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Efficacy of a Remote Train-the-Trainer Model for Wheelchair Skills Training Administered by Clinicians: A Cohort Study with Pre- vs. Post-Training Comparisons

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Abstract

Objective: To test the hypotheses that remote training improves trainer confidence and, when these trainers train others, the capacity and confidence of the trainees improves.

Design: Cohort study with pre- vs post-training comparisons.

Setting: Four Spinal Cord Injury Model Systems Centers.

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Participants: Convenience sample of 7 clinician trainers and 19 able-bodied trainees.

Intervention: Part 1 focused on trainer skill acquisition with self-study of the Wheelchair Skills Program Manual and instructional videos focused on motor learning, spotting, and 10 intermediate and advanced wheelchair skills. Trainers practiced in pairs, receiving asynchronous feedback on video-recordings from a remote instructor. Part 2 included additional video modules targeted at "how to" assess and train others in four wheelchair skills: gets over obstacle, ascends low curb, ascends high curb with caregiver assistance, and performs stationary wheelie. Upon completion, the trainers each provided 1:1 in-person training for 2–3 trainees.

Main Outcome Measures: Trainer confidence was assessed using the Self-Efficacy on Assessing, Training, and Spotting (SEATS) Test for Manual Wheelchairs. Trainee capacity ("Can you do it?") and confidence ("How confident are you?") were evaluated using the Wheelchair Skills Test Questionnaire (WST-Q).

Results: Trainer confidence increased for assessment ($p=0.003$) and training ($p=0.002$), but not spotting ($p=0.056$). Trainee 4-item median [IQR] WST-Q scores significantly increased with training for capacity (13% [6,31] to 88% [75,88], $p < 0.001$) and confidence (13% [0,31] to 88% [81,100], $p < 0.001$).

Conclusions: Remote training improves trainers' confidence with respect to wheelchair-skills testing and training, and the wheelchair-skills capacity and confidence of their trainees.

Keywords

Motor skills; Rehabilitation; Wheelchairs; Clinician

Wheelchair-skills training can improve wheelchair user capacity to complete wheelchair skills. This has been demonstrated by 16 randomized controlled trials (RCTs)[1–7] and two systematic reviews and meta-analyses.[8,9] Despite published evidence for the effectiveness of wheelchair skills training,[8,9] it remains limited in duration, is often limited to basic skills, does not cover real-world skills that many users face (e.g. curb negotiation), and is often not based on validated training methods.[10] Clinician knowledge of how to complete and provide training can be a barrier to implementation. In-person training of health-care professionals can increase clinician capacity to perform wheelchair skills for medical students[2] and occupational therapists (OTs) with a "boot-camp style" approach.[1,11] A "boot-camp style" approach is a condensed wheelchair training workshop, generally offered over 1–2 days. This approach is limited in terms of costs, time and travel to attend a course, and limited opportunity for practice which is required to move from skill acquisition to skill retention.[8,9]

While psychomotor skills easier to teach and learn with in-person training,[12] recent methods have explored remote learning options to deliver wheelchair skills training to clinicians. Burrola-Mendez et al.[13] demonstrated that, for the WHO Wheelchair Service Training Package Basic Course for wheelchair-service providers, remote self-study can replace at least two days of the 5-day in-person training with no loss of effectiveness.

A recent cohort study with pre- vs post-training comparisons demonstrated how building clinician capacity might be conducted completely remotely.[14] The participants, 41 physical therapists (PTs), OTs and students, focused on 10 intermediate- and advanced-

level wheelchair skills. Participants an online Manual[15] and viewed instructional video-recordings, practiced in pairs, and uploaded video-recordings of skill performance. After reviewing the video-recordings, a remote trainer provided asynchronous feedback to the learners. Compared to pre-training, post-training participants had improved Wheelchair Skills Test Questionnaire (WST-Q) capacity ($p < 0.001$) and confidence ($p = 0.003$) scores. However, these studies[13,14] did not evaluate whether newly-trained professionals were able to train peers.

The objective of this study was to test the hypotheses that remote-training improves the confidence of trainers and, when these trainers train other healthcare professionals, the wheelchair-skills capacity and confidence of the trainees improves.

METHODS

Study design

This was a cohort study with pre- vs post-training comparisons. A flow chart of study activities can be found in Figure 1.

Setting

Participants were enrolled across four Spinal Cord Injury Model Systems Centers: Midwest Regional SCI Care System, Northern New Jersey SCI System, South Florida SCI System, and University of Pittsburgh Model Center on SCI.

