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Feasibility of the Wheelchair Self-Efficacy Enhanced for Use (WheelSeeU) training program: study protocol for a randomized controlled trial

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Abstract

Background—Manual wheelchairs (MWC) can improve mobility and social participation for individuals who experience difficulty walking, but older adults receive little training for wheelchair use. The *Wheelchair Self-efficacy enhanced for Use (WheelSeeU)* research program provides peer-led training that may positively influence wheelchair use, while reducing clinician burden.

Purpose—The purpose of this study is to evaluate the feasibility and clinical outcomes of WheelSeeU.

Methods—A randomized control trial (RCT) recruits and randomly assigns 40 MWC users (55+ years). Feasibility indicators assessing process, resource, management and treatment issues are measured and clinical outcomes (wheelchair skills, safety, confidence, mobility, social participation, quality of life, health utility) are collected at 3 time points.

Implications—WheelSeeU provides an innovative approach for teaching wheelchair skills to an aging population, which may improve wheelchair use and decrease clinician burden. Since RCTs are expensive and challenging in rehabilitation, establishing feasibility prior to larger effectiveness trials is prudent.

Trial registration—Clinical Trials NCT01838135 April 18, 2013

Keywords

Rehabilitation; Manual Wheelchair; Older adults; Self-Efficacy; Peer-training

Manual wheelchairs (MWC) provide mobility options for nearly 100,000 older Canadians who experience difficulty walking (Best & Miller, 2011). As the population continually ages, the number of MWC users is expected to increase exponentially (Statistics Canada, 2008). From a clinical perspective, MWCs are often prescribed as compensatory devices to support life-role independence (Arthanat, Nochajski, & Stone, 2004) and reduce physical disability effect on daily life (Hoenig et al., 2005). However, procurement of a MWC does not guarantee safe independent use or satisfactory performance in meaningful activities.

Despite the potential benefits, MWCs are often associated with negative consequences. In Canada, nearly 60% per cent of older MWC users depend on others for mobility assistance (Shields, 2004), and over 90% experience restricted performance in at least one major life activity (Statistics Canada, 2008). Reliance on others for mobility and participation can adversely impact both MWCs and their caregivers, who are often unpaid family members (World Health Organization, 2011). Negative consequences may include reduced economic and social inclusion (Hanson, Neuman, & Voris, 2003), decreased social participation, and lowered quality of life (Mortenson et al., 2012).

Unsafe use of wheelchairs may be associated with accidents and injuries (Kirby, Ackroyd-Stolarz, Brown, Kirkland, & MacLeod, 1994). A 2011 study on experienced, community-dwelling wheelchair users found that 55% of participants reported one accident in the past three years, and 17% reported two or more (Chen et al., 2011). Most accidents are directly or indirectly related to falls, which may cause injuries that further impede mobility, restrict activities, limit participation, reduce quality of life, and add to caregiver burden.

Training is a critical component in the provision of assistive technologies (Fuhrer, 2001) and is arguably needed for MWC use (WHO, 2011). There is empirical support for the use of standardized wheelchair skills training, in which a clinician provides up to 5 hours of 1:1 training. Studies suggest training is safe and practical (Coolen et al., 2004; Kirby et al., 2004) and randomized controlled trials (RCT)s report significant effects on wheelchair skill capacity (MacPhee et al., 2004; Best, Kirby, Smith, & MacLeod, 2005; Routhier et al., 2012) and safety (Öztürk & Ucsular, 2011). However, relatively few MWC users receive such standardized wheelchair training (Zanca et al., 2011; Charbonneau, Kirby, & Thompson, 2013).

In Canadian rehabilitation centres, approximately 66% of clinicians provide basic wheelchair skills training (e.g., maneuvering in small spaces). However, due to lack of time and resources, less than 10% provide training in the advanced skills that are critical for community mobility and participation, such as descending curb cuts (Best, Routhier & Miller, 2013). Moreover, since a large number of older adults independently purchase wheelchairs directly from community vendors, it is likely they receive even less training. Alternative approaches to wheelchair training may increase the number of MWC users who receive training, while alleviating the burdens experienced by clinicians.

