



# EVIDENCE TO IMPACT

## RESEARCH PARTNER SERIES

The Wheelchair Skills Program

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## Key Messages

- In 2023, the World Health Organization (WHO) estimated that there were 80 million people globally who would benefit from wheelchairs, but many do not have access to appropriate wheelchairs.
- Wheelchair skills and life-situation training of the wheelchair user and/or their caregiver is integral to practical and safe wheelchair use.
- The Wheelchair Skills Program (WSP) is a set of free online low-tech, high-impact, evidence-based resources for the assessment and training of wheelchair skills of users, with or without assistance of their caregivers. The WSP is recognized by a variety of national and international organizations.
- The WSP has shown clinically effective increases in wheelchair skills from several pilot studies and randomized controlled trials, primarily for manual wheelchair users.
- Wheelchair skills assessments and the WSP are easy and effective resources to implement in practice for healthcare providers who work with individuals requiring a wheelchair.

## Introduction

Within assistive technology, the wheelchair is arguably the most important therapeutic tool in rehabilitation with a wide range of benefits for those who use them. In 2023, the World Health Organization (WHO) estimated that there were 80 million people globally who would benefit from wheelchairs, but many do not have access to appropriate wheelchairs (WHO, 2018). The prevalence of wheelchairs continues to rise, in part due to the aging of the population; therefore, appropriate assessment of skills and training for function and safety is imperative for those who use wheelchairs to maximize their roles in society and fulfill their daily living activities. There are many benefits to wheelchair use. Wheelchairs have been documented to improve mobility, improve childhood development, empower, reduce caregiver burden, and reduce the likelihood of placement in long-term-care facilities. Importantly, wheelchairs improve participation of people's roles in society. Despite their widespread use and importance, wheelchairs are not without their problems. Wheelchairs can be inappropriate for their users, fit them poorly, or are poorly set up. They may also undergo frequent repairs and can cause the user to suffer acute or chronic injuries as a result of their use. In making improvements to wheelchairs, there is often a compromise between upgrades in performance versus safety.

To improve the benefits and reduce the problems associated with wheelchair use, there are three areas of development. The first being better accessibility for wheelchair users in the world, the second is better wheelchair design, and the third is better wheelchair service delivery. The third area is a key focus of the Wheelchair Skills Program (WSP). The 2023 WHO Guidelines describe a four-step wheelchair service-delivery model – select, fit, train and follow-up. The assessment and training of wheelchair skills for wheelchair users and their caregivers (the two key elements of the WSP) are relevant for three of these four steps, namely selection, training, and follow-up. The WSP is a set of free online low-tech, high-impact, evidence-based resources for the assessment and training of wheelchair skills of users, with or without assistance of their caregivers. The scope of the WSP is broad, including manual wheelchairs, powered wheelchairs and motorized mobility scooters.

## The Wheelchair Skills Program

The assessment aspect of the program is evaluated using the Wheelchair Skills Test (WST) and its questionnaire version (WST-Q), while user-training is achieved through the Wheelchair Skills Training Program (WSTP). The WST was first developed in 1996 as a means of assessing the capacity of wheelchair users to safely perform the skills they use every day. Prior to its development, no other measurement instruments available evaluated wheelchair function in daily living activities. After the development of the WST/WST-Q, it became apparent that wheelchair users were not capable of performing all of the skills that seemed feasible and necessary for them to perform. Using the best available evidence on motor skills learning principles and wheelchair skills techniques, the WSTP was developed.

The concept of the WSP is that individual skills are building blocks for other activities. For a wheelchair user and/or their caregiver to perform an activity in their daily living routines, it would involve many of the items on the individual-skill list. These skills are taught in training and tested by WSP personnel. These personnel include rehabilitation clinicians who are regularly involved in wheelchair provision, or other professionals (e.g., kinesiologists, teachers, coaches, recreation therapists), however there are no minimal educational requirements. To become WSP personnel, interested individuals are recommended to become familiarized with the WSP website, read the appropriate sections of the most up-to-date WSP Manual, review practice materials, and observe how experienced WSP personnel function and perform the activities themselves. Practice materials are widely accessible through the WSP YouTube channel. This channel provides videos on all the individual skills for manual wheelchairs, powered wheelchairs, and scooters; as well as wheelchair skills for caregivers of manual wheelchair users. A full demonstration of the manual wheelchair version of the WST is also provided on the channel. Additionally, annual in-person courses are offered in Halifax, Nova Scotia, and for those who cannot attend in person, annual remote-learning courses are also available.