Ethical issues

Institutional Review Boards approved the study at each site. Trainers and trainees provided written informed consent.

Inclusion and exclusion criteria

Trainers and trainees were not primary wheelchair users and were eligible if they were had no restrictions regarding activities of daily living, were 18 to 75 years old, and did not have an upper- or lower-extremity injury that precluded ability to use a wheelchair and complete the pre-training assessment.

Demographic data

Participants completed an online questionnaire through the Qualtrics Online Survey System[a] to record age (years), sex (male, female), race/ethnicity (Caucasian, African-American, Hispanic or Asian American), profession (OT, PT, physician, other), matriculation (yes, no), years of experience working with wheelchairs and wheelchair users, whether they were a certified Assistive Technology Professional (yes, no) and reason for enrolling in the study (interest, job requirement, other).

[a]Qualtrics, 333 W Riverpark Dr, Provo, UT 84604

Sample size

The sample size was based on a power analysis (G*Power[16]) for Wilcoxon signed-rank test (matched pairs) using data from studies of OT students for the WST[1] and SEATS[17]were referenced. These reports showed total percentage pre- / post-training scores (mean ± SD) of 64.8% ± 9.0 / 81.0% ± 5.2 for WST[1] and 38.5% ± 15.8 / 67.9% ± 17.3 for SEATS Self-Efficacy[17]. Using an effect size of 0.8 and an α level of 0.05 as a conservative estimate, due to trainers learning remotely rather than face-to-face, suggested sample sizes of 15, 20 and 24 trainees would provide 80%, 90% and 95% power, respectively, for changes in trainee WST. Sample size for trainers on the SEATS[17] was based on an effect size of 1.75 and an α level of 0.05, which suggested that sample sizes of 5, 6, and 7 provided 80%, 90% and 95% power, respectively. To minimize trainer burden, we studied seven trainers.

Intervention

Trainers completed a two-part remote asynchronous training program. Part 1 focused on skill acquisition[14] that included reviewing the Wheelchair Skills Program Manual Version 4.3[18] (sections on general wheelchair skills training, spotter safety, and 10 intermediate and advanced wheelchair skills), viewing instructional video-recordings, paired practice of the skills, and remote asynchronous feedback from a content expert on videos of their skill performance. Part 2 was novel to this study and included six train-the-trainer video modules on how to assess, train, and spot four skills (Table 1 and available at no cost at https://wheelchairskillsprogram.ca/en/videoshome). The four wheelchair skills were selected due to high demand for teaching in a clinical setting: gets over obstacle, ascends low curb, ascends high curb with caregiver assistance, and performs stationary wheelie.

After completing the training program, each trainer was paired with 2–3 trainees and provided 1:1 in-person training to each trainee. Trainers self-selected the frequency of sessions and duration of training and completed a log for each session including details on training date, location, duration, and skills taught.

Outcome Measures

Trainers and trainees completed questionnaires using the Qualtrics Online Survey System.

Self-Efficacy on Assessing, Training, and Spotting (SEATS): The SEATS is a self-report measure of clinicians' self-efficacy to assess, train and spot each WST skill. Each item is scored 0 to 4 (not at all confident, somewhat confident, neutral, fairly confident, completely confident). Separate scores are calculated for assessment, training and spotting with higher scores representing higher self-efficacy.[19] The SEATS tool has been used to assess final-year OT students in Canada[17] and Colombia[20] and to assess different methods of receiving wheelchair skills training. Trainers completed the SEATS Test for Manual Wheelchairs[19] for the four skills listed above. The SEATS was completed at T1 and T2 as indicated in Figure 1. We calculated the percentage SEATS scores (0–100%) for the 4 items targeted by the study intervention, and the total pre-training SEATS score for all 32 items in the SEATS to compare pre-training knowledge to previous studies.

$$SEATS\ score = 100 \times \frac{\sum item\ scores}{Number\ of\ items \times 4}$$

Wheelchair Skills Test Questionnaire (WST-Q): The measurement properties of the WST and WST-Q are well established.[21] Before and after training (Figure 1, T1 and T2), trainees completed the WST-Q Version 4.3 to assess their capacity ("can you do it?") and confidence ("how confident are you?") for each skill. Capacity was scored 0–2 for responses of "no", "yes, with difficulty", and "yes", respectively. Confidence was scored 0–2 for responses of "not at all confident", "somewhat confident", and "confident", respectively. We calculated the subtotal percentage WST-Q capacity and confidence scores (0–100%) for the 4 items targeted by the study intervention, and the total pre-training WST-Q capacity score for all 32 items in the WST-Q to compare baseline trainee knowledge with previous studies.

$$\textbf{WST-Q}\ score = 100 \times \frac{\sum item\ scores}{Number\ of\ items \times 2}$$

Videos: Trainers uploaded video-recordings of the trainees performing the skills using upon skill acquisition using their personal smartphones. Trainees' skill acquisition (WST capacity scores of 1 or 2) was evaluated by researchers based on the video-recordings.