Wheelchair self-efficacy, conceptualized as belief in one's ability to overcome challenging situations when using a MWC (Rushton, Miller, Kirby, Eng, & Yip, 2011), is a relatively new construct that has been shown to be important for wheelchair mobility (Sakakibara,

Miller, Eng, Backman, & Routhier, 2012). Social cognitive theory suggests that self-efficacy can be remediated through strategies that facilitate peer observation, successful performances, verbal reinforcement, and understanding physiological responses (Bandura, 1997). Application of peer-led, social cognitive strategies has been effective for eliciting favourable behavioural changes for exercise (Dorgo, Robinson, & Bader, 2009) and chronic disease management (Lorig, Ritter, Villa, & Armas, 2009). Moreover, peer-led self-management programs are cost-effective compared to usual care for treating chronic conditions, thus leading to better health outcomes at lower costs (Richardson et al., 2008).

Peer-led wheelchair training is a novel intervention that may not only increase wheelchair skills, but may also be more efficacious in improving self-efficacy for wheelchair use compared to wheelchair training by a clinician. Furthermore, implementing community-based interventions that don't rely solely on professionals may reduce clinician burden and have direct cost benefits. For example, a lay-trained peer-leader could be paid wages similar to an occupational therapy assistant (approx. \$16/h CAD), compared to those of licensed occupational therapists (approx. \$33/h CAD) in Canada (Government of Canada, 2010).

We propose that a self-efficacy enhancing, peer-led wheelchair training program that is designed to improve wheelchair skills capacity is feasible to administer and effective at improving clinical outcomes among older MWC users. If feasible and effective, a peer-led approach may provide a useful and cost saving alternative to clinician-led wheelchair training.

Study Objectives

Feasibility Indicators

Feasibility indicators have been selected to evaluate the feasibility of study methods and procedures, including:

1. *Process issues* of participant recruitment, consent, retention, and perceived benefit;
2. *Resource issues* of treatment adherence, burden of data collection, use of a peer-Trainer; translation of study material; and intervention burden;
3. *Management issues* of participant processing, and protocol administration (in English and French); and
4. *Treatment issues* of safety, response, treatment effect, and variation of outcomes.

Primary Clinical Outcome

The aim of this study is to evaluate the effect of WheelSeeU on objective wheelchair skills capacity and obtain an estimate of treatment effect size.

Secondary Clinical Outcomes

The secondary aims are to evaluate the effect of WheelSeeU on subjective wheelchair skills capacity, wheelchair safety, wheelchair confidence, life-space mobility, satisfaction with performance, activity and participation, health-related quality of life, and health utility.

Methods

Trial design

This RCT is currently underway at two-sites (Vancouver and Quebec City), to compare differences in older adults' wheelchair use between a WheelSeeU (treatment) group and a wheelchair information (iWheel) (control) group. Participants are randomly assigned to WheelSeeU or iWheel in pairs, using a 1:1 allocation ratio between groups. To support balance between groups and blinding of assignment, a central computerized randomization process was designed by a statistician, with an undisclosed block size (to allow for randomization of pairs of participants) and stratified by site (Vancouver $n = 20$; Quebec City $n = 20$). Once two participants are enrolled, the Tester proceeds with collection of baseline data and enters the data into a secure database. The Site Coordinator then contacts the statistician to obtain group assignment for the pair of participants within 48 hours. The Site Coordinator forwards participant contact information to the appropriate group Trainer, who then contacts both participants to schedule six training sessions. Upon completion of training, the Site Coordinator schedules post-intervention (2–7 days) and retention (6 months) testing sessions with the Tester (see figure 1). To address bias, participants are instructed not to discuss their program; separate trainers are used for the treatment and control groups; and the testers are blinded to group allocation. To prevent attrition, condensed WheelSeeU training or iWheel information is offered to all participants at the end of the study. Since Canada is a bilingual country, with 22% primarily speaking French (Statistics Canada, 2011), WheelSeeU interventions and assessments are administered in English or French.

Ethics

The protocol for this study has been approved by the Research Ethics Boards at the University of British Columbia (Approval # H13-00509) and the Institut de réadaptation en déficience physique de Québec (Approval # 2013-317), as well as regional health authorities in Vancouver. All study participants provide informed consent.

Participants

A total of 40 community-dwelling MWC users living in Vancouver or Quebec City are recruited on a volunteer basis. Each site has 20 participants, with 10 in each of the treatment and control groups. The Site Coordinator screens for inclusion criteria to confirm that participants: are 55 years of age or older; live in the community; self-propel MWCs an average of 1 hour per day; have self-proclaimed wheelchair mobility goals; and be cognitively able to engage in the program (Modified Mini-mental Status Exam score of 24) (Crum, Anthony, Bassett, & Folstein, 1993). Individuals are excluded if they: are unable to complete study questionnaires in English or French; anticipate health conditions or procedures that contraindicate training (e.g., surgery which may impair physical activity); have degenerative conditions that are expected to progress quickly (e.g., amyotrophic lateral sclerosis); or are receiving or planning to receive wheelchair mobility training during the study period.

