Measuring wheelchair confidence among power wheelchair users: an adaptation of the WheelCon-M using focus groups and a think aloud process

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Abstract

Purpose—The aim of this study was to adapt the WheelCon-M, an outcome measure used to assess confidence with manual wheelchair use, into a version that is applicable for power wheelchair users (WheelCon-P).

Methods—Adaptation of the WheelCon-M into the WheelCon-P occurred in two phases: 1) item modification was conducted using focus groups and 2) item refinement was done using a think aloud process.

Results—The health care professionals (n=12) were mostly female, mostly occupational therapists, and practiced an average of 14 years. The power wheelchair users (n=8) were 50% men with an average of 8 years of power wheelchair experience and a range of diagnoses. In phase 1, of the 63 WheelCon-M items, 6 remained the same, 18 were removed, 38 modified, and 15 new items added to develop the WheelCon-P. In phase 2, 15 WheelCon-P items were refined.

Conclusions—This study resulted in the modification of the WheelCon-M into the WheelCon-P, a 59-item, self-report outcome measure designed to assess confidence with power wheelchair use. The next step in the evolution of this promising new measure is the assessment of its measurement properties.

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Reprints: Not available from the authors.

Declaration of interest: The Canadian Institutes of Research is acknowledged for providing salary (WCM) (grant number 100925-1) and scholarship support (PWR).

Authors' financial disclosure: We certify that no party having a direct interest in the results of the research supporting this article has or will confer a benefit on us or on any organization with which we are associated and we certify that all financial and material support for this research are clearly identified in the title page of the manuscript. The authors declare that they have no competing interests.

Keywords

wheelchair; Confidence; outcome assessment; instrument development; focus groups; think aloud

INTRODUCTION

Self-efficacy, or confidence, refers to one's belief in his/her ability to perform a given task.¹ Confidence is task specific and, according to Social Cognitive Theory,¹ a high level of confidence results in a vigorous, persistent effort in a task/activity, while a low level of confidence results in avoidance of a task/activity. Bandura suggests that confidence is the single most important predictor of future behaviour, even if one has the necessary skill to perform a task.¹

Wheelchair confidence is a relatively new construct in the field of wheeled mobility. It is defined as the belief that individuals have in their ability to use their wheelchair in a variety of challenging situations.² As a construct not included in existing wheelchair outcome measures, such as the Wheelchair Skills Test,³⁻⁷ the Wheelchair Outcome Measure,⁸⁻¹¹ and the Functional Evaluation in a Wheelchair¹², the development of a new measure designed specifically to assess wheelchair confidence was necessary. To that end, the assessment of wheelchair confidence originated within the context of measuring confidence with *manual* wheelchair use with the development of the Wheelchair Use Confidence Scale for manual wheelchair users, or WheelCon-M.² This measure is a 63-item self-report questionnaire that assesses wheelchair confidence using a 0 (not confident at all) to 100 (completely confident) response scale in 6 conceptual areas: negotiating the physical environment, activities performed in the manual wheelchair, knowledge and problem solving, advocacy, managing social situations, and managing emotions. It has demonstrated reliability and validity when tested with community-dwelling, experienced manual wheelchair users.¹³ A validated French-Canadian version¹⁴ and WheelCon-M short form¹⁵ are also available.

The importance of wheelchair confidence, and thus the need for a wheelchair confidence specific outcome measure, has been confirmed by studies conducted using the WheelCon-M. Specifically, we now know that: there is a high prevalence of low wheelchair confidence among adult manual wheelchair users;¹⁶ wheelchair confidence influences life-space mobility¹⁷ and participation^{18,19} among community-dwelling manual wheelchair users; wheelchair confidence is a modifiable barrier to wheelchair use among both older adults²⁰ and occupational therapy students;²¹ and there is a discordance between wheelchair confidence and wheelchair skill among adult manual wheelchair users.¹⁶ These findings are of particular significance given that wheelchairs are prescribed to improve mobility and enhance one's ability to participate in their chosen daily activities, important rehabilitation outcomes. The findings also highlight the importance of the development of confidence-enhancing intervention strategies. In fact, a novel confidence-enhancing, peer-led wheelchair skills training program has been developed and determination of its feasibility and efficacy is underway.²²

