Power Wheelchair Skills: Assessment and Training

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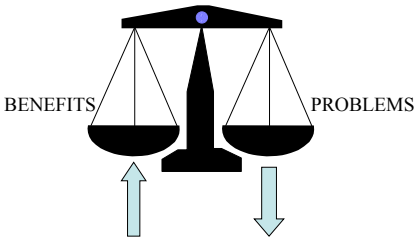
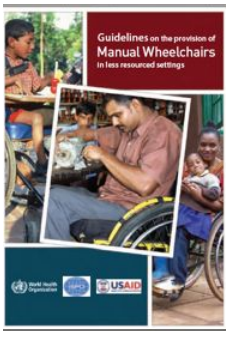
Prevalence of Wheelchair Use

- World: ~65M people need wheelchairs (~20M people do not have them).
  - WHO guidelines 2008.
- US: 3.86M non-institutionalized users by 2009 (~30% PWCs or scooters).
  - Flagg JF. Buffalo, February 2009.
- US: similar proportion of powered wheelchair use (5-11%) in the US VA
  - Hubbard SL et al. J Rehab Re Dev 2007;44:581-92.

Wheelchairs



World Health Organization



www.who.int/disabilities/publications/technology/wheelchairguidelines/en/index.html.

Wheelchair-Provision Process

- Assessment
- Wheelchair acquisition
- Training
- Follow-through

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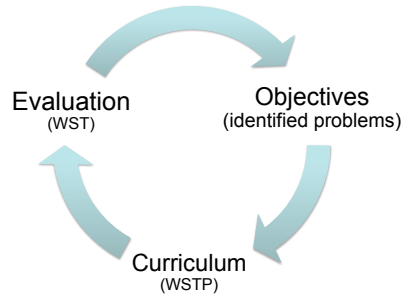
The Circle of Education



Wheelchair Skills Program (WSP)

- Wheelchair Skills Test (WST)
- Wheelchair Skills Training Program (WSTP)

What's Different About the WSP?

- Evidence-based
- Both assessment and training
- Both wheelchair users and caregivers
- Both power and manual wheelchairs
- The process and sequencing used
- It's FREE! ("open source")

WST Individual Skill Scores

- Capacity* Score:
  - Pass or Fail
- Safety Score:
  - Safe or Unsafe

* Capacity ('can do') vs Performance ('do do')

WST Total Calculated Scores: Routine for Each Modular Version

- Total Capacity Score = passed/applicable x 100%
- Total Safety Score = safe/ attempted x 100%

WST Measurement Properties

- WST 1.0:
  - Kirby et al. Arch PM&R 2002;83:10-18
- WST 2.4:
  - Kirby et al Arch PM&R 2004;85:794-804
- WST 3.2:
  - Routhier F et al, Rehab International 2008
- WST 4.1:
  - Lindquist NJ et al. Arch PMR, 2010;91:1752-7

Questionnaire Version (WST-Q)

- Newton et al. Arch PM&R 2002;83:1295-9.
- Mountain et al. Arch PM&R 2004;85:416-23.
- Rushton PR et al. Proc RESNA 2011.
- Inkpen P et al. Proc CAPM&R 2011.

Systematic Reviews on Assessments of Wheelchair Skills

- Kilkens et al. Clin Rehabil 2003;17:418-430 (24 papers)
- Fliess-Douer O et al. Clin Rehabil 2010;24:867-86 (13 papers)

How about the WST-P?

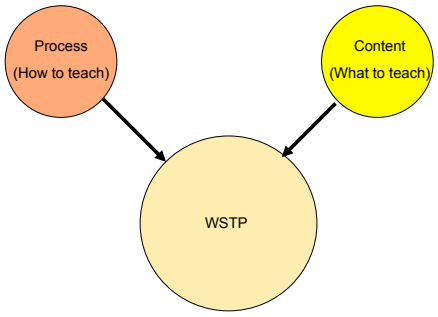
- Content validity
- Smith C, Kirby RL. Wheelchair Skills Test as a means of assessing power mobility. Proc Canadian Seating and Mobility Conference, September 23-25, 2001, Toronto, p 130.
- Mountain et al (2010): feasibility, responsiveness, construct validity
- CanWheel P2 project