Sample size

The sample size is large enough to evaluate the feasibility indicators and represent the target population (Campbell et al., 2007). The sample size calculation is powered to detect a statistically significant difference between groups and provide an estimate of a treatment effect. Our calculations are based on the primary clinical outcome measure, the Wheelchair Skills Test (WST) version 4.1. Since there are three published wheelchair training RCTs using actual wheelchair users, and the peer-training approach used in this study is novel, a significance level (α) of 0.10 was selected. This study is powered (β) at 90%. Based on a sample size calculation formula for analysis of covariance (ANCOVA) in RCT designs (McDonald, 2009), each group requires 15 participants. Due to a 9–18% dropout rate reported in previous trials, the sample size is conservatively adjusted for a 25% dropout rate, for a total study N of 40 (20 in each group).

Previously published studies have used younger/mixed-age populations and data specific to older adults are not available. We used a subset of unpublished data (F Routhier, personal communication) from adults (>50 years) to determine the WST mean change (SD) ($m = 9.3\%$; $s = 9.5\%$) scores following training and powered our study to capture a comparable change. A difference of 9.3% corresponds to acquisition of three additional skills on the WST; previous studies report participants' perceptions of a clinically important difference with such improvements (MacPhee et al., 2004; Best et al., 2005). No formal minimal clinically important change (MCID) has been established for the WST; however, using data from a previous trial (Best et al., 2005), a Smallest Detectable Difference calculation suggests a difference of 9.2% would exceed any measurement error or noise (Beaton, Boers & Wells, 2002). A Reliability Change Index calculation indicates 3.0% is the Minimal Detectable Change required and is a reasonable proxy for MCID (Beaton et al., 2002).

Procedure

Pairs of participants are randomly assigned to either the treatment group (WheelSeeU) or the control group (iWheel). Participants in both groups attend six, 1.5 hour training sessions at a frequency of one to two sessions per week. WheelSeeU is co-administered by a peer-Trainer and a support-Trainer, and iWheel is administered by a clinician or similar health professional. Both training programs are administered in (randomized) pairs, and participants remain with the same partner and trainers for the duration. To mask participants from study objectives, both groups are told that the training program is designed to improve wheelchair use. To maintain equipoise in this study, participants in the control group will be offered WheelSeeU upon completion of the study. Likewise, participants in the intervention group will be provided with the iWheel information booklet.

Intervention

Treatment group (WheelSeeU)—The WheelSeeU peer-Trainer has at least 10 years of experience using a MWC and are 55 years of age or older. The support-Trainer is an occupational therapist, physiotherapist, or other health professional who has at least five years of experience working with MWC users. Trainers complete a 2-day comprehensive orientation to WheelSeeU, administered by a single expert trainer who has more than 10 years experience in manual wheelchair training. The protocol includes details for each

session, an overview of the Specific, Measurable, Attainable, Relevant and Time-based (SMART) goal framework, education on the social cognitive approaches, and training in how to teach wheelchair skills. The peer-Trainer is taught to facilitate goal setting, select applicable skills required to achieve goals, teach wheelchair skills, and set manageable task objectives. The peer-Trainer is also taught to present situational vignettes, using description, imagery, and his or her own experiences. The role of the support-Trainer is to aid the peer-Trainer in identifying necessary skills required to achieve a particular goal, assist with identifying task objectives, and reinforce safety during practice of wheelchair skills. The purpose of the support-Trainer in this feasibility study is to gain expert feedback about the intervention, and provide an extra element of safety in early trials. Participants are encouraged to bring a significant other to WheelSeeU, who are encouraged to provide positive support during practice and taught how to spot for safety.