The advent of the WheelCon-M, and subsequent research in this area that has validated the value of assessing confidence, spurred similar questions among researchers and clinicians

regarding confidence with power wheelchair use. However, the WheelCon-M was developed specifically for assessing confidence with manual wheelchair use and thus in its present form could not be considered valid for assessing confidence with power wheelchair use. For example, the WheelCon-M assesses one's confidence in his/her ability to ascend a 15cm curb, a task that would not be feasible in a power wheelchair. The WheelCon-M required modification in order to extend this body of work to power wheelchair users. To that end, the purpose of this study was to adapt the WheelCon-M into a version that would be applicable for power wheelchair users (the WheelCon-P) using a two-phase process: 1) item modification and 2) item refinement.

PHASE 1: ITEM MODIFICATION

Methods

Design—We used a focus group study design in phase 1 as a means of adapting the WheelCon-M to the WheelCon-P.

Recruitment—Purposive sampling was used to identify two groups of experts: health care professionals and power wheelchair users. Health care professionals were included who were occupational therapists or physical therapists that worked in the area of wheeled mobility and had at least 3 years of experience working with clients who use power wheelchairs. Health care professionals were targeted on the basis of their clinical reputation and expertise and recruited from two different rehabilitation centres, one in Halifax, Nova Scotia and one in Vancouver, British Columbia. Power wheelchair users were eligible to participate if they were at least 19 years of age, lived in the community, used a power wheelchair as their primary means of mobility and had at least 3 months of experience using a power wheelchair. They were recruited through clinicians and various organizations, such as the Canadian Paraplegic Association, capable of recommending individuals who could speak about confidence with power wheelchair use. All power wheelchair users were recruited from Vancouver, British Columbia. Ethics approval was obtained from local university and hospital research ethics boards and informed consent was received from each participant.

Procedure—We conducted three focus groups to modify the WheelCon-M into the WheelCon-P. Two focus groups were held with health care professionals, one in person (n=7) and one via video-conferencing (n=5), and one focus group was held with power wheelchair users in person (n=6). Prior to the focus group, each participant was provided with a package containing a demographic questionnaire, a brief overview of the development of the WheelCon-M and rationale for modification into the WheelCon-P, and an Adaptation of the WheelCon-M to the WheelCon-P Questionnaire. Participants were asked to complete the Adaptation Questionnaire prior to the focus group, rate each WheelCon-M item in terms of its relevance for inclusion in the WheelCon-P (i.e., relevant, not relevant, or relevant with modification), and provide suggestions for those items that they felt were relevant but required modification. Participants were also asked to provide input regarding items that were missing, but should be included in order to comprehensively

measure confidence with power wheelchair use. Information from these questionnaires was compiled as a starting point for discussion during the focus groups.

A moderator and an assistant ran the focus groups. Each session followed the same process: (1) welcome and introduction of moderator and assistant, including description of their respective roles; (2) a review of the purpose of the focus group (to solicit input from experts regarding the modification of the WheelCon-M into the WheelCon-P); (3) participant introductions; (4) discussion of 'ground rules' for the focus group; (5) brief presentation regarding the development of the WheelCon-M and rationale for adaptation into the WheelCon-P; (6) brainstorming regarding relevance and modification of the WheelCon-M items, as well as addition of items, for inclusion in the WheelCon-P, initiated with a brief description of results from the Adaptation Questionnaire; and (7) summary and wrap up. Each focus group lasted 90 minutes and was audio recorded.

Analysis—Summary statistics were conducted to describe the sample. The focus group data were analyzed specifically to identify content related to each WheelCon-M item with respect to: (1) its relevance for inclusion in the WheelCon-P, (2) its need for modification to be included in the WheelCon-P, and (3) suggestions for modification to be included in the WheelCon-P. The data were also analyzed to identify recommendations regarding additional content to be included in the measurement of confidence with power wheelchair use, as well as to determine if other general changes were required. Figure 1 outlines the specific analysis and item modification process used.