Feedback: Trainers completed a feedback survey after completing Part 2 of the training. Trainees completed the same survey after completing their training. Both groups indicated agreement on a 5-point Likert scale (strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree) on the training's usefulness, relevance, tolerability, understandability, and enjoyability. Trainers and trainees also gave feedback on the duration of the intervention (too long, too short, just right) and if they would refer others (definitely yes, probably yes, not sure, probably not, definitely not). Optional questions allowed trainers and trainees to provide open-ended responses about aspects of the experience with which they were dissatisfied or found difficult to understand, parts of the course that would be useful to clinical practice, content that should be emphasized or reduced, and other suggestions. The full feedback questionnaire can be found in the Supplemental Material.

Data Analysis

Descriptive statistics were calculated for all quantitative data – means (SDs) or medians [IQRs] for continuous measures (depending on whether the data were distributed normally or not) and frequencies (percentages) for categorical data. Normality was assessed using the Shapiro-Wilk test. Analysis was completed using IBM SPSS Statistics[b] version 24 with an alpha level of 0.05. For the SEATS tool and WST-Q capacity and confidence scores, pre- and post-training scores were compared (for both the 4-item subtotals) using the Wilcoxon Signed Rank test. Descriptive analysis was used to describe the percent of trainees who achieved WST capacity skill acquisition, participant feedback data, the number of sessions

[b]SPSS Inc, 223 S Wacker Dr, 11th Fl, Chicago, IL 60606

and total training time. For open-ended questions on the feedback survey, a single researcher reviewed responses and identified themes.

RESULTS

Participants

We enrolled a convenience sample of 7 trainers and 19 trainees. Six of the trainers participated in the previously reported study that matched Part 1 of this study.[14] Trainer and trainee demographic data are presented in Table 2. No participants were Assistive Technology Professionals.

Trainer: Self-Efficacy on Assessing, Training, and Spotting

The median [IQR] pre-training 32-item SEATS scores for assessment, training and spotting were 62% [53, 86], 57% [57, 84], and 96% [77, 97]. The trainer' pre- and post-training 4-item SEATS scores are shown in Table 3; there were significant improvements in trainer self-efficacy for assessment and training, but no significant difference in spotting, which was higher at baseline.

Training

Two trainers each completed training with two trainees and five trainers each provided training to three trainees. Trainers completed 1–7 1:1 training sessions per trainee with a median [IQR] of 3 [2, 3]. Training sessions ranged in duration from 5–120 minutes with a median [IQR] of 30 [20, 45]. The median [IQR] total training time per trainee across sessions was 95 [65, 120] minutes. One trainee worked on all 4 skills during each of the 6 sessions she completed; all other trainees worked on subsets of skills for 1–3 sessions. The mean (SD) number of sessions that trainees worked on each skill were 1.6 (1.2) for ascends high curb with caregiver assistance, 1.9 (1.2) for gets over obstacle and ascends low curb, and 2.2 (1.3) for performs stationary wheelie.

Trainee: Wheelchair Skills Test Questionnaire

The median [IQR] pre-training 32-item WST-Q scores for capacity and confidence scores were 55% [24, 42] and 48% [23, 38]. Four-item WST-Q capacity and confidence scores significantly increased with training (Table 3). Trainee capacity and confidence for each skill are shown in Figure 2. Participants reported being able to complete all skills with or without difficulty (WST-Q capacity scores of 1 or 2) with the exception of ascends high curb (n=2).

Video Assessment of Skills

Training was considered complete when trainees achieved skill acquisition (WST capacity score of 1 or 2) for all 4 skills. Skill acquisition was assessed by the trainer and confirmed by researchers who reviewed a video recording of the trainee.