WheelSeeU is tailored to the individual's goals, identified at the start of each session. During the first four WheelSeeU sessions, participants are encouraged to select goals related to performing activities and negotiating the environment around the home and outside the home. The peer-Trainer guides the participant in the selection of specific task objectives required to achieve each goal. Tasks may include specific wheelchair skills, knowledge in skills sequencing, knowledge of potential physical and subjective barriers, and methods to overcome challenging situations. For example, the participant identifies that his or her goal is *'to confidently cross the street at a busy crosswalk with 6 lanes of traffic'*. The peer-Trainer helps break that goal into task objectives, such as: *'maneuver wheelchair close enough to push walk light, descend a curb cut, propel the wheelchair across the street using big pushes, ascend a curb cut'*. The peer-Trainer addresses issues of anxiety or fear related to each task objectives, and then provides training for each task that is required to achieve the goal. The participants take turns working on his or her individual goals during each session, while watching and encouraging the other participant to do the same. Graded learning strategies are applied, such that: the skill fundamentals are learned indoors without distraction; then practiced in more challenging environments to build sequencing of skills and task objectives, while progressing to the 'real' environment. Performance feedback is given by the peer-Trainer, the support-Trainer and the other participant throughout. A reflection and discussion period is then facilitated, where the peer-Trainer challenges participants to talk about what they were feeling during practice, and how they plan to manage their emotions when performing the skills outside of WheelSeeU. Each session ends with a brief summary of progress.

The final two WheelSeeU sessions focus on reinforcing less tangible skills, such as knowledge and problem-solving in challenging situations, advocacy, managing social situations, and controlling emotions. Goals are identified using the same methods as above, but practice of these more abstract skills occurs through discussion and role-playing of situational scenarios. For example, the participant identifies that his or her goal is to *'overcome feelings of embarrassment when entering a friend's house with wet or snowy tires'*. The peer-Trainer uses various approaches, including role-playing, discussion of feelings, symptom interpretation, and anxiety management techniques that have worked for them in the past. If time permits, participants may practice the objective skills that were identified in previous four sessions.

Control group (iWheel)—Resources for improving Wheelchair use (iWheel) is administered by a clinician or other health professional with at least five years of clinical experience. The iWheel-Trainer completes a half-day workshop in the administration of iWheel, which is an educational presentation of wheelchair-related information. The iWheel sessions are based on general wheelchair use topics, including: accessing the city, seating considerations and wheelchair maintenance transportation, pain management, and physical activity and nutrition. A didactic Power Point lecture guides an interactive discussion based on points of interest. The iWheel-Trainer is instructed to not provide details about specific wheelchair skills, and is instructed to divert related questions by acknowledging that wheelchair skills training is not the purpose of the session.

Scheduling and equipment—WheelSeeU and iWheel are held in local, healthcare institutions that have dedicated research space and in community-based locations depending on participant goals. Participant manuals and Power Point presentations have been developed for the treatment and control groups to help guide and standardize the process. The WheelSeeU and iWheel manuals include brief overviews of the programs, as well as specific details about each session. Participants use their own wheelchair for all training sessions.

Safety

To reinforce participant safety, WheelSeeU employs safety equipment and the training of safe techniques. The support-Trainer is trained in wheelchair spotting, and proper use of a spotter strap, and takes responsibility for demonstrating, instructing and monitoring wheelchair spotting by caregivers. It is important for MWC users to be aware of potentially unsafe situations; therefore, WheelSeeU provides education and training to minimize risks that are inherent in the community. If unsafe situations arise, they are acknowledged and discussed immediately, and additional training is provided to avoid future situations. A data safety and monitoring board, consisting of a biostatistician, a physiotherapist, and an experienced wheelchair user provides advice regarding safety issues. Adverse events occurring during the study will be recorded and reported to the data safety and monitoring board and the ethics review board.

Data collection

Sociodemographic and personal information (e.g., age, sex, marital status, highest level of education, cognition, primary diagnosis related to MWC use, length of time using the MWC, and propulsion method) are collected for all participants at baseline. Wheelchair device characteristics are collected using a Wheelchair Specification Form.

Feasibility indicators for process, resources, management, and treatment parameters are measured during administration and at study's end. Table 1 provides a description of measurement processes and criterion for success for each indicator.

Clinical outcome measures are collected at baseline (pre-randomization), post-intervention, and six months post-intervention. Experimental bias is minimized by having one trained Tester at each site, who is unaware of group allocation, administer all of the assessments.

The assessments are completed within the healthcare institution's designated research space at each site. All Testers are trained in the administration and scoring of all assessments. Assessments and training are done in French/English, depending on participant preference.

Upon completion of each testing session the Tester enters raw data into a secure database. Data entry is validated by a third party who is not part of the study after every fourth participant. Hard copies of the data are kept in locked filing cabinets at each site. Encrypted documents are shared between sites using a secure online file sharing program.