Results

Participants—The demographic data for the participants are presented in table 1. The health care professional participants were mostly female, mostly occupational therapists, and practiced an average of 14 years. Half of the power wheelchair user participants were men, with an average of 8 years of power wheelchair experience, and a range of diagnoses.

Focus Group—Of the 63 WheelCon-M items, 18 were removed, 38 were modified, and 6 retained their original form (figure 1). Ten of the 18 removed items were deemed not relevant as they did not present confidence challenging situations with power wheelchair use, such as '...how confident are you moving your wheelchair over carpet?' and '...how confident are you carrying a hot drink while moving in your wheelchair?' The other eight items were removed because one new item replaced multiple items. For example, the items '... how confident are you moving your wheelchair through slush then up a curb cut?' and '... how confident are you moving your wheelchair through snow then up a curb cut?' were replaced with one item '... how confident are you driving your wheelchair up a 5 degree slope with poor traction?'

Of the 45 WheelCon-M items that were deemed relevant for measuring confidence with power wheelchair use, 6 items did not require modification and 38 items did require modification. Three of the 38 adapted items required power wheelchair specific modifications, such as changing the item '... how confident are you that you can move your wheelchair up/down a standard height curb (15cm) without a curb cut?' to '... how confident are you that you can drive your wheelchair up/down a 5cm level change?' The remaining 35

items were modified to improve their clarity with respect to: clarification of the task focus, such as consequence of action (n=10); clarification of the task demands, such as driving distance or driving surface details (n=12); simplification of sentence structure for ease of comprehension (n=9); and modification of terminology (n=4). An example of a modification for clarification of task focus was changing ‘... how confident are you that you can move your wheelchair though a crowded mall?’ to ‘... how confident are you that you can drive your wheelchair through a crowd of people without hitting anyone?’ This modification was intended to improve clarity with respect to the task focus of not hitting anyone, as opposed to simply moving through crowds. An example of a modification to clarify task demands was changing ‘... how confident are you that you can move your wheelchair over freshly mowed grass?’ to ‘... how confident are you that you can drive your wheelchair across 3m (10ft) of flat, freshly mowed grass?’

In addition to item modification, there were 15 new items added to the WheelCon-P. For example, four new items reflected confidence in the use of the power wheelchair electronics or tasks related to the ongoing operation of a power wheelchair including, ‘... how confident are you that you know the correct drive mode to select in different environments?’ and ‘... how confident are you that you know when you need to charge your batteries?’ Eleven new items reflected confidence in tasks which may be particularly confidence challenging for power wheelchair use, such as ‘... how confident are you that you can stop suddenly to avoid hitting a moving object?’ and ‘... how confident are you that you can use public transportation?’

As part of the WheelCon-M to WheelCon-P modification process, the WheelCon was also changed in two general ways. First, all items in the WheelCon-M that included the phrase ‘moving your wheelchair’ were modified to ‘driving your wheelchair’ for the WheelCon-P to reflect the method of propulsion. Second, the multiple stems used in the WheelCon-M were changed to one stem in the WheelCon-P, ‘As of now, how confident are you that you...’.

PHASE 2: ITEM REFINEMENT

Design—Employing the same process used in the development of the WheelCon-M, a concurrent think aloud process was used to assess response processes for each WheelCon-P item.²³ This method can provide insight as to whether or not the WheelCon-P items are being interpreted as intended so that issues can be resolved prior to assessment of its measurement properties.

Recruitment—Four of the power wheelchair users who participated in the item modification phase of the study also participated in the item refinement phase. Two additional power wheelchair users were recruited using the original recruitment strategies and inclusion criteria. Informed consent was obtained from the two new participants.

Procedure—Participants began the data collection procedure by completing a short demographic questionnaire. Next, the WheelCon-P was provided accompanied by a description of the tool, including administration and response scale instructions. The think

aloud process was then described, which involved asking the participants to ‘think aloud’ as he/she responded to each WheelCon-P item. Once the participant began to complete the WheelCon-P, the researcher sat to his/her side to discourage initiation of discussion.²⁴ Throughout the session, if more than a few seconds passed without verbalized thoughts, participants were reminded to continue to ‘think aloud’. Otherwise, the researcher remained silent to allow for uninterrupted flow of thoughts.²⁵ Responses to questions were delayed (5–10 seconds) to allow/encourage the participant to generate further thoughts related to the question or item. The researcher recorded the participant’s responses in written format.