Participants' Feedback

The majority of trainers and trainees believed that the training they received (remote and 1:1) were useful (100% and 95%), relevant (100% and 84%), easily tolerated (100% and

100%), understandable (86% and 100%), and enjoyable (86% and 100%). All participants (100%) felt the durations were “just right” and would encourage others to participate. Trainers and trainees who did not endorse agreement on the feedback surveys, indicated a neutral response for items.

In their responses to the open-ended questions, trainers identified the most useful parts of the training were the instructional videos identifying common difficulties and proper technique, step-by-step training progressions, tips for providing feedback to trainees, and strategies for teaching wheelies. One trainer believed that some videos were too short and could be consolidated while others described short videos as a strength. Trainers did not suggest removing any content. One trainer suggested adding videos with an unskilled client to better simulate training a new wheelchair user. All trainers asked for inclusion of additional skills (e.g. stair negotiation, descending high curbs, descending steep inclines in a wheelie).

In their responses to the open-ended question about the most useful part of the training, trainees reported that the most useful parts were skill acquisition to be able to demonstrate the skills, the ability to provide instruction (feedback and progression) to be able to teach their own patients the skills, and an appreciation of the learning curve associated with skill acquisition. One trainee suggested adding a ‘refresher’ training on motor learning to the training while many (n=10) requested adding additional skills (e.g. ascending/descending curbs/inclines/stairs, picking up items off the floor, getting through a door, negotiating obstacles and uneven terrain).

DISCUSSION

Remotely-trained trainers improve their confidence and their trainees improve their wheelchair-skills capacity and confidence following training. We found evidence to support two of the three hypotheses that aspects of the trainers’ confidence improve as a result of training. There were significant improvements in trainer self-efficacy for assessment and training, but no significant difference in spotting, perhaps due to the high pre-training values.

The trainee 4-item WST-Q capacity and confidence scores also increased significantly with training. These findings build on earlier studies about the training of health-care professionals regarding wheelchair skills training[1,2,11,17,19,20] and extend our earlier results[14] by demonstrating that remotely trained trainers can transmit their learning to a subsequent generation of trainees.

Regarding the training provided to the trainers, Part 1 focused on trainer skill acquisition as we previously reported.[14] Part 2 of the training – train-the-trainer video modules – is novel. As evidenced by the pre-training SEATS scores, an individual can have achieved skill acquisition, but lack confidence in providing training to others. Part 2 of the training was effective at addressing deficits in these areas, as evidenced by improvements in SEATS scores post-training.

The median number of training sessions per trainee was 3 and the median total training time was 95 minutes. The mean number of sessions that trainees worked on each skill ranged from 1.6 to 2.2. This training “dose” achieved acquisition of the four targeted skills.

Additional training would be required to ensure skill retention and transfer[15] and to provide training on the full set of WSTP skills would have required more training.

The WST-Q allowed us to quantify the extent of gains in the trainees' capacity and confidence and adds to the already extensive literature using the WST or WST-Q.[21] Smartphone video-recordings, although not without limitations, were adequate to provide the data needed to evaluate the trainees' skill acquisition. Skill acquisition by the trainees (WST capacity scores of 1 or 2) was confirmed by study staff video review. Although all participants achieved skill acquisition for ascending a high curb, not all participants indicated capacity or confidence on the WST-Q. This result may have been because in contrast to other skills, which they learned to complete independently, they were taught to complete the high curb with caregiver assistance. Participants may have answered the WST-Q high curb question (Getting the wheelchair up a high curb, for example at a street corner without a ramp - Can you do it? How confident are you?) with their ability to complete the skill independently, rather than their ability to complete the skill with assistance.

The feedback questionnaire provided insight regarding the participants' perceptions of the training. The majority of trainers considered the remote training useful, relevant, easily tolerated, understandable and enjoyable. All trainers considered the duration of the training "just right" and would encourage others to participate in this type of training. These evaluations were mirrored by trainees further supporting this remote train-the-trainer curriculum.

The trainers' pre-training (32-item) SEATS scores for confidence in assessment (62%) and training (57%) was lower than we expected for therapists in Model SCI Centers who have already acquired these skills.[17,19,22]. The trainees' pre-training (32-item) WST-Q scores for capacity (55%) and performance (48%) were consistent with those of other untrained healthcare professionals.[11,14,19,23] With a general lack of knowledge and skills related to wheelchair skills training among healthcare professionals, it is not surprising that many wheelchair users lack key skills required to navigate their environments. Feedback from trainers and trainees indicated that healthcare professionals are eager for this type of training. Most reported satisfaction and the desire to expand the training to other skills.