The primary clinical outcome, objective wheelchair skills capacity, is measured by the WST 4.1 for MWC users (Available: www.wheelchairskillsprogram.ca). The objective WST is a standardized evaluation of the execution of 32 MWC skills (pass/fail) and the safety of skill execution (safe/unsafe). Total percent scores (0–100%) are calculated for skill execution and safety. The WST was selected as the primary measure because it is a standardized tool for evaluating wheelchair capacity, the primary construct of interest. Compared to other measures of wheelchair skill, the WST has the strongest psychometric properties and been used most extensively in clinical trials (Fliess-Douer, Vanlandewijck, Manor, van der Woude, 2010). The WST 4.1 has demonstrated excellent reliability for test-retest (ICC = .901), intra-rater (ICC = .950), and inter-rater (ICC = .855) administration (Lindquist et al., 2010). Construct validity of an earlier version of the WST (version 2.4) has been supported by significant relationships with predictive variables of age, sex, MWC experience, diagnosis, and use of a lightweight wheelchair, which account for 35% of variability in WST score using multiple regression (adjusted $R^2 = .35$) (Kirby et al., 2004). Concurrent validity has been established through positive correlation with therapists' global assessment of user ability ($R_S = .39 - .40$) and the Functional Independence Measure (Admission score $R_S = .38$; Discharge score $R_S = .31$) (Kirby et al., 2004).

Secondary clinical outcomes are measured to help explain variability of the primary outcome, including perception of wheelchair skills capacity, wheelchair safety, confidence using a MWC, life-space wheelchair mobility, satisfaction with performance, activity and participation, health-related quality of life, and health utility. The measurement properties for all clinical outcomes are summarized in Table 2.

WST – Questionnaire [WST-Q] 4.1—An individual's capacity to perform wheelchair skills may not necessarily be indicative of his or her perception of ability/what he or she actually does. Therefore, the WST-Q is used to capture subjective evaluation of perceived ability to execute 32 MWC skills (yes/no), and whether or not the skill has been successfully performed in the past month. Total percent scores (0–100%) are calculated for perceived capacity and performance. The WST-Q was selected as a secondary measure because perceived ability may influence actual wheelchair use.

WST 4.1 Safety—The WST provides a total Safety score on the 32 wheelchair skills included in the test (0–100%), which reflects the number of skills attempted safely, regardless of whether the skill is passed (Lindquist et al., 2010). This is important since training involves learning to recognize risks and limitations. Recognition that a particular

situation is unsafe or that one is not capable of safely performing an activity is preferable to attempting a maneuver that may lead to accident or injury.

Wheelchair Use Confidence Scale for Manual Wheelchair Users (WheelCon-M 3.0)—The WheelCon was selected as a secondary outcome measure because confidence for using a wheelchair has been shown to influence capacity (Sakakibara, Miller, Souza, Nikolova, & Best, 2013). The WheelCon is a 65-item self-report scale (0–100) with documented reliability, validity and responsiveness (Rushton, Miller, Kirby, & Eng, 2013). Responses indicate current perceived confidence to navigate the physical environment and perform activities in a wheelchair, problem-solve, advocate for needs, and manage social situations and emotions.

Life-Space Assessment (LSA)—Life-Space Assessment (LSA) is a 20-item questionnaire that tracks mobility habits of wheelchair users in a continuum of environmental contexts (home; around the home; in the neighbourhood; in town; and outside of town). Participants report their attainment of each life-space during the past 4 weeks, frequency of attainment, and any assistance required. The LSA was selected because it provides information about an individual's wheelchair mobility habits and has documented reliability and validity (Auger et al., 2009; Auger et al., 2010).

The Wheelchair Outcome Measure (WhOM)—The Wheelchair Outcome Measure (WhOM) is a client-specific tool that identifies satisfaction with participation in activities for wheelchair users. Rates of perceived 'importance' of the goal (0–10) and 'satisfaction' with current performance of this activity (0–10) are obtained. The WhOM is reliable and valid for obtaining information about participation goals of MWC users with spinal cord injury (Rushton, Miller, Mortenson, & Garden, 2010; Miller, Garden, & Mortenson, 2011), and is used to explore whether WheelSeeU influences perceived satisfaction with participation.

Late Life Function and Disability Instrument (LLFDI)—Late Life Function and Disability Instrument (LLFDI) is a 16-item disability component and a 40-item function component, which includes 8 items specific for individuals who use assistive devices for mobility (Jette et al., 2002; Haley et al., 2002). Participants are asked to identify the frequency of performing life tasks using a scale ranging from 1 (never) to 5 (very often) and then asked to identify the extent that they feel limited in performing specified tasks. The LLFDI is a reliable, valid and responsive measure among older adults (Sakakibara et al., 2013).

