later. Those in the control group were informed that they would receive a socialization contact. All participants completed the WheelCon-M and Wheelchair Skills Test (WST) at the post-intervention data collection session, approximately 5 to 7 days after the first meeting.

Two different wheelchairs were used. One wheelchair had a rigid frame with a footplate, a sling seat and back, foam cushion, adjustable seat dump and removable propelling wheels.^a The other wheelchair had a folding frame with adjustable footrests, a sling seat and back, foam cushion, and fixed propelling wheels.^b Participants were provided with the most appropriately sized wheelchair for their use during the training.

Intervention group—Participants received 2, one-on-one 1-hour training sessions based on the WSTP protocol.⁹ Because the WSTP trains the same wheelchair skills as those assessed by the WST, the training followed the test's order of skills from easy to more difficult. As soon as participants were able to successfully complete a skill in a safe manner, or when there was sign of frustration, training of the subsequent skill began, and so on until the end of the session. In following this guideline, there was the possibility that participants would not receive training for all skills. The members of the research team who administered the intervention were trained according to the WSTP guidelines, and blinded to the results of the data collection.

Control group—Participants received a 5-minute socialization contact. The contact was made via phone to remind the participants about the study and its purpose, ensure they were still interested in completing the study, schedule an appointment for post-intervention data collection, and garner interest in attending a WSTP training session after completion of the study.

^aElevation wheelchair, Instinct Mobility Inc., www.useyourinstinct.com.

^bQuickie 2 wheelchair, SouthwestMedical.com LLC, 505 W. Thomas Road, Phoenix, AZ 85013.

Measurement

Trained raters who were blinded to group assignment administered the measures. The WheelCon-M was used to evaluate confidence with using a manual wheelchair. The WheelCon-M is a self-report questionnaire comprised of 65 situations that challenge confidence in 6 conceptual areas including the physical environment, activities performed, knowledge and problem solving, social situations, advocacy, and managing emotions.¹⁹ Participants rate their confidence using a response scale ranging from 0 (not confident) to 100 (completely confident). Averaging the sum of all responses derives a total score. The WheelCon-M has predictive validity in older, community-living, manual wheelchair users.²¹ Support for the reliability and validity of the WheelCon-M have also been reported in other studies with samples partially comprised of older adults.^{19,23}

Because of the potential for confounding, information on depression and anxiety symptoms, risk taking behaviour, and wheelchair skills were collected. The severity of depression and anxiety symptoms was assessed with the 14-item, self-report Hospital Anxiety and Depression Scale (HADS).²⁴ The depression and anxiety subscales are each made up of 7 items. Responses are on a 4-point scale (0 = not at all, 3 = very often indeed) and based on reflections of the previous week. Total scores for each subscale range from 0 to 21 with higher scores indicative of more severe symptoms. The HADS has evidence in support of its reliability and validity in older adults.²⁵

The Evaluation of Risk Scale (EVAR) is a self-report measure comprised of 24-items evaluating self-perceived risk taking behaviour.²⁶ Responses range on a scale from 0 to 25. A mean score is calculated, with higher scores indicating greater risk taking behaviour. Support of the reliability and validity of the EVAR has been reported.²⁷

The Wheelchair Skills Test 4.1 (WST) was used to assess ability with using a manual wheelchair.²⁸ It is comprised of 32 skills of varying degrees of difficulty, ordered from easy to more difficult. A trained rater observes the completion of a wheelchair skill and either passes or fails the attempt. Total scores range from 0 to 100%. The WST has evidence in support of its reliability with adult manual wheelchair users, including older adults.²⁹

Data analyses

Summary statistics were analyzed for all variables. To ensure uniform composition of the groups at baseline, differences were tested using independent t-tests.

Primary analysis—A 1-way between groups analysis of covariance (ANCOVA) was used to compare the WSTP and control groups' post-intervention WheelCon-M scores, while controlling for any pre-existing WheelCon-M differences at baseline. ANCOVAs are useful to evaluate the impact of interventions when there are small samples sizes, in addition to alleviating possible misinterpretations of expected change due to natural variation from real change due to treatment effect.³⁰ Associated ANCOVA assumptions were tested.

Secondary analysis—Independent t-tests were used to examine for group differences in the baseline - post-intervention change scores in each of the WheelCon-M's 6 conceptual areas.

Because no WheelCon-M data existed to calculate a sample size, a sample size was estimated using data from studies reporting the effects of the WSTP on the WST.^{10,12,13} With an average effect size of 1.6 used in combination with an alpha of 0.05, a 2-sided independent sample t-test would have a power of 90% with 10 participants per group.^c Despite ANCOVAs having more statistical power than t-tests and thus smaller sample size requirements, all else being equal,^{31,32} the sample size was kept at 10 per group because it was derived using WST and not WheelCon-M data.