Example of a WST-P/WCU 4.1

Prevalence of Wheelchair Skills Training

- 17% in UK got any formalized training
  - Whizz-Kidz 2004
- 18% in US got any formalized training
  - Karmarkar AM et al. JRRD 2009;46:567-76
- 19% in US with powered wheelchairs got > 30 minutes of training
  - Salatin B et al. Proc RESNA 2010

Wheelchair Skills Training Program

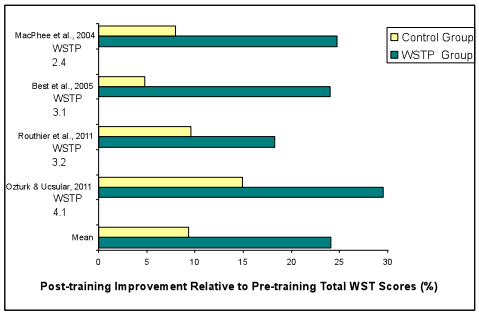


WSTP Curriculum

- Individual or small group sessions
- 15-30 minute sessions, 1-5x/week
- ~2-4 hrs extra training time
- Based on wheelchair and motor learning principles literature

Mobility Centre

Evidence for Manual Wheelchair Training



Other Outcomes

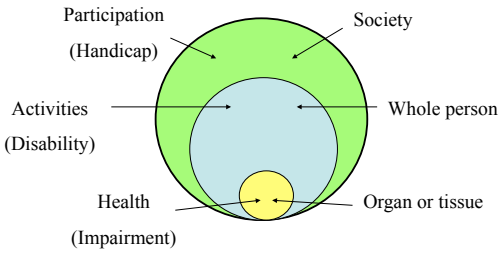
- WSTP 4.1
- WheelCon
  - Sakakibara B et al. Efficacy of a training program to improve confidence with using a wheelchair. Proc RESNA 2011.

Levels of Scientific Evidence

I. Large randomized trials with clear-cut results (and low risk of error)
II. Small randomized trials with uncertain results (and moderate-high risk of error)
III. Nonrandomized trials with concurrent controls
IV. Nonrandomized trials with historical controls
V. Case series with no controls

Sackett DL. Chest (2 Suppl) 1989:2S-4S

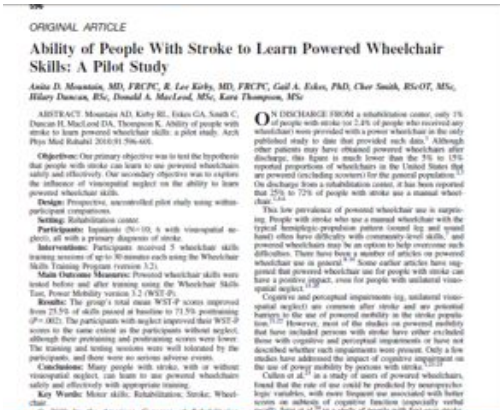
International Classification of Function (ICF)



WHO, 2001

Do Skills Improve Participation?

- Training increases amount of wheelchair use:
  - Hoenig H et al. J Am Geriatr Soc 2005;53:1712-20
- Skills correlate with return to work:
  - Van Velzen et al. Am J PM&R 2009;88:47-56
- Skills correlate with participation measures:
  - Kilkens et al. JRRD 2005;42:65-73
  - Krause J et al. J Spinal Cord Med 2009;32:237-48



ORIGINAL ARTICLE

Ability of People With Stroke to Learn Powered Wheelchair Skills: A Pilot Study

Anita D. Mountain, MD, FRCPC, R. Lee Kirby, MD, FRCPC, Gail A. Eskes, PhD, Cher Smith, BScOT, MSc, Hilary Duncan, BSc, Donald A. MacLeod, MSc, Kara Thompson, MSc

ABSTRACT. Mountain AD, Kirby RL, Eskes GA, Smith C, Duncan H, MacLeod DA, Thompson K. Ability of people with stroke to learn powered wheelchair skills: a pilot study. Arch Phys Med Rehabil 2010;91:596-605.