Ideally, the WSP should only be used by personnel who have been trained in its administration. However, good results are possible by careful attention to the Manual and other materials, as these materials have been designed to be reasonably self-explanatory and to reflect normal practices. There is no certification required, however a certification exam is offered regularly for those interested.

The WSP advocates a policy that, as part of the wheelchair-provision process, every person receiving a wheelchair, and their caregiver, must have their wheelchair skills assessed. Additionally, whenever that assessment identifies potentially achievable goals, training must be provided. The assessment of wheelchair skills should be done at intake, as part of the prescription

### Individual Skill List

- Rolls forward/backward
- Turns in place
- Turns while moving forward
- Turns while moving backward
- Maneuvers sideways
- Reaches objects
- Operates body positioning options
- Shifts weight
- Performs level transfers
- Folds and unfolds wheelchair
- Performs ground transfers
- Gets through hinged door
- Ascends/Descends slight incline
- Ascends/Descends steep incline
- Rolls on soft surface
- Gets over obstacle
- Ascends/Descends low curb
- Ascends/Descends high curb
- Performs stationary wheelie
- In wheelie position:
  - Turns in place
  - Rolls back and forward
- Descends high curb
- Descends steep incline
- Ascends/Descends stairs

and fitting steps. For example, assessment may be done to compare how well the wheelchair user can perform skills with different types of manual wheelchairs. This assessment continues during follow-up to determine what revisions or further training are required.

The WST may be used during assessment and is simple to administer and score. Forms for scoring of the WST can be found on the WSP website. Each skill is scored on the basis of capacity, with the scoring criteria provided on the form. Scores range from zero to three, from a fail to advanced pass. There is also room for comments on each skill, where notes can be made on areas for improvement with a trainer. Comments may also reflect on someone's diagnosis; for example, upon testing a skill it may appear the wheelchair user has a movement disorder which impedes them from performing the skill. In that case, revision to the type of wheelchair used and follow-up with a healthcare professional would be indicated. The WST-Q is similarly scored, where instead of evaluating capacity, users are asked about their performance (can they do it in their own setting), confidence, and frequency (how often the skill is performed).

## Evidence

The evidence surrounding the applicability of the WST/WSTP is extensive. As of March 2023, a PubMed search reveals 112 peer-reviewed articles about the measurement properties of the WST/WST-Q or papers that have used the WST/WST-Q as outcome measures. A pilot study on 24 manual wheelchair users in 2002 found that the WST is practical, safe, well tolerated, exhibits good to excellent reliability, excellent content validity, fair construct and concurrent validity, and moderate usefulness (Kirby et al., 2002). This study made an important contribution toward meeting the need for a well-validated outcome measure of manual wheelchair ability (Kirby et al., 2002). Since then, the WSP has refined their skill sets and assessment procedures through experience and monitoring the literature about how others assessed wheelchair skills. Using the best available research evidence and the guidance of an Editorial Committee from a variety of backgrounds, the face or content validity of the WST has evolved, producing many updated versions since its creation. Since the first pilot study, the WST has been validated in several other populations including power wheelchair users (Smith et al., 2018), scooter users (Mortensen et al., 2018), and in children (Huegel et al., 2019). The WST-Q has also shown cross-cultural adaption in countries such as Brazil (Campos et al., 2022), and reliability in other languages (Passuni et al., 2019).



Wheelchair skills and life-situation training of the wheelchair user and/or their caregiver is integral to achieving goals. For this training, the WSTP can be used during the initial provision of the wheelchair and as necessary during follow-up. The WSTP consists of two main components: the process, which includes *how* to teach, and the content, which is *what* to teach. The process

includes the appropriate motor skills learning principles that are necessary to achieve the desired skill. The content varies from individual to individual based on skill level and their diagnosis.