Study Limitations

This preliminary study utilized a cohort design, with pre- vs post-training comparisons; however, an RCT is needed to establish efficacy. Trainees were able-bodied, which was appropriate because the focus of this study was on building trainers' capacity; however, future studies should assess trainees who are wheelchair users. Both trainers and trainees were primarily young, white and female; a more diverse sample would be more representative of the population of clinicians providing wheelchair skills training. While the sample was small, it provided sufficient power in light of the large effect sizes, and were informed by *a priori* sample-size calculations. Only one researcher reviewed open-ended responses, which may introduce bias into the interpretation of responses.

Although the trainees were not wheelchair users, they were naïve to wheelchair skills and represent the skill level of new wheelchair users, which is a challenging cohort to recruit.

Future RCTs should recruit a larger sample and trainees who are wheelchair users with heterogeneous reasons for wheelchair use. For our WST-Q data, there was some ambiguity with how participants interpreted the “ascends high curb” item. Future studies that teach caregiver-assisted skills would benefit from modifying the item to ensure it matches the skills taught. Although all trainees achieved skill acquisition, future studies should include a delayed follow-up to evaluate skill retention.

Remote capacity building of healthcare professionals’ wheelchair skills addresses a barrier (inadequate educational preparation) to knowledge translation.[24] Including trainers and trainees from four geographically dispersed centers supports the generalizability of the findings, but our findings cannot be generalized with confidence to wheelchair users or clinicians working with people who use wheelchairs for different reasons.

CONCLUSIONS

Remote training improves trainers’ confidence in wheelchair-skills assessment and training, and they are able to provide training that results in improved trainee wheelchair-skills capacity and confidence. Remote training provides an opportunity to increase clinician ability to learn and teach wheelchair skills than previously possible. Improved dissemination of wheelchair skills could improve not only the skills of wheelchair users but their ability to participate in community settings and valued roles.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of Abbreviations:

OT	Occupational Therapist
PT	Physical Therapist
RCT	Randomized controlled trial
SEATS	Self-Efficacy on Assessing, Training, and Spotting (SEATS) Test for Manual Wheelchairs
WHO	World Health Organization

WSP	Wheelchair Skills Program
WSTP	Wheelchair Skills Training Program
WST-Q	Wheelchair Skills Test Questionnaire

REFERENCES

1. Coolen AL, Kirby RL, Landry J, et al. Wheelchair skills training program for clinicians: a randomized controlled trial with occupational therapy students. Archives of physical medicine and rehabilitation. 2004;85(7):1160–1167. [PubMed: 15241768]
2. Kirby RL, Crawford KA, Smith C, Thompson KJ, Sargeant JM. A wheelchair workshop for medical students improves knowledge and skills: a randomized controlled trial. American Journal of Physical Medicine & Rehabilitation. 2011;90(3):197–206. [PubMed: 21273901]
3. Kirby RL, Mitchell D, Sabharwal S, McCranie M, Nelson AL. Manual wheelchair skills training for community-dwelling veterans with spinal cord injury: a randomized controlled trial. PloS one. 2016;11(12).
4. MacPhee AH, Kirby RL, Coolen AL, Smith C, MacLeod DA, Dupuis DJ. Wheelchair skills training program: A randomized clinical trial of wheelchair users undergoing initial rehabilitation. Archives of physical medicine and rehabilitation. 2004;85(1):41–50. [PubMed: 14970966]
5. Öztürk A, Ucsular FD. Effectiveness of a wheelchair skills training programme for community-living users of manual wheelchairs in Turkey: a randomized controlled trial. Clinical Rehabilitation. 2011;25(5):416–424. [PubMed: 21059666]
6. Routhier F, Kirby RL, Demers L, Depa M, Thompson K. 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. 2012;93(6):940–948. [PubMed: 22494946]
7. Worobey LA, Kirby RL, Heinemann AW, et al. Effectiveness of group wheelchair skills training for people with spinal cord injury: a randomized controlled trial. Archives of physical medicine and rehabilitation. 2016;97(10):1777–1784. e1773. [PubMed: 27153762]
8. Keeler L, Kirby RL, Parker K, McLean K, Hayden J. Effectiveness of the Wheelchair Skills Training Program: a systematic review and meta-analysis. Disabil Rehabil Assist Technol. 2019;14(4):391–409. [PubMed: 29616832]
9. Tu C-J, Liu L, Wang W, et al. Effectiveness and safety of wheelchair skills training program in improving the wheelchair skills capacity: a systematic review. Clinical rehabilitation. 2017;31(12):1573–1582. [PubMed: 28580801]
10. Best KL, Routhier F, Miller WC. A description of manual wheelchair skills training: current practices in Canadian rehabilitation centers. Disability and Rehabilitation: Assistive Technology. 2015;10(5):393–400. [PubMed: 24702608]
11. Rushton PW, Daoust G. Wheelchair skills training for occupational therapy students: comparison of university-course versus “boot-camp” approaches. Disability and Rehabilitation: Assistive Technology. 2019;14(6):595–601. [PubMed: 29996670]
12. Seymour-Walsh AE, Weber A, Bell A, Smith T. Teaching psychomotor skills online: exploring the implications of novel coronavirus on health professions education. Rural and Remote Health. 2020;20(4):6132–6132. [PubMed: 33160300]
13. Burrola-Mendez Y, Bonilla-Escobar FJ, Goldberg M, Pearlman J. Comparing the effectiveness of a hybrid and in-person courses of wheelchair service provision knowledge: A controlled quasi-experimental study in India and Mexico. PloS one. 2019;14(5).
14. Worobey LA, Kirby RL, Cowan RE, et al. Using remote learning to teach clinicians manual wheelchair skills: a cohort study with pre- vs post-training comparisons. Disability and Rehabilitation: Assistive Technology. 2020:1–8.
15. Kirby RL SC, Parker K, McAllister M, Boyce J, Rushton PW, Routhier F, Best KL, Diane MacKenzie, Mortenson B, Brandt A.. The Wheelchair Skills Program