Intention to treat analyses—Missing data due to participants dropping out of the study were accounted for by using the last-observation-carried-forward approach.³³

All data were analyzed with SPSS Version 19.0.^d

Results

Participants

Twenty individuals met the inclusion criteria and completed baseline testing. Figure 1 shows the participant involvement according to the CONSORT guidelines.³⁴ After randomization, 1 male from the intervention group and 1 female from the control group dropped out of the study due to lack of interest (Figure 1). Analyses therefore assumed no change in confidence scores for these participants.

Demographic information and baseline values for all participants are presented in table 1. There was no significant difference between the intervention and control groups for any characteristic, although there was a large difference between the 2 groups' WheelCon-M total score at baseline, and the intervention group had 5 individuals with a post-secondary education, whereas the control group had 9 individuals with such an education. Examination of the score distributions with boxplots indicated an absence of outliers in both groups that would have otherwise influenced the means given the small sample size. There were no differences in the participants' WST scores at both the baseline and post-intervention, although the intervention group's WST change score (14.4%) was more than double the control group's change score (5.8%) (Table 1)

Group difference by WheelCon-M total score

After adjusting for baseline scores, there was a significant difference between the 2 groups on post-intervention WheelCon-M scores [$F(1,17) = 10.9$, $p = 0.004$]. A large effect size was also observed (partial eta squared = 0.39) indicating that 39% of the post WheelCon-M score variance is explained by treatment group. Table 2 presents the WheelCon-M descriptive statistics, and the results of the ANCOVA.

Group difference by conceptual areas

Independent t-tests revealed significant differences between the groups' WheelCon-M change scores related to the physical environment, knowledge and problem solving,

^c G*Power version 3.1, Department of Experimental Psychology, Heinrich-Heine-University, 40225 Düsseldorf, Germany.

^d SPSS version 19.0, IBM Corporation 1 New Orchard Road Armonk, New York 10504-1722.

advocacy, and managing emotions. Table 3 presents the descriptive statistics of the conceptual areas, the mean difference in change scores in each area by group, as well as the results of the t-tests.

Discussion

This study examined the effects of wheelchair skills training on confidence with using a manual wheelchair via a parallel group, randomized controlled trial study design. Despite randomization, the groups exhibited, through random chance, large differences in confidence scores at baseline. After determining an absence of outliers, and adjusting for baseline differences between groups, the results of the primary analysis provide evidence in support of two 1-hour WSTP training sessions to improve confidence with using a manual wheelchair among older adults who are inexperienced with using a manual wheelchair. This finding is consistent with other rehabilitation research that has similarly demonstrated the effectiveness of confidence-enhancing interventions among various populations.^{35–37} Our results are unique, however, in that the evidence is specific to confidence with using a wheelchair.

Although the results of the primary analysis support the use of the WSTP to improve overall confidence with using a wheelchair, secondary analyses revealed the intervention to be more effective at improving confidence in specific areas. For example, differences between the groups' mean change scores were found to be most significant in the area related to maneuvering the wheelchair in the physical environment. According to Social Cognitive Theory, information derived by a successful performance acts to enhance confidence specific to that situation.¹⁶ In the physical environment area of the WheelCon-M, questions are asked about confidence related to performing various wheelchair skills. Therefore, given evidence that the WSTP is effective at improving wheelchairs skills,^{10–13} it is notable that the program improved confidence related to performing those skills in this study.

Interestingly there was a mean WST change score of 14.4% between the baseline and post-intervention scores among intervention group participants. This represents an improvement of at least 10% less than that shown in previous studies.^{10–13} However, previous research averaged between 3 and 9 hours^{10–13} of skills training compared to the 2 hours used in our study. Interpretation of these observations in combination with the finding that the WSTP improved confidence with using a wheelchair might indicate that skills training may initially have greater confidence-enhancing effects than improvements to ability. This progression is consistent with Social Cognitive Theory,¹⁶ which suggests that after individuals are given definite aims and feedback on performance, their improved confidence functions as influential regulators of motivation and performance accomplishment. From a wheelchair user's perspective, exposure to the WSTP in a safe and controlled environment may enable confidence to try a skill, and then subsequently improve ability as a result of accomplishing the skill.