Analysis—Demographics were analyzed using descriptive statistics. Think aloud responses were coded using Fowler and Cannell’s behavioural code categories,²⁶ including: ‘adequate’ (participant gives answer that meets item objective); ‘clarification’ (participant asks for clarification of item, or makes statement indicating uncertainty about item meaning); ‘qualified’ (participant gives answer that meets item objective but is qualified to indicate uncertainty about accuracy); ‘inadequate’ (participant gives answer that does not meet item objective); and ‘refusal to answer’ (participant refuses to answer the question). With the exception of the ‘adequate’ think aloud response, all codes were considered to indicate a problem with a WheelCon-P item. Two researchers independently coded all think aloud responses according to the intent of the item. Discrepancies in coding were resolved through discussion until consensus was reached.

All WheelCon-P items that were coded with ‘clarification’, ‘qualification’, and/or ‘inadequate response’ were reviewed to identify the source or reason for the difficulty. Items were modified (or not) based on our assessment of the impact of the problem and clinical judgment. In general, we refined the items by adding additional details to address the problems identified in the participants’ responses.

Results

Participants—The participants’ demographic data are presented in table 1. Four of the 6 think aloud power wheelchair user participants also participated in the item modification phase of the study. The sample had similar characteristics to the focus group sample.

Think Aloud—Twenty-seven out of 60 items (45%) were coded as ‘adequate response’. The remaining 33 items (55%) were coded as ‘clarification’, ‘qualification’, or ‘inadequate response’ for at least one participant’s response. None of the participants’ responses were coded with ‘refusal to answer’. Table 2 describes each WheelCon-P item, its refinement (if applicable), and the number of behaviour codes per item. Some items (n=14) had only one behavioural code indicating a problem, while others (n=18) had multiple. As described above, the decision on whether or not to modify an item was based on our assessment of the impact of the problem and clinical judgment. Ultimately, 15 items were modified by adding detail to enhance the correct interpretation of the item. For example, ‘... how confident are you that you can help people feel comfortable if they don’t know how to act because you use a wheelchair?’ was refined to ‘... how confident are you that you can use strategies, such as humor, that will help people feel comfortable if they are unsure how to act because you use a wheelchair?’

DISCUSSION

In this study, the WheelCon-M was adapted into the WheelCon-P using focus groups and a think aloud process. The study resulted in a 59-item outcome measure, the first wheelchair confidence questionnaire designed for power wheelchair users.

The insights provided by the health care professionals and power wheelchair users during the focus groups proved to be instrumental in adapting the WheelCon-M into the WheelCon-P. The differences in situations that challenge confidence with manual wheelchair use versus power wheelchair use were highlighted by the removal of the 10 WheelCon-M items that did not present confidence challenging situations for power wheelchair use, the 3 power specific modifications to WheelCon-M items, and the addition of 15 new items. The WheelCon-M items that did not challenge confidence with power wheelchair use were, for the most part, related to negotiating an aspect of the physical environment that would be physically easier with a power wheelchair. The power specific modifications reflected differences in the capacity of a manual versus power wheelchair. The new items reflected confidence in the use of power wheelchair electronics and tasks related to the ongoing operation of the power wheelchair, as well as tasks that may be particularly confidence challenging for power wheelchair use. These modifications and particularly the additions reflect new knowledge and skills for which a power wheelchair user would require confidence. Finally, the items modified to improve clarity with respect to task focus, task demands, simplification of sentence structure, and modification of terminology reflects changes that were general improvements to the items.

The think aloud process was useful in understanding how participants perceived and interpreted each item on the WheelCon-P. That almost half of the WheelCon-P items were correctly interpreted was an excellent result. For those items that required modification, the cause of the confusion was easily determined and the item easily modified. Ultimately, we believe that all WheelCon-P items will be interpreted as we had intended.