Manual. Published electronically at Dalhousie University, Halifax, Nova Scotia, Canada. www.wheelchairskillsprogram.ca/eng/manual.php.

16. Faul F, Erdfelder E, Lang A-G, & Buchner A (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39, 175–191. Download PDF. [PubMed: 17695343]
17. Smith EM, Best KL, Miller WC. A condensed wheelchair skills training 'bootcamp'improves students' self-efficacy for assessing, training, spotting, and documenting manual and power wheelchair skills. Disability and Rehabilitation: Assistive Technology. 2019:1–3.
18. Sinclair PM, Kable A, Levett-Jones T, Booth D. The effectiveness of Internet-based e-learning on clinician behaviour and patient outcomes: a systematic review. International journal of nursing studies. 2016;57:70–81. [PubMed: 27045566]
19. Rushton PW, Smith EM, Miller WC, Kirby RL, Daoust G. Reliability and responsiveness of the Self-Efficacy in Assessing, Training and Spotting wheelchair skills (SEATS) outcome measure. Disability and Rehabilitation: Assistive Technology. 2019;14(3):250–254. [PubMed: 29385845]
20. Toro-Hernández ML, Alvarez L, Vargas-Chaparro MC, Goldberg M. Final Year Students' Knowledge on Basic Manual Wheelchair Provision: The State of Occupational Therapy Programs in Colombia. Occupational Therapy International. 2020;2020.
21. Dynamic link to articles in PubMed about wheelchair skills training programs. https://wheelchairskillsprogram.ca/en/publications-impact/. Accessed August 19, 2020.
22. Giesbrecht E, Carreiro N, Mack C. Improvement and Retention of Wheelchair Skills Training for Students in Entry-Level Occupational Therapy Education. American Journal of Occupational Therapy.75(1):7501205160p7501205161–7501205160p7501205169.
23. Worobey LA KR, Cowan RE, Dyson-Hudson TA, Shea M, Heinemann AW, Presperin Pedersen J. Hibbs R, Boninger ML. Effectiveness of wheelchair skills training for clinicians using self-study guided by remote asynchronous feedback: a cohort study with pre- vs post-training comparisons. Arch Phys Med Rehabil (under review). Epub ahead of print.
24. Best KL, Miller WC, Routhier F. A description of manual wheelchair skills training curriculum in entry-to-practice occupational and physical therapy programs in Canada. Disability and Rehabilitation: Assistive Technology. 2015;10(5):401–406. [PubMed: 24702609]