The WSTP also appears to have confidence-enhancing effects related to knowing the wheelchair and solving problems, advocating, and managing emotions when in stressful situations. When examining the WheelCon-M items specific to these 3 areas, some entail

responses that may be highly influenced by simply using the wheelchair more frequently and more knowledge of its mechanics, and functioning (e.g. how confident are you that you know when your wheelchair is not working properly?). Speculation suggests that because WSTP participants would have been exposed to various situations that the control group would have not, they also would have a greater idea of when the wheelchair is having mechanical issues, the environmental modifications for accessibility purposes, and how they would react in stressful situations. Although not its primary purpose, the training program likely has these non-specific effects among inexperienced wheelchair users, which may then be translated into greater confidence in a variety of situations.

Finally, the WSTP did not have a significant effect on the WheelCon-M areas relate to activities performed or social situations. The items in both of these areas reflect actual experiences of using a wheelchair in the home and community, and not simply basic knowledge of wheelchair mechanics or functioning derived from a skills training program. Logically, without experience in these areas one would not anticipate changes to confidence, which is task/activity specific.

Study Limitations

This study is not without limitations. First, because the sample was comprised of individuals who do not use wheelchairs, the effects of the WSTP on confidence with using a manual wheelchair may be underestimated. For example, the participants' motivation to master the wheelchair skills may have been lower than new wheelchair users who have an actual need for wheelchair skills, and thus translated into lower confidence. Next, because 2 types of wheelchairs were used, the training experiences may have been different for 1 participant in the control group who used a different chair than the others. The differences in confidence may be due to the different number of individuals with a post-secondary education between the two groups. This, however, is unknown because we did not control for the difference in the analyses. Next, the psychometric properties of the EVAR in older adults are unknown. Furthermore, the amount of time participants were taken through the WSTP is on the lower end of that recommended to experience improvement in skills. As a result, such a training protocol does not reflect improvements to confidence had participants been given more time to completely master some skills. Even as such, 2 hours of training does appear to improve confidence with using a manual wheelchair among older, inexperienced wheelchair users. Finally, future trials should consider a control procedure to eliminate any changes that may occur simply due to the more frequent use of a manual wheelchair by the group receiving the WSTP.

Conclusions

A program of two 1-hour WSTP sessions has the potential to improve confidence with using a manual wheelchair among older adults who are inexperienced wheelchair users. Such training has a specific and beneficial effect on confidence related to maneuvering the wheelchair in physical environments, and non-specific effects on confidence pertaining to knowledge and problem solving, advocacy efforts, and managing emotions. Our pilot study

provides foundational data suggesting that confidence with using a wheelchair is an important area for additional study.

Acknowledgments

Financial support: The Canadian Institutes of Health Research (Doctoral Canada Graduate Scholarship, CIHR MSH-76731, Vanier Canada Graduate Scholarship), and the Canadian Association of Gerontology (Donald Menzies Award).

List of Abbreviations

WSTP	Wheelchair Skills Training Program
WheelCon-M	Wheelchair Use Confidence Scale - Manual
WST	Wheelchair Skills Test 4.1
HADS	Hospital Anxiety and Depression Scale
EVAR	Evaluation of Risk Scale
ANCOVA	Analysis of Covariance

References

1. Shields M. Use of Wheelchairs and Other Mobility Devices. Statistics Canada. Health Reports Statistics Canada Catalogues 82-003. 2004; 15:37–41.
2. Disability Statistics Report 14. Washington, DC: U.S. Department of Education, National Institute on Disability and Rehabilitation Research;
3. Clarke P, Colantonio A. Wheelchair use among community-dwelling older adults: Prevalence and risk factors in a national sample. *Can J Aging*. 2005; 24(2):191–198. [PubMed: 16082621]
4. Rousseau-Harrison K, Rochette A, Routhier F, Dessureault D, Thibault F, Cote O. Impact of wheelchair acquisition on social participation. *Disabil Rehabil*. 2009; 4(5):344–352.
5. Hoenig H, Taylor DH Jr, Sloan FA. Does assistive technology substitute for personal assistance among the disabled elderly? *Am J Public Health*. 2003; 93(2):330–337. [PubMed: 12554595]
6. Chaves ES, Boninger ML, Cooper R, Fitzgerald SG, Gray DB, Cooper RA. Assessing the influence of wheelchair technology on perception of participation in spinal cord injury. *Arch Phys Med Rehabil*. 2004; 85:1854–1858. [PubMed: 15520981]
7. Barker DJ, Reid D, Cott C. The experience of senior stroke survivors: factors in community participation among wheelchair users. *Can J Occup Ther*. 2004; 73:18–25.
8. Kilkens OJE, Post MWM, Dallmeijer AJ, Seelen HAM, van der Woude LHV. Wheelchair skills tests: a systematic review. *Clin Rehabil*. 2003; 17:418–430. [PubMed: 12785251]
9. Kirby, RL. The Wheelchair Skills Program (version 4.1) Manual. Available at: www.wheelchairskillsprogram.ca
10. MacPhee AH, Kirby RL, Coolen AL, Smith C, MacLeod DA. Wheelchair skills training program: a randomized clinical trial on wheelchair users undergoing initial rehabilitation. *Arch Phys Med Rehabil*. 2004; 85:41–50. [PubMed: 14970966]
11. Best KL, Kirby RL, Smith C, MacLeod DA. Wheelchair skills training for community-based manual wheelchair users: A randomized controlled trial. *Arch Phys Med Rehabil*. 2005; 86:2316–2323. [PubMed: 16344029]
12. Ozturk A, Dokuztug Ucsular F. Effectiveness of a wheelchair skills training programme for community-living users of manual wheelchairs in Turkey: a randomized controlled trial. *Clin Rehabil*. 2011; 25:416–424. [PubMed: 21059666]