There were limitations to this study. First, the power wheelchair users who participated in both the focus group and think aloud phases were experienced users. We did not include new power wheelchair users and may have missed valuable contributions from this group. Second, the nature of the think aloud process requires the participant to share his/her thoughts regarding each item in front of the researcher. It is therefore possible that social desirability bias may have occurred as participants may have altered their responses to conform to perceived social expectations. Third, the processes used in both the item modification and item refinement phases of this study are subjective. Therefore, it may be questionable if the modified and refined items are, in fact, improved.

The next step in the evolution of the WheelCon-P involves the assessment of its measurement properties for both experienced and new power wheelchair users. After estimates of its reliability and validity, it will be important to investigate the influence of power wheelchair confidence on key mobility outcomes such as participation.

In conclusion, focus groups were used to modify the WheelCon-M into the WheelCon-P and a think aloud process was used to refine the items. The final result was the development of a

new 59-item, self-report outcome measure designed to assess confidence with power wheelchair use. The next step in the evolution of this promising new measure is the assessment of its measurement properties.

References

1. Bandura, A. Self-efficacy: The exercise of control. New York, NY: W.H. Freeman & Company; 1997.
2. Rushton PW, Miller WC, Kirby RL, Eng JJ, Yip J. Development and content validation of the Wheelchair Use Confidence Scale: a mixed-methods study. *Disabil Rehabil Assist Technol*. 2011; 6:57–66. [PubMed: 20809874]
3. 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. [PubMed: 11782826]
4. Kirby RL, Dupuis DJ, MacPhee AH, et al. The Wheelchair Skills Test (version 2. 4): measurement properties. *Arch Phys Med Rehabil*. 2004; 85:794–804. [PubMed: 15129405]
5. Lindquist NJ, Loudon PE, Magis TF, Rispin JE, Kirby RL, Manns PJ. Reliability of the Wheelchair Skills Test (WST) version 4. 1 for manual wheelchair users. *Arch Phys Med Rehabil*. 2010; 91:1752–7. [PubMed: 21044722]
6. Kirby, RL., Smith, C., Parker, K., MacLeod, DA., McAllister, M., Rushton, PW., Routhier, F. [Accessed December 2, 2013] Wheelchair Skills Test Version 4.1 Manual. Available at: http://www.wheelchairskillsprogram.ca/eng/documents/WST_Manual_version_4.1.60.pdf
7. Rushton PW, Kirby RL, Routhier F, Smith C. Measurement properties of the Wheelchair Skills Test – Questionnaire for powered wheelchair users. *Disabil Rehabil Assist Technol*. 2014; Early online. doi: 10.3109/17483107.2014.984778
8. Mortenson WB, Miller WC, Miller-Polgar J. Measuring wheelchair intervention outcomes: development of the Wheelchair Outcome Measure. *Disabil Rehabil Assist Technol*. 2007; 2:275–285. [PubMed: 19263533]
9. Miller WC, Garden J, Mortenson WB. Measurement properties of the Wheelchair Outcome Measure in individuals with spinal cord injury. *Spinal Cord*. 2011; 49:995–1000. [PubMed: 21577219]
10. Auger C, Demers L, Gélinas I, Routhier F, Mortenson WB, Miller WC. Wheelchair Outcome Measure (WhOM) for middle-aged and older users of power mobility devices. *J Rehabil Med*. 2010; 42:574–581. [PubMed: 20549163]
11. Parvaneh S, Mortenson WB, Miller WC. Validating the Wheelchair Outcome Measure for residents in long-term care. *Disabil Rehabil Assist Technol*. 2014; 9:209–212. [PubMed: 24749555]
12. Mills T, Holm MB, Trefler E, Schmeler M, Fitzgerald S, Boninger M. Development and consumer validation of the Functional Evaluation in a Wheelchair (FEW) instrument. *Disabil Rehabil*. 2002; 24:38–46. [PubMed: 11827153]
13. Rushton PW, Miller WC, Kirby RL, Eng JJ. Measure for the assessment of confidence with manual wheelchair use (WheelCon-M) Version 2. 1: reliability and validity. *J Rehabil Med*. 2013; 45:61–67. [PubMed: 23138341]
14. Rushton PW, Routhier F, Miller WC, Auger C, Lavoie MP. French-Canadian translation of the WheelCon-M (WheelCon-M-F) and evaluation of its validity evidence using telephone administration. *Disabil Rehabil*. 2014; Early Online. doi: 10.3109/09638288.2014.941019
15. Sakakibara BM, Miller WC, Rushton PW. Rasch analyses of the Wheelchair Use Confidence Scale. *Arch Phys Med Rehabil*. 2015 in press.
16. Sakakibara BM, Miller WC. Prevalence of low mobility and self-management self-efficacy in manual wheelchair users and the association with wheelchair skills. *Arch Phys Med Rehabil*. 2015 in press.
17. Sakakibara BM, Miller WC, Eng JJ, Backman CL, Routhier F. Influences of wheelchair-related efficacy on life-space mobility in adult, community dwelling manual wheelchair users. *Phys Ther*. 2014; Early Online. doi: 10.2522/ptj.20140113