Health Utility Index Mark 3 (HUI3)—The cost-utility and cost-effectiveness of new rehabilitation interventions is important for informing health-related funding decisions and can be evaluated through health utility measurement (Torrance, Furlong, & Feeny, 2002). The HUI3 is a short questionnaire that asks participants about their health status, reflected in a single-score measure of health-related quality of life (HRQOL). Higher scores are indicative of better health and higher quality of life. The measurement properties of the HUI3 have been documented (Jones, Feeny & Eng, 2005; Horsman, Furlong, Feeny, & Torrance, 2003).

Statistical analyses

Data will be analyzed for feasibility indicators as well as statistical clinical outcomes. Data will be assessed for normality using the Kilmgrov-Smirnov statistic and observation of histogram charts. Appropriate summary statistics will be calculated, including means and standard deviations for continuous variables, and frequencies and proportions for categorical variables.

Aside from the clinical outcomes that undergo statistical analysis, feasibility indicators for process, resources, management and treatment will be treated as binary ('successful/unsuccessful'). 'Success' will indicate the protocol is sufficiently robust to move forward with the large RCT with only small/no adaptation required, while 'unsuccessful' will indicate a need for changes to the protocol before proceeding. A detailed description of the feasibility indicators and the criterion for success is provided in table 1.

Intention-to-treat analysis will be applied for all clinical outcomes. Significance will be $\alpha = 0.10$ and 90% confidence intervals will be estimated. For the primary clinical objective, post-treatment WST capacity scores will be compared in the experimental and control groups using analysis of covariance (ANCOVA) (or equivalent non-parametric statistic), controlling for baseline score and paired randomization of participants as a covariate. Secondary clinical objectives will be evaluated using ANCOVA (or equivalent non-parametric statistic), to compare post-treatment scores between the experimental and control groups for perceived wheelchair skills capacity (WST-Q), wheelchair safety (WST), wheelchair confidence (WheelCon), life-space mobility (LSA), satisfaction with performance (WhOM), activity and participation (LLFDI), physical activity (data logger), and health-related quality of life (HUI 3). Baseline score and paired randomization of participants will be used as a covariate. Participants' satisfaction with performance of participation outcomes (WhOM scores) will be analyzed using analysis of variance (or equivalent non-parametric statistic),.

Discussion

WheelSeeU is an innovative approach for providing wheelchair skills training to an aging population. The benefits of an effective intervention co-led by a peer-Trainer and a support-Trainer include limited direct contact with a clinician and development of community-based social supports. Peer-training may also provide further theoretical and social benefits for older adults.

WheelSeeU is grounded in Social Cognitive Theory, and has been enhanced to improve self-efficacy, as well as wheelchair skills. Theory suggests that teaching skills capacity alone may not be enough and the learner may not use acquired skills if he or she is not self-efficacious. WheelSeeU encompasses all four sources of self-efficacy, which are vicarious learning, performance mastery, verbal persuasion and reinterpretation of physiological symptoms. Vicarious learning is facilitated through peer instruction and guidance, and the observation of similar others (i.e., use of a peer-Trainer, and participant pairing), which plays a role in how an individual approaches goals and challenges. Performance mastery of necessary skills is achieved through goal setting and participant-defined wheelchair mobility

goals. Verbal persuasion consists of positive and suitable verbal encouragement from peers and significant others. Finally, the WheelSeeU peer-Trainer allows for MWC users to reinterpret stress reactions by viewing physiological symptoms as a facilitator to performance instead of a debilitating state.

Studies show that incorporating social cognitive strategies for improving self-efficacy into behavioural interventions effectively improves physical activity (Allison & Keller, 2004) and disease management (Lorig et al., 2009). Further, there is reason to believe peer-led programs may have additional advantages over programs led by health professionals. For example, in addition to providing vicarious experiences, peer-led programs may be more cost effective. A community-based program led by peers may enable continual advanced wheelchair skills, while reducing the costs associated with institutional-based training by a health professional. Compared to professionals, peer-trainers also tend to be perceived as more empathic, especially among older adults (Bratter & Freeman, 1990). With appropriate training, peer-trainers are able to teach specialized skills to learners in a non-threatening environment. Peer-led programs can be administered in pairs or a group, which leads to efficient use of time and fosters a sense of community (Webel, Okonsky, Trompeta, & Holzemer, 2010). Further, interaction with peers enhances program adherence (Layne et al., 2002).