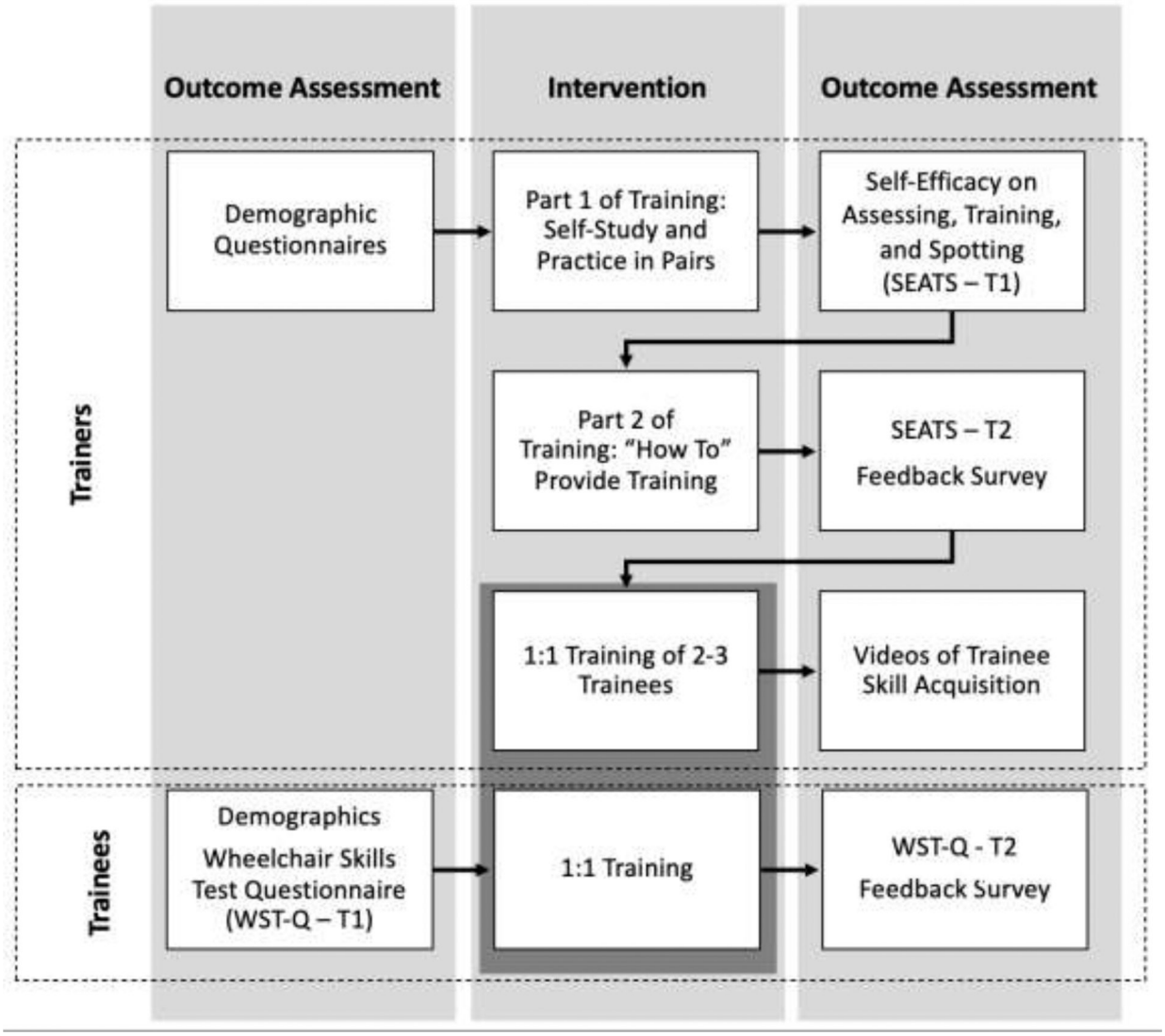

Figure 1:
Flow chart of study activities for trainers and trainees

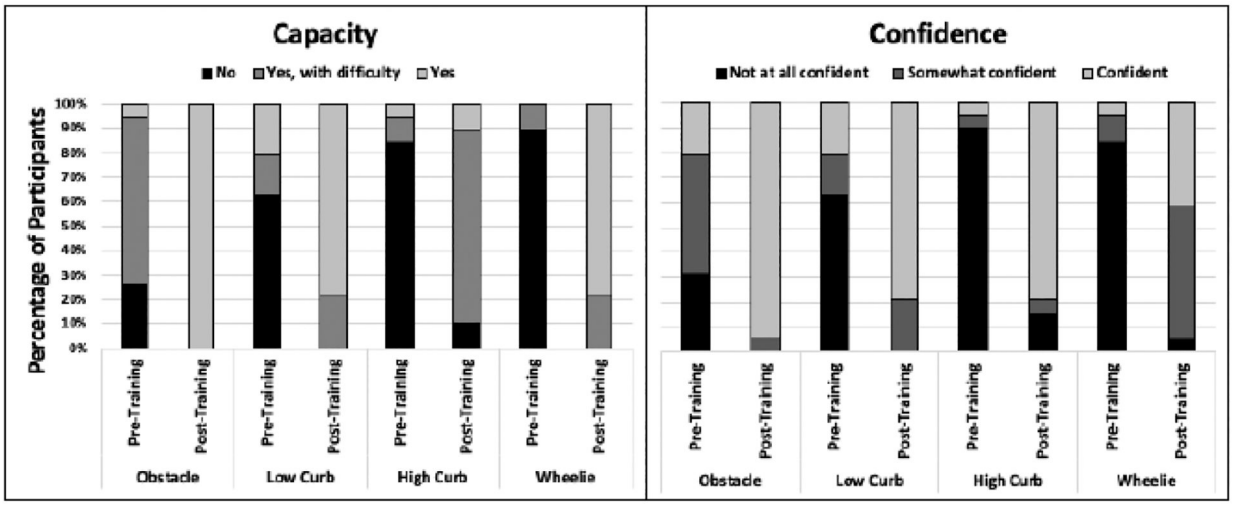

Figure 2:
Trainee Wheelchair Skills Test Questionnaire (WST-Q) capacity and confidence scores pre- and post-training.

Table 1:

Train-the-Trainer Video Modules

Module	Video Name
Safety	Wheelchair Skills Program: Introduction
	Spotter Strap: Attachment to a folding-frame wheelchair
	Spotter Strap: Attachment to a rigid frame wheelchair
	Alerting the wheelchair user: Spotter off status
Motor Learning	Motor-skills-learning principle: Example of Timing and Content of Feedback
	Motor-skills-learning principle: Example of Demonstration
Gets Over Obstacle	Gets Over Obstacle: Transient Caster Pop
	Gets Over Obstacle: Transient Caster Pop - Auditory Feedback
	Gets Over Obstacle: Stationary method
	Gets Over Obstacle: Momentum method
	Gets Over Obstacle: Backwards method
Independent Curb Ascent	Ascends Low Curb: Stationary Method
	Ascends Low Curb: Momentum Method
	Ascends Low Curb: Caster Slap Error
Assisted Curb Ascent	Ascends High Curb: Caregiver assistance
Stationary Wheelies	Performs Stationary Wheelie: Introduction and testing
	Performs Stationary Wheelie: Training sequence
	Performs Stationary Wheelie: Take-off phase
	Performs Stationary Wheelie: Balance phase