18. Sakakibara BM, Miller WC, Eng JJ, Backman CL, Routhier F. Preliminary examination of the relation between participation and confidence in older manual wheelchair users. *Arch Phys Med Rehabil.* 2013; 94:791–794. [PubMed: 23022451]
19. Sakakibara BM, Miller WC, Routhier F, Backman CL, Eng JJ. Association between self-efficacy and participation in community-dwelling manual wheelchair users aged 50 years or older. *Phys Ther.* 2014; 94:664–674. [PubMed: 24415774]
20. Sakakibara BM, Miller WC, Souza M, Nikolova V, Best KL. Wheelchair skills training to improve confidence with using a manual wheelchair among older adults: a pilot study. *Arch Phys Med Rehabil.* 2013; 94:1031–1037. [PubMed: 23385110]
21. Giesbrecht EM, Wilson N, Schneider A, Bains D, Hall J, Miller WC. Preliminary evidence to support a ‘boot camp’ approach to wheelchair skills training for clinicians. *Arch Phys Med Rehabil.* 2015 in press.
22. Best K, Miller WC, Routhier F, Eng JJ, Goldsmith C. Feasibility of the Wheelchair Self-Efficacy Enhanced for Use (WheelSeeU) training program: study protocol for a randomized controlled trial. *CJOT.* 2014 submitted.
23. Rushton, PW., Miller, WC. Item Refinement of the Wheelchair Use Confidence Scale. Proceedings of the Canadian Association of Occupational Therapists Annual Conference; Halifax, Nova Scotia. May 27–29, 2010;
24. Darker CD, French DP. What sense do people make of a theory of planned behaviour questionnaire?: A think-aloud study. *Journal of Health Psychology.* 2009; 14:861–871. [PubMed: 19786512]
25. Fonteyn ME, Kuipers B, Grobe SJ. A description of think aloud method and protocol analysis. *Qualitative Health Research.* 1993; 3:430–441.
26. Fowler, F., Cannell, C. Using behavioral coding to identify cognitive problems with survey questions. In: Schwarz, N., Sudman, S., editors. *Answering questions: Methodology for determining cognitive and communicative processes in survey research.* San Francisco: Josey-Bass Inc; 1996. p. 15-36.

Implications for rehabilitation

- The WheelCon-P is a new outcome measure designed to assess confidence with power wheelchair use.
- This study suggests that the items in this measure will be interpreted as intended.

Figure 1.
WheelCon-M to WheelCon-P Item Modification Process and Focus Group Results

Table 1

Demographics of Participants in the Item Modification (focus groups) and Item Refinement (think aloud) Phases