The advantages of improved wheelchair self-efficacy and skills for older MWC users may also extend beyond fundamental wheelchair use. According to Sakakibara et al. (2012), if people believe they can produce desired effects by their actions while using their wheelchair, they have greater incentive to participate in personal and social roles more frequently. This is an area of research needed especially for older MWC users, who report low levels of participation in physical (8.3%) and leisure (41.3%) activities (Best & Miller, 2011).

Formalized wheelchair skills training has demonstrated excellent potential for improving user skills (MacPhee et al., 2004; Best et al., 2005; Routhier et al., 2012; Öztürk & Ucsular, 2011). However, the most effective and cost-efficient means of wheelchair skills training remains unclear. Large multi-site clinical trials are required to establish evidence to inform and direct clinical practice. Conducting this feasibility trial is not only critical, but also prudent, prior to moving forward with an expensive multi-site RCT. The results of this study will evaluate feasibility indicators and estimate effect sizes for clinical outcomes, while allowing for study design and protocol refinement. Pilot data from this study will be used for larger experimental trials. The intent, beyond the feasibility stage, is that WheelSeeU will be administered solely by peer-Trainers.

Due to the nature of feasibility studies, several inherent limitations may arise and will be addressed in the larger multi-site RCT. The potential for recruitment of older adult MWC users is unknown. Previous wheelchair training studies have suggested high attrition, especially in the control group. We are mitigating this limitation through an active control that may be perceived as useful and fun to the participants. However, it should be noted that caregivers are not asked to attend iWheel, thus participants in WheelSeeU may receive more support for participation that could influence outcomes. To overcome the discrepancies between WheelSeeU and iWheel and to enforce equipoise, participants in iWheel are offered

wheelchair skills training upon study completion and participants in WheelSeeU are provided with the iWheel resources. If a treatment effect is found, the effect size may lack generalizability due to the restricted age group being targeted. However, we anticipate that an effective training program proven for older adults should have at least as large a treatment effect in younger and stronger individuals.

Future study can compare with more labour-intensive strategies, estimate cost-effectiveness, and measure impact on community participation and caregiver burden. Evidence for the effectiveness of WheelSeeU would inform best practice and provide justification for funding to incorporate WheelSeeU into existing peer-support programs through the provincial government and disability advocate agencies. A peer-led wheelchair training program may be more appealing to older adults and may foster increased participation in social activities that rely on wheelchair mobility. WheelSeeU has great potential for use across age and diagnostic groups, and feasibility for administering WheelSeeU in English and French, and may lead to translation in other commonly used languages in Canada.

Conclusion

WheelSeeU provides an innovative approach for teaching wheelchair skills to an aging population, which could impact, wheelchair skills, independence, safety and participation in social roles and other important activities.

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Figure 1.
Detailed depiction of WheelSeeU trial design.

Table 1

A detailed description of the measurement process and parameters for success of the feasibility indicators.

Feasibility component	Outcome measure	Criterion for success
Process		
Recruitment rate	# of subjects recruited over time	2 subjects/month/site
Consent rate	% of subjects consenting	< 10% subject refusal
Retention rate	% of subjects with complete data collection (T ₁ , T ₂ , T ₃)	Complete T ₂ data collection with 80% of subjects
Perceived benefit	Post-intervention Participant Questionnaire	> 85% of responses report perceived benefit from the intervention.
Resources		
Adherence rate (Experiment group) (Control group)	Attend 6 WheeSeeU sessions Attend 6 iWheel sessions	> 85% of subjects > 85% of subjects
Data collection subject & tester burden	Data collection T ₁ Data collection T ₂ & T ₃	> 85% of subjects complete in 2 h > 85% of subjects complete in 1.5 h
Collection of HUI data	Administration HUI pre/post score	Data collection is < 10 mins Statistically significant change between T ₁ & T ₂
Peer-trainer adherence	Attend 6 × 5 training sessions per site = Total 30 intervention sessions	Able recruit and retain a peer trainer to administer the intervention at both sites
Management		
Combining data	Able to combine English and French data	No issues with combining English and French Data
Intervention fidelity	Videotape and score peer-trainer and support-trainer administer the intervention.	A score of > 90% on the WheelSeeU Administration Rating Sheet.
Subject processing	Time from initial contact to enrolment	Mean time is < 10 days at each site
Treatment admin	Treatment protocol checklist	Issues identified can be modified without substantial changes to protocol
Treatment		
Safety (Intervention)	Adverse events during intervention	No major injuries or adverse events reported
Safety (Data collection)	Adverse events during assessment	No major injuries or adverse events reported
Treatment response	ANCOVA comparison between groups	Significant difference between groups
Dose response	Correlation between total training time and WST change score	Minimum practice time guidelines sufficient for a treatment effect.