The evidence surrounding the WSTP is equally as abundant. Strong evidence supporting the effectiveness of the WSTP has been found in randomized control trials and systematic reviews and meta-analyses. In 2018, Keeler and colleagues conducted a systematic review and meta-analysis of 13 randomized control trials (RCTs) on a total of 581 participants, using the WSTP as the intervention (Keeler et al., 2019). Results demonstrate that compared to no treatment, standard of care or educational controls, the WSTP improved post-training WST/WST-Q total capacity scores 14% (Keeler et al., 2019). These scores saw a 21.2% increase over baseline, corresponding to a clinically meaningful effect. This intervention was also shown to be more effective in improving the scores of new wheelchair users compared to existing wheelchair users. Overall, the study demonstrated moderate quality evidence for the WSTP as a safe intervention (Keeler et al., 2019). Another systematic review and meta-analysis reported similar findings based on ten RCTs and seven non-randomized studies (Tu et al., 2017). Relative to a control group, manual wheelchair skills training increased WST scores by 13.3% in RCTs and by 23.4% in non-randomized studies in the short term (immediately to one week post-intervention). Training also proved to be safe, with few adverse events that occurred during training. The evidence was however insufficient to support the effectiveness of powered wheelchair skills training and the long-term (3-12 months) advantages of manual wheelchair skills training (Tu et al., 2017). Together, these studies support wheelchair skills training as a safe means of improving manual wheelchair users skills capacity.

The WSP has shown to increase scores on the wheelchair skills test by 21.2% in randomized control trials.

In addition to being a safe and effective program, it appears that training is associated with positive participation outcomes, as evidenced by correlations or associations between wheelchair skills capacity and participation in everyday life. In 2019, a cross-sectional study in Kenya and the Philippines revealed that when a provider did training, participants were more likely to experience three or more positive wheelchair-use outcomes, including improvements in daily wheelchair use, outdoor unassisted wheelchair use, high performance of activities of daily living, and absence of serious falls, compared to those who did not receive training (Kirby & Doucette, 2019). The training administered to wheelchair users may or may not have been the WSTP, and causality cannot be inferred from the cross-sectional nature of the surveys; nevertheless, the results highlight positive correlations between wheelchair training and participation outcomes. Further evidence is required to support these correlations, as providers continue to train wheelchair users and additional studies are conducted.

## Impact

The WSP has been described by Nenad Kostanjsek of the WHO as a “low tech, high impact intervention”. This reflects the ease of implementing the WSP as minimal equipment is necessary, aside from a person who uses a wheelchair and a tester who has been properly educated on the

material along with simple obstacles encountered in everyday life. The WSP also makes a big difference not only in people's skill level, but also their participation in everyday life. Members of the Wheelchair Research Team at Dalhousie University and the Nova Scotia Rehabilitation and Arthritis Centre of Nova Scotia Health in Halifax, Nova Scotia have also provided practical training on the WSP to wheelchair service providers in several countries around the world, in both highly developed and less-resourced settings. The WSP is now recognized by a variety of national and international organizations.

The concepts that the WSP endorse have gradually become the gold standard of practice. Wheelchairs should be provided using the four-step process described by the WHO, all people who use wheelchairs and their caregivers should have their wheelchair skills assessed, and wheelchair skills training should be provided, if appropriate. Additionally, assessment and training should be documented in the health record. The importance and necessity of wheelchair-skills training provision is recognized around the world. In 2021, a global online survey of 309 wheelchair service providers in 35 countries revealed that 81.6% typically provide wheelchair-skills training to clients, and 81.9% provide training to caregivers (Kirby et al., 2021). Despite this, the median duration of training sessions for clients and caregivers was only 45 and 30 minutes respectively, with a median number of 2 sessions for both (Kirby et al., 2021). This does not reflect an adequate amount of time spent on training to achieve the skills necessary for wheelchair users to perform activities of daily living with the appropriate capacity.