	Professionals	Power Wheelchair Users	
	Focus Groups (n=12)	Focus Groups (n=6)	Think Aloud (n=6)
Age (years)			
Mean (SD)	42.1 (8.5)	44.8 (20)	54.8 (6)
Range	28–54	25–65	25–65
Sex (n)			
Female	10	3	3
Male	2	3	3
Education (n)			
< High School Diploma		1	
College Diploma		2	2
Uncompleted Post-secondary			1
Bachelor's Degree	10	2	2
Master's Degree	2	1	1
Location (n)			
Vancouver	7	6	6
Halifax	5	--	--
Profession (n)		--	--
Occupational Therapist	10		
Physiotherapist	2		
Years Practicing with Power Wheelchairs		--	--
Mean (SD)	13.9 (7.4)		
Range	3–33		
Diagnosis (n)	--		
Cerebral Palsy		2	1
Paraplegia		1	1
Guillan Barre Syndrome		1	0
Amputation		1	1
Spina Bifida		1	2
Quadriplegia		0	1
Power Wheelchair Use (years)	--		
Mean (SD)		8.5 (5.4)	8.5(2)
Range		1.2–15	1.2–14
Location of Power Wheelchair Use (n)	--		
Home		6	5
Work		1	2
School		1	
Community		6	6
Recreation or sports		4	5

	Professionals	Power Wheelchair Users	
	Focus Groups (n=12)	Focus Groups (n=6)	Think Aloud (n=6)
Other		3	2
Method of Power Wheelchair Control (n)	--		
Right handed joystick		4	5
Left handed joystick		2	1
Type of Power Wheelchair (n)	--		
Mid wheel drive		5	4
Rear wheel drive		1	1
Front wheel drive			1

Table 2

WheelCon-P item refinement and think aloud behavioural codes results

Original Items As of now, how confident are you that you...	Refined Items As of now, how confident are you that you...	A	C	Q	I
1. know how to use all of the functions on your controller, such as drive modes, tilt, or lift?	No change	5	1	0	0
2. know the correct drive mode to select in different environments?	No change	6	0	0	0
3. know when you need to charge your batteries?	No change	6	0	0	0
4. can drive around furniture in your own home?	No change	6	0	0	0
5. can maneuver your wheelchair in small spaces, such as a bathroom?	No change	6	0	0	0
6. can transfer from your wheelchair to your bed?	No change	6	0	0	0
7. can transfer from your wheelchair to your toilet or commode?	No change	6	0	0	0
8. can transfer from your wheelchair into your bathtub or shower (including bathseats)?	can transfer from your wheelchair into your bathtub (including use of bathseats) OR using your commode to get into your shower stall?	3	0	0	3
9. can transfer from the floor to your wheelchair?	No change	5	1	0	0
10. can make a meal or snack while using your wheelchair?	No change	6	0	0	0
11. can drive your wheelchair through a door that opens automatically?	No change	5	1	0	0
12. can open, go through, and then close a lightweight door?	can open, go through, and then close a standard (32") lightweight door?	4	0	1	1
13. can open and go through a spring loaded door?	No change	4	0	1	1
14. can drive your wheelchair along a paved sidewalk?	can drive your wheelchair along a dry, flat, paved sidewalk?	4	0	1	1
15. can drive your wheelchair up a standard 5° ramp?	can drive your wheelchair up a standard, built to code (5° incline)?	3	1	1	1
16. can drive your wheelchair down a standard 5° ramp?	can drive your wheelchair down a standard, built to code (5° incline)?	4	0	0	2
17. can drive your wheelchair up a steep slope?	No change	4	0	1	1
18. can drive your wheelchair down a steep slope?	No change	5	0	1	0
19. can stop your wheelchair on a steep slope without your body sliding or slumping forward?	can come to a controlled stop on a steep slope without your body sliding or slumping forward?	3	1	2	0
20. can drive your wheelchair up a 5° slope that has poor traction?	No change	6	0	0	0
21. drive your wheelchair down a 5° slope that has poor traction?	No change	6	0	0	0
22. can drive your wheelchair up a curb cut?	No change	5	1	0	0