13. Coolen AL, Kirby RL, Landry J, et al. Wheelchair skills training program for clinicians: a randomized controlled trial with occupational therapy students. *Arch Phys Med Rehabil.* 2004; 85:1160–7. [PubMed: 15241768]
14. Mortenson, WB. Exploring the impact of wheelchairs on individuals in residential care: A two-phase, mixed-methods study [dissertation]. Vancouver: University of British Columbia; 2009.
15. Hoenig H, Landerman LR, Shipp KM. Activity restriction among wheelchair users. *J Am Geriatr Soc.* 2003; 51:1244–1251. [PubMed: 12919236]
16. Bandura, A. Self-efficacy: The exercise of control. New York: Freeman; 1997.
17. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev.* 1977; 84(2):191–215. [PubMed: 847061]
18. Neupert SD, Lachman ME, Whitbourne SB. Exercise self-efficacy and control beliefs: Effects on exercise behaviour after an exercise intervention for older adults. *J Aging Phys Act.* 2009; 16:1–16.
19. Rushton PW, Miller WC, Kirby RL, Eng JJ, Yip J. Development and content validation of the Wheelchair Use Confidence Scale: a mixed-methods study. *Disabil Rehabil Assist Technol.* 2011; 6(1):57–66. [PubMed: 20809874]
20. Jette AM, Haley SM, Coster WJ, Kooyoomjian JT, Levenson S, Heeren T, Ashba J. Late Life Function and Disability Instrument: I. Development and evaluation of the disability component. *J Gerontol Med Sci.* 2002; 57A:M209–M216.
21. Sakakibara BM, Miller WC, Eng JJ, Backman CL, Routhier F. Preliminary examination of the relationship between participation and confidence in older manual wheelchair users. *Arch Phys Med Rehabil.* 2012 epub ahead of print.
22. Folstein MF, Folstein SE, McHugh PR. “Mini-mental state”: a practical method for grading the state of patients for the clinician. *J Psychiatr Res.* 1975; 12:189–198. [PubMed: 1202204]
23. Rushton PW, Miller WC, Kirby RL, Eng JJ. Measuring confidence with manual wheelchair use: reliability and validity of the WheelCon. *J Rehab Med.* 2012 epub ahead of print.
24. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand.* 1983; 67:361–370. [PubMed: 6880820]
25. Bjelland I, Dahl AA, Tangen Haug T, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale: an updated literature review. *J Psychosom Res.* 2002; 52:69–77. [PubMed: 11832252]
26. Sicard B, Jouve E, Blin O, Mathieu C. Construction and validation of visual analogue scale for risk assessment. *Encephale.* 1999; 25(6):622–629. [PubMed: 10668606]
27. Killgore WDS, Castro CA, Hoge CW. Preliminary normative data for the Evaluation of Risks Scale-Bubble Sheet Version (EVAR-B) for large-scale surveys of returning combat veterans. *Mil Med.* 2010; 10;175(10):725–731.
28. Kirby RL, Dupuis DJ, MacPhee AH, Coolen AL, Smith C, Best KL, Newton AM, Mountain AD, MacLeod DA, Bonaparte JP. The Wheelchair Skills Test (version 2.4): measurement properties. *Arch Phys Med Rehabil.* 2004; 85:794–804. [PubMed: 15129405]
29. Lindquist NJ, Loudon PE, Magis TF, Rispin JE, Kirby RL, Manns PJ. Reliability of the performance and safety scores of the Wheelchair Skills Test Version 4. 1 for manual wheelchair users. *Arch Phys Med Rehabil.* 2010; 91:1752–1757. [PubMed: 21044722]
30. Barnett AG, van der Pols JC, Dobson AJ. Regression to the mean, what it is and how to deal with it. *Int J Epidemiol.* 2005; 34:215–220. [PubMed: 15333621]
31. Van Breukelen GJ. ANCOVA versus change from baseline had more power in randomized studies and more bias in nonrandomized studies. *J Clin Epidemiol.* 2006; 59:920e5. [PubMed: 16895814]
32. Borm GF, Fransen J, Lemmens WAJG. A simple sample size formula for analysis of covariance in randomized controlled trials. *J Clin Epidemiol.* 2007; 60:1234–1238. [PubMed: 17998077]
33. Shao J, Zhong B. Last observation carry-forward and last observation analysis. *Statist Med.* 2003; 22:2429–2441.
34. Schulz KF, Altman DG, Moher D. for the CONSORT Group. CONSORT 2010 Statement: Updated guidelines for reporting parallel group randomized trials. *Ann Intern Med.* 2010; 152:1–8. [PubMed: 19949136]

