

WHEELCHAIR SKILLS PROGRAM (WSP)[®]

VERSION 3.2 MANUAL

Includes:

- **Wheelchair Skills Test, Objective Version (WST)**
- **Wheelchair Skills Test, Questionnaire Version (WST-Q)**
- **Wheelchair Skills Training Program (WSTP)**

For further information, contact:

Dr. R. Lee Kirby
Division of Physical Medicine and Rehabilitation, Dalhousie University and
Queen Elizabeth II Health Sciences Centre, Rehabilitation Centre Site
1341 Summer Street
Halifax, Nova Scotia
Canada B3H 4K4
Phone: 902-473-1268
Fax: 902-473-3204
E-mail: kirby@dal.ca

This manual and related materials can be downloaded from:

www.wheelchairskillsprogram.ca

Last Revised: February 14, 2005

Conditions of Use

In using this document, the user agrees to the following conditions:

- The terms “Wheelchair Skills Program”, “Wheelchair Skills Test” and “Wheelchair Skills Training Program” are copyright.
- By using the “Wheelchair Skills Program”, “Wheelchair Skills Test,” “Wheelchair Skills Training Program” and related materials, the user agrees to be bound by the terms of this license.
- In written material arising from the use of the “Wheelchair Skills Program”, “Wheelchair Skills Test” and “Wheelchair Skills Training Program”, the user agrees to acknowledge the source.
- The user must not use the terms “Wheelchair Skills Program”, “Wheelchair Skills Test” and “Wheelchair Skills Training Program” to apply to any modified version, unless the modifications are explicitly described.
- The software, documentation and other materials associated with this Manual are licensed, not sold or given, to the user for uses only under the terms of this license.
- The user must not copy, decompile, reverse engineer, modify or create derivative works of any associated software.
- This license allows the user to use a copy of the materials for his/her personal use.
- This license does not allow the user to place this material on a website, to sell it or to charge for its use.
- The user must not rent, lease, lend or sub-license the materials.
- The user’s rights, under this license, will terminate automatically without notice, if he or she fails to comply with any of the terms of this license.
- The developers of the “Wheelchair Skills Program”, “Wheelchair Skills Test,” “Wheelchair Skills Training Program” and related materials assume no liability for any personal injury or consequential damages resulting from the use of these materials.
- Any translation of this license or materials, not provided by the developers, is the responsibility of local users. In the event of a dispute, the English version of this license shall govern.
- The license is governed by and construed in accordance with the laws of the Province of Nova Scotia, Canada.