Original Items As of now, how confident are you that you...	Refined Items As of now, how confident are you that you...	A	C	Q	I
23. can drive your wheelchair down a curb cut?	No change	6	0	0	0
24. can cross a street at a crosswalk with traffic lights?	can maneuver your wheelchair to press the crosswalk button and cross the street before the traffic light changes?	5	1	0	0
25. can cross a street with light traffic at a crosswalk with no traffic lights?	No change	4	1	0	1
26. can drive your wheelchair across 3m (10 ft) of flat, freshly mowed grass?	No change	4	0	1	1
27. can move your wheelchair from the sidewalk to the grass, with a 3cm (1 inch) height difference?	No change	5	1	0	0
28. can drive your wheelchair through a pothole that is wider than your wheelchair and 5cm (2 inches) deep?	No change	6	0	0	0
29. can drive your wheelchair along a dirt path or trail with some tree roots and rocks?	No change	6	0	0	0
30. can drive your wheelchair across 3m (10ft) of flat, unpacked gravel?	No change	6	0	0	0
31. can drive your wheelchair along a sidewalk with hard packed snow?	can drive your wheelchair along a sidewalk with 5cm (2") of snow?	3	0	2	1
32. can drive your wheelchair up a 5cm level change?	can drive your wheelchair up a single 5cm (2") step to change levels between rooms?	2	4	0	0
33. can drive your wheelchair down a 5cm level change?	can drive your wheelchair down a single 5cm (2") step to change levels between rooms?	6	0	0	0
34. can drive your wheelchair through a crowd of people without hitting anyone?	No change	5	0	1	0
35. can ask people to move out of your way while driving your wheelchair?	No change	6	0	0	0
36. can stop suddenly to avoid hitting a moving object?	can stop suddenly to avoid hitting a moving object, such as a small child or a dog?	2	3	0	1
37. can drive your wheelchair down a store aisle without knocking items over?	No change	5	1	0	0
38. can find a place to charge your batteries when you are not at home?	No change	5	0	0	1
39. can manage toileting activities while in an accessible washroom?	No change	4	0	1	1
40. can use public transportation?	No change	6	0	0	0
41. can travel on an airplane?	No change	6	0	0	0
42. can do your chosen leisure activities in your power wheelchair?	No change	6	0	0	0
43. can do your work or volunteer activities in your power wheelchair?	No change	6	0	0	0
44. can help people feel comfortable if they don't know how to act because you use a wheelchair?	can use strategies, such as humor, that will help people feel comfortable if they are unsure how to act because you use a wheelchair?	4	0	0	2
45. can correct others' mistaken beliefs about people who use power wheelchairs?	No change	6	0	0	0
46. can present yourself as you wish to be seen while in your wheelchair around acquaintances, colleagues, or peers?	No change	5	0	0	1

Original Items As of now, how confident are you that you...	Refined Items As of now, how confident are you that you...	A	C	Q	I
47. can present yourself as you wish to be seen when you are in public and feel people are watching you?	No change	5	0	0	1
48. can present yourself as you wish to be seen while in your wheelchair when you want to impress others, such as during a job interview?	No change	6	0	0	0
49. can problem solve how to get to your destination when there is an unexpected situation, such as construction detours on a sidewalk?	No change	6	0	0	0
50. know the safety limits of your wheelchair, such as what curb height your wheelchair can climb?	can drive within the safety limits of your power wheelchair so that it won't tip over?	3	0	0	3
51. can use your wheelchair in a situation that makes you feel anxious or nervous?	can continue to drive your wheelchair in a situation that is making you feel anxious or nervous?	3	1	0	2
52. know when your wheelchair is not working properly?	No change	6	0	0	0
53. know what to do if your wheelchair has suddenly stopped working?	No change	6	0	0	0
54. know what to do if you fall out of your wheelchair?	No change	5	1	0	0
55. can ask a stranger for help?	No change	6	0	0	0
56. can advocate for changes you want made to your wheelchair?	can advocate for changes you want made to your wheelchair, such as a different cushion to be more comfortable?	4	2	0	0
57. can advocate for changes you want in your home, such as a roll in shower?	No change	6	0	0	0
58. can advocate for your needs at work or school?	No change	6	0	0	0
59. can advocate for changes in your community, such as adding an accessible bus route in your neighborhood?	No change	5	1	0	0

A=adequate (participant gives answer that meets item objective); C=clarification (participant asks for clarification of item, or makes statement indicating uncertainty about item meaning); Q=qualification (participant gives answer that meets item objective but is qualified to indicate uncertainty about accuracy); I=inadequate (participant gives answer that does not meet item objective).