Feasibility component	Outcome measure	Criterion for success
Treatment effect	Estimate of effect size and variance for future sample size/ power calculations	

Table 2

Summary of the measurement properties of the clinical outcome measures.

Measure	Reliability	Validity
Wheelchair Skills Test-Capacity (WST)	ICC _{interrater} = 0.86 ^a ICC _{intrarater} = 0.95 ^a ICC _{test-retest} = 0.91 ^a	Construct validity WST significant Pearson r with: age = -0.32 ^b distance wheeled per day = 0.36 ^b maximum velocity = 0.72 ^c spontaneous velocity = 0.57 ^c WST has significant associations with: experience p = 0.01 ^d sex p = 0.001 ^d diagnosis p < 0.05 ^d wheelchair type p < 0.001 ^d Predictive validity WST predicted CHART score, perceived health status, and satisfaction with life scale in linear regression (p < 0.05). ^e Concurrent validity WST Pearson r with occupational therapists global rating of WC skills (r = 0.40 – 0.54). ^f
Wheelchair Skills Test - Questionnaire (WST-Q)	Wheelchair skills Capacity Correlation between WST and WST-Q was p = 0.89 (p < 0.001). WST-Q scores were 3.5±6.5% higher than WST scores. ^g Wheelchair skills Safety Correlation between WST and WST-Q was p = 0.12 (p = 0.25). WST-Q scores were 0.52±2.8% lower than WST scores. ^g	
Wheelchair Skills Test - Safety (WST)	ICC _{interrater} = 0.06 ^a ICC _{intrarater} = 0.29 ^a ICC _{test-retest} = 0.90 ^a	Not assessed
Wheelchair Use Confidence Scale (WheelCon)	Cronbach's α = 0.92 ^h ICC _{test-retest} = 0.84 ^h SEM = 5.9 ^h	Construct validity WheelCon significant Spearman r _s with: Previous WC experience = 0.32 ^h Age × sex interaction (p = 0.004) ^h Concurrent validity WheelCon significant Spearman r _s with: wheelchair skill = 0.52 ^h perceived wheelchair skill = 0.58 ^h activities of daily living = 0.32 ^h anxiety and depression = -0.43 ^h mobility = 0.38 ^h social support = 0.21 ^h
Life-Space Assessment (LSA)	ICC _{test-retest} = 0.87 ⁱ	Construct validity WheelCon significant Spearman r _s with: age = -0.22 ^j sex = -0.21 ^j walking = -0.33 ^j device type ^j drives a vehicle = 0.28 ^j Concurrent validity LSA significant Spearman r _s with: physical performance = 0.19 – 0.60 ⁱ ADL difficulty = 0.25 – 0.43 ⁱ SF12 physical = 0.31 – 0.46 ⁱ SF12 mental = 0.12 – 0.25 ⁱ depression = 0.17 – 0.41 ⁱ perceived health = 0.27 – 0.42 ⁱ

Measure	Reliability	Validity
Wheelchair Outcome Measure (WhOM)	ICC _{interrater} = 0.90 – 0.91 ^k ICC _{test-retest} = 0.83 – 0.88 ^k	Construct validity WhOM significant Spearman ρ with: life habits ρ = 0.3 – 0.5 ^k
Late Life Function and Disability Instrument (LLFDI)	ICC _{test-retest} = 0.83 – 0.88 ^l	Construct validity LLFDI scores were significantly higher for manual wheelchair users compared to power wheelchair users ($p < 0.05$). ^l
Health Utility Index (HUI3)	Cronbach's α = 0.51 ^m ICC _{interrater} = 0.71 – 0.85 ⁿ ICC _{test-retest} = 0.81 ^o	Construct validity HUI3 significant Spearman's ρ with: SF36 = 0.29 – 0.40 ^p EuroQol = 0.45 – 0.57 ^p

^aLindquist et al., 2010;

^bLemay et al., 2012;

^cPhang et al., 2012,

^dKirby et al., 2004;

^eHosseini et al., 2012;

^fKirby et al., 2002;

^gRushton et al., 2012;

^hRushton et al., 2013;

ⁱAuger et al., 2009;

^jAuger et al., 2010;

^kMiller et al., 2011;

^lSakakibara et al., 2013;

^mPressler et al., 2011;

ⁿMathias et al., 1997;

^oMarra et al., 2005; Luo et al., 2003