TABLE OF CONTENTS

Conditions of Use2

Table of Contents3

1. Summary6

2. General Instructions for the WST Tester7

 2.1 Scope7

 2.2 Test Subject7

 2.3 Setting7

 2.4 Indications8

 2.5 Contraindications8

 2.6 Referral8

 2.7 Informed Consent8

 2.8 Forms8

 2.9 Equipment and Supplies8

 2.10 Initial Interview9

 2.11 Wheelchair and User Set-up9

 2.12 General Instructions to Subject9

 2.13 Getting Out of the Wheelchair to Accomplish a Task9

 2.14 Feedback10

 2.15 Safety10

 2.16 Ergonomics11

 2.17 Disclaimer re Safety11

 2.18 Disclaimer re Sensitivity and Specificity11

 2.19 Starting Positions11

 2.20 Testers12

 2.21 Spotters12

 2.22 Scoring of Individual Skills12

 2.23 Time Limits14

 2.24 Rests and Breaks14

 2.25 Timing14

 2.26 Video-Recording14

 2.27 Comments14

 2.28 Skill Levels14

 2.29 Skill Groups15

 2.30 Individual Skills15

 2.31 Order of Tests15

 2.32 Skill Pre-requisites15

 2.33 Skill Combinations16

 2.34 Left- vs Right-Sided Skills16

 2.35 Testing-and-Training Protocol16

 2.36 After the Test16

 2.37 Calculated Scores16

2.38 Test Report	17
3. General Considerations for the WST-Q Tester.....	19
3.1 When Used.....	19
3.2 Cognitive and Communication Requirements	19
3.3 Instructions and Questions	19
3.4 Evaluation Criteria	19
3.5 In-Person Administration	19
3.6 Telephone Administration.....	20
4. General Instructions for WSTP Trainers	21
4.1 Targets of Training	21
4.2 General Caregiver Considerations	21
4.3 Trainers.....	21
4.4 Self-Training	21
4.5 Spotters	22
4.6 Attend to Ergonomics.....	22
4.7 Use Brief Training Sessions	22
4.8 Use a High Ratio of Trainers to Learners.....	22
4.9 Use a Partner of Comparable Skill Level.....	22
4.10 Demonstrate the Skills.....	22
4.11 Segment Complex Skills	22
4.12 Identify Limiting Factors.....	23
4.13 Provide Feedback Correctly	23
4.14 Choose an Appropriate Focus of Attention.....	23
4.15 Use Learning Exercises	23
4.16 Facilitate Consolidation.....	23
4.17 Ensure Retention	24
5. Skill Groups and Individual Skills.....	25
Organization of the following sections	25
Table of skill groups, individual skills and skill levels	26
Brakes	28
Armrests	30
Footrests	33
Rolling	37
Turns in place	41
Moving turns	43
Sideways maneuvering	46
Reaching.....	48
Transfers	52
Fold/unfold wheelchair.....	58
Doors	62
Obstacles	65
Cross slope	70
Increased rolling resistance	72

Potholes	75
Inclines	77
Level changes	83
Wheelie skills on level terrain	92
No-hands rest	92
Stationary wheelie.....	95
Rolling forwards and backwards	99
Turns in place.....	101
Moving turns.....	103
6. Acknowledgements.....	105
Appendix: Wheelchair Skills Test –Questionnaire: Suggested Scripts	106

1. SUMMARY

The Wheelchair Skills Program (WSP) includes the Wheelchair Skills Test (WST), the questionnaire version of the WST (WST-Q) and the Wheelchair Skills Training Program (WSTP). It is an integrated system that includes elements that can be used for testing and training clinicians, wheelchair users and/or their caregivers.

The WST is an evaluation method that permits a wide range of representative manual wheelchair skills to be objectively, simply and inexpensively documented. This test is intended to test a specific person in a specific wheelchair in a reasonably standardized setting. For clinical purposes, the WST may be used early in the course of a rehabilitation program as a diagnostic measure, to determine which (if any) skills need to be addressed during the rehabilitation process (e.g., by training or wheelchair changes). By repeating the test on completion of the rehabilitation phase (or later during follow-up), the WST can be used as an outcome measure. The WST may also be used for program evaluation, to answer research questions, to assist in wheelchair design and for studies of cost-effectiveness. The WST was not developed for the purposes of excluding potential wheelchair users from using wheelchairs, but an institution or wheelchair provider may wish to use the WST to ensure that users have been adequately trained in the safe and effective use of specific wheelchairs. Research evidence regarding the measurement properties of the WST can be found in the list of published papers on the web-site.

For situations in which objective testing is impractical or impossible (e.g., during telephone follow-up interviews), the WST-Q is available. How the testing is adapted for WST-Q administration is described in a general section. In addition, specific considerations for individual skills are discussed in the sections on individual skills and an Appendix summarizes the suggested script for the entire WST-Q. Research evidence regarding the correlations between the objective WST and the WST-Q versions can be found in the list of published papers on the web-site.

The WSTP uses the WST skill set and training methodology based on the rehabilitation, wheelchair and motor-skills literature. Evidence to date from randomized controlled trials has demonstrated the safety and efficacy of the WSTP in the training of occupational therapy students, wheelchair users undergoing their initial formal rehabilitation, community-based wheelchair users and caregivers. Research evidence can be found in the list of published papers on the web-site.

The documentation regarding the WSP is in a modular format, with separate documents (available on the web-site) for the list of papers published about the WSP, WSP forms, brochures and visual images or video clips. This document (the WSP Manual) deals only with the practical details of what WST testers, WST-Q interviewers and WSTP trainers need to know. The WSP Manual begins with sections of general information regarding the WST, WST-Q and WSTP. These sections are followed by others, for each of the specific skills, in which the assessment and training issues are integrated.