The WSP continues to document and improve on their training procedures, with a goal that this will become an integral part of clinical practice and wheelchair provision policies. For providers to implement this in their own practice is easy; it takes asking wheelchair users what they can do, ask them to demonstrate that skill, and if something is identified as an area for improvement, help them achieve that.





## References

Campos LCB, Caro CC, Fachin-Martins E, Cezar Da Cruz DM. Cross-cultural adaptation and reliability of the Brazilian version of the wheelchair skills test-questionnaire 4.3 for manual wheelchair users. *Assistive Technology*. 2022;34(1):54-60. DOI: 10.1080/10400435.2019.1697906

Dalhousie University, Faculty of Medicine. Wheelchair Skills Program [Internet]. Nova Scotia (CAN). Available from: <https://wheelchairskillsprogram.ca/en/>

Huegel M, Otieno S, Kenyon LK. Validity of the WST and the WST-Q in children with spina bifida: a pilot project, *Disability and Rehabilitation: Assistive Technology*. 2019;1(7):744-750. DOI: 10.1080/17483107.2018.1550114

International Society of Wheelchair Professionals Webinar by Dr. Kirby presented November 5, 2021. Webinar titled: Assessment and Training of Wheelchair Skills: From Research Evidence to Clinical Practice

Keeler L, Kirby RL, Parker K, McLean KD, Hayden JA. Effectiveness of the Wheelchair Skills Training Program: a systematic review and meta-analysis. *Disability and Rehabilitation: Assistive Technology*. 2019;14(4):391-409.

Kirby RL & Doucette SP. Relationships between wheelchair services received and wheelchair user outcomes in less-resourced settings: A cross-sectional survey in Kenya and the Philippines. *Archives of Physical Medicine and Rehabilitation*. 2019;100:1648-54.

Kirby RL, Smith C, Parker K, Theriault CJ, Sandila N. Practices and views of wheelchair service providers regarding wheelchair-skills training for clients and their caregivers: a global online survey. *Disability and Rehabilitation: Assistive Technology*. 2021. DOI: [10.1080/17483107.2021.1989505](https://doi.org/10.1080/17483107.2021.1989505)

Kirby RL, Swuste J, Dupuis DJ, MacLeod DA, Monroe R. The Wheelchair Skills Test: a pilot study of a new outcome measure. *Arch Phys Med Rehabil*. 2002;83:10-8.

Mortenson BW, Hurd Clarke L, Goldsmith CH, Jang S, Kirby RL. Measurement properties of the Wheelchair Skills Test for scooters among experienced users. *Disability and Rehabilitation: Assistive Technology*. 2018;13(1):60-65. DOI: 10.1080/17483107.2017.1280546

Passuni D, Dalzotto E, Gath CF, Buffetti E, Elizalde M, Jarmoluk V, Russo MJ, Intruvini S, Olmos LE, Freixes O. Reliability of the Spanish version of the wheelchair skills test 4.2 for manual wheelchair users with spinal cord injury. *Disability and Rehabilitation: Assistive Technology*. 2019;14(8):788-791. DOI: 10.1080/17483107.2018.1463404

Smith EM, Low K, Miller WC. Interrater and intrarater reliability of the wheelchair skills test version 4.2 for power wheelchair users. Disability and Rehabilitation. 2018;40(6):678-683. DOI: [10.1080/09638288.2016.1271464](https://doi.org/10.1080/09638288.2016.1271464)

Tu CJ, Liu L, Wang W, Du HP, Wang YM, Xu YB, et al. Effectiveness and safety of wheelchair skills training program in improving the wheelchair skills capacity: a systematic review. Clin Rehabil. 2017 Dec;31(12):1573–82.

Wheelchair provision guidelines. Geneva: World Health Organization; 2023. Licence: CC BY-NC-SA 3.0 IGO.

Assistive Technology – Fact Sheet. Geneva: World Health Organization; 2018 (<https://www.who.int/news-room/fact-sheets/detail/assistive-technology>).