	Performs Stationary Wheelie: Advancing balance position
	Performs Stationary Wheelie: On soft surface
	Performs Stationary Wheelie: Practice exercise
	Performs Stationary Wheelie: Proactive and reactive balance strategies

Table 2:

Participant Demographic Data

Demographic	Trainer	Trainee
Age (years)	29.4 (4.9)	27.8 (5.3)
Experience (years)	5.4 (4.8)	1.7 (2.2)
Female	5 (71%)	18 (95%)
Race		
Caucasian	7 (100%)	16 (84%)
Asian	0 (0%)	3 (16%)
Ethnicity		
Hispanic	2 (29%)	2 (11%)
Profession		
Physical Therapist	4 (57%)	6 (32%)
Physician	1 (14%)	2 (11%)
Occupational Therapist	1 (14%)	1 (5%)
Physical Therapy Student	0 (0%)	2 (11%)
Medical Student	0 (0%)	1 (5%)
Other	1 (14%)	7 (37%)
Reason for participation		
Interest	7 (100%)	16 (84%)
Financial Compensation	0 (0%)	1 (5%)
Contribute to Research	0 (0%)	2 (11%)

Means (SDs) are shown for continuous data and n (%) for categorical data

Table 3:

Pre- and Post-Training Trainer and Trainee 4-Item SEATS and WST-Q Scores

Outcome Measure		Pre-Training (median [IQR])	Post-Training (median [IQR])	Change (p-value)
SEATS (Trainer)	Assessment	63% [50, 78]	94% [94,100]	0.003
	Training	56% [50, 78]	94% [94,100]	0.002
	Spotting	85% [75,100]	94% [94,100]	0.056
WST-Q (Trainee)	Capacity	13% [6,31]	88% [75,88]	<0.001
	Confidence	13% [0,31]	88% [81,100]	<0.001