Objective: One primary objective was to test the hypothesis that people with stroke can learn to use powered wheelchairs safely and effectively. Our secondary objective was to explore the influence of visuospatial neglect on the ability to learn powered wheelchair skills.

Design: Prospective, uncontrolled pilot study using within-participant comparisons.

Setting: Rehabilitation center.

Participants: Inpatients (N=10, 6 with visuospatial neglect), all with a primary diagnosis of stroke.

Interventions: Participants received 5 wheelchair skills training sessions of up to 30 minutes each using the Wheelchair Skills Training Program (version 3.2).

Main Outcome Measures: Powered wheelchair skills were tested before and after training using the Wheelchair Skills Test, Power Mobility version 3.2 (WST-P).

Results: The group's total mean WST-P scores improved from 25.5% of skills passed at baseline to 71.5% posttraining ($P = .002$). The participants with neglect improved their WST-P scores to the same extent as the participants without neglect, although their pretraining and posttraining scores were lower. The training and testing sessions were well tolerated by the participants, and there were no serious adverse events.

Conclusions: Many people with stroke, with or without visuospatial neglect, can learn to use powered wheelchairs safely and effectively with appropriate training.

Key Words: Motor skills; Rehabilitation; Stroke; Wheelchair.

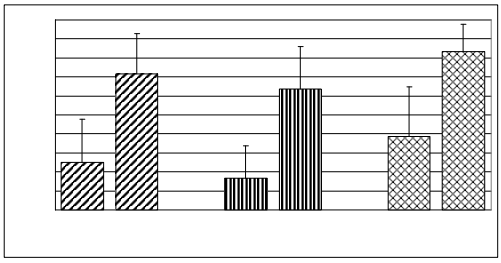
ON DISCHARGE FROM a rehabilitation center, only 1% of people with stroke (or 2.4% of people who received any wheelchair) were provided with a power wheelchair in the only published study to date that provided such data.[1] Although other patients may have obtained powered wheelchairs after discharge, this figure is much lower than the 5% to 15% reported proportions of wheelchairs in the United States that are powered (excluding scooters) for the general population.[2,3] On discharge from a rehabilitation center, it has been reported that 25% to 72% of people with stroke use a manual wheelchair.[1,4-6]

This low prevalence of powered wheelchair use is surprising. People with stroke who use a manual wheelchair with the typical hemiplegic-propulsion pattern (sound leg and sound hand) often have difficulty with community-level skills,[7] and powered wheelchairs may be an option to help overcome such difficulties. There have been a number of articles on powered wheelchair use in general.[8-10] Some earlier articles have suggested that powered wheelchair use for people with stroke can have a positive impact, even for people with unilateral visuospatial neglect.[11-13]

Cognitive and perceptual impairments (eg, unilateral visuospatial neglect) are common after stroke and are potential barriers to the use of powered mobility in the stroke population.[11,12] However, most of the studies on powered mobility that have included persons with stroke have either excluded those with cognitive and perceptual impairments or have not described whether such impairments were present. Only a few studies have addressed the impact of cognitive impairment on the use of power mobility by persons with stroke.[11,12,14]

Cullen et al,[12] in a study of users of powered wheelchairs, found that the rate of use could be predicted by neuropsychologic variables, with more frequent use associated with better scores on subtests of cognitive function (especially verbal

Power Mobility and Stroke



Mountain et al. 2010

WSTP-P Training

- Uncontrolled study
- 5 new powered wheelchair users
- All improved their WST-P 4.1 performance and safety scores after 3 one-hour sessions of WSTP training
  - Archambault PS et al. Assessing improvement of powered wheelchair driving skills using a data logging system. Proc RESNA Annual Conference, Las Vegas, June 28-29, 2010.

Levels of Scientific Evidence

I. Large randomized trials with clear-cut results (and low risk of error)

II. Small randomized trials with uncertain results (and moderate-high risk of error)

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Summary

- For manual wheelchairs, there is good and growing evidence for:
  - the WST as a good outcome measure
  - the WSTP as a safe, low-tech, high-impact intervention.
- For powered wheelchairs, there is reason for optimism, but that research is still underway.

Peter Gough. Fresh Paint.