35. Barlow JH, Turner AP, Wright CC. A randomized controlled trial of the Arthritis Self-Management Programme in the UK. *Health Educ Res.* 2000; 15(6):665–680. [PubMed: 11142075]
36. Salbach NM, Mayo NE, Robichaud-Ekstrand S, Hanley JA, Richards CL, Wood-Dauphinee S. The effect of a task-oriented walking intervention on improving balance self-efficacy poststroke: A randomized, controlled trial. *J Am Geriatr Soc.* 2005; 53:576–582. [PubMed: 15817001]
37. Sanford JA, Griffiths PC, Richardson P, Hargraves K, Butterfield T, Hoenig H. The effects of in-home rehabilitation on task self-efficacy in mobility-impaired adults: A randomized controlled clinical trial. *J Am Geriatr Soc.* 2006; 54:1641–1648. [PubMed: 17087689]

Figure 1.
CONSORT³⁴ diagram of participant involvement

Table 1

Sample characteristics

	WSTP group (n = 10)	Control group (n = 10)
Age	69.9 ± 3.1	71.8 ± 3.7
Male	5	5
Marital status:		
Married	5	7
Single/Never married	2	1
Divorced	1	2
Widowed	2	0
Post-secondary education	5	9
HADS-D	2.4 ± 1.3	2.6 ± 2.1
HADS-A	5.0 ± 2.8	4.4 ± 2.2
EVAR	10.7 ± 2.4	11.5 ± 2.5
WST:		
Baseline	57.6 ± 6.2	58.8 ± 13.4
Post-intervention	65.9 ± 10.3	62.2 ± 13.8

Values are frequency counts or mean ± SD.

Table 2

ANCOVA results and descriptive statistics for the WheelCon-M scores

WheelCon-M	WSTP group means $\pm$ sd (n=10)	Control group means $\pm$ sd (n=10)
Baseline	57.3 $\pm$ 15.6	70.3 $\pm$ 15.2
Post-intervention	71.0 $\pm$ 17.0	69.9 $\pm$ 17.1

Source	SS	df	MS	F	p-value
WheelCon-M Baseline	3995.22	1	3995.22	54.88	0.000
Group	790.22	1	790.22	10.86	0.004
Error	1237.55	17	72.80		

SS = sum of squares type III; df = degrees of freedom; MS = mean square; F = test of between-subjects effects.

Table 3

Differences in WheelCon-M mean changes scores by conceptual area

	WSTP group mean change	Control group mean change	Mean difference	95% CI	t-test	p-value
Physical environment: *	14.57 ± 11.96	-0.76 ± 10.43	15.3	4.8, 25.9	3.1	0.007
Activities performed:	9.14 ± 11.11	2.16 ± 15.85	7.0	-5.9, 19.8	1.1	0.269
Knowledge and problem solving: *	18.61 ± 17.04	1.33 ± 13.77	17.3	2.7, 31.8	2.5	0.023
Advocacy: *	8.63 ± 10.38	-4.13 ± 11.27	12.8	2.6, 22.9	2.6	0.017
Social situations:	11.08 ± 21.73	-2.75 ± 8.89	13.8	-1.8, 29.4	1.9	0.079
Managing Emotions: *	19.00 ± 20.11	-4.00 ± 18.97	23.0	4.6, 41.4	2.6	0.017

Values are mean ± SD; CI = confidence interval

* P 0.05