2. GENERAL INSTRUCTIONS FOR THE WST TESTER

2.1. Scope

The WST is intended for manual wheelchairs. However, with minor adjustments, the WST can be used to assess the users of powered wheelchairs (see Forms section of the web-site). Throughout the WSP Manual, it has been assumed that the wheelchair being used is one with rear-wheel drive (i.e., large diameter wheels in back and smaller diameter swivel casters in front). Other types of wheelchairs can be tested, but some of the explanations may need to be interpreted by the reader. The WST is not intended to be an adequate measure of other important wheelchair parameters (e.g., maintenance and repair skills), overlapping skills (e.g., transfers to a variety of surfaces, vehicle loading) or more extreme skills (e.g., falling, stairs and escalators). The skills chosen for inclusion are intended to be representative of the range of skills that a manual wheelchair user may need to perform, varying from the most basic to the very difficult, but there has been no intention to be all-inclusive.

2.2. Test Subject

We have often used the term “subject” as the most generic term possible, given that the person who is the object of testing can be a wheelchair user and/or the caregiver, a clinician or a research participant. The nature of the test subject(s) should be recorded.

If the caregiver is to be involved in the testing, the intake questionnaire (see Forms on the web-site) provides a means to document the extent to which the WST results reflect the caregiver’s role (i.e., as the sole performer of the skills, or the combined efforts of the caregiver and wheelchair user). It is necessary to slightly modify the evaluation criteria of some skills to include the caregiver. These considerations are noted in the sections on individual skills. To summarize, however, the following general rules apply:

- For skills that normally require the wheelchair user to remain within certain boundaries (e.g., the turning circle of 1.5m diameter), the caregiver must also remain within those boundaries.
- Caregivers are not given a passing grade for any attempted full wheelie skill, if they fail to adjust any rear anti-tip devices that only permit a partial wheelie. The caregiver is required to either adjust the anti-tip devices into positions that permit full wheelies or to remove them. However, a caregiver is permitted to leave the rear anti-tip devices in the engaged position when performing a partial wheelie (e.g., to negotiate gravel).
- If a caregiver creates discomfort or potential harm (e.g., using excessive force with the knee against a flexible backrest of the wheelchair to help push the wheelchair through gravel) or startles the wheelchair user (e.g., by abruptly tipping the wheelchair back into the wheelie position without first warning the wheelchair user), this results in a failing grade.

2.3. Setting

The test setting should be reasonably quiet, private and free of distractions, in a well-lighted area. In the descriptions that follow, a standardized obstacle course may be used. However, if comparable challenges can be found in the existing environment (including in and around a hospital or the wheelchair user’s home), they may be used instead.

2.4. Indications

In the clinical setting, the WST should be used when a clinician wishes to evaluate or document the wheelchair skills of a wheelchair user and/or caregiver. This may be for diagnostic purposes (to identify a problem) or as an outcome measure.

2.5. Contraindications

The test should not be administered if the subject is unwilling to participate or if the subject or tester would be placed at risk during testing (e.g., due to unstable cardiac disease, uncontrolled seizures).

2.6. Referral

The WST should be initiated in whatever way is normal for the clinical setting in which the WST will be performed (e.g., by individualized clinician referral or as part of a critical pathway). A clinician familiar with the subject and the WST should ensure that there are no contraindications for testing and should identify any precautions.

2.7. Informed Consent

The subject should be informed about the purpose and general nature of the test. If the WST is being performed exclusively for clinical purposes, an informed consent form may not need to be signed in some settings, if a general consent for investigation and treatment has been obtained.

2.8. Forms

There are a number of forms that facilitate the administration, recording and reporting of the WST. They can be found in a separate Forms file on the web-site.

2.9. Equipment and Supplies

The settings described are appropriate for either the testing or training of wheelchair skills. Some of the tests (e.g., brake application) require no equipment and can be performed anywhere. In general, the equipment specifications, in this section and the sections on individual skills later, should be considered as guidelines to encourage standardization, rather than as rigid constraints.

The following equipment is suggested, if the complete WST is to be completed on a single occasion in a standardized setting:

- WSP Manual (this document): for general and specific instructions. This can be downloaded from the web-site and stored on a personal computer or a PDA.
- Spotter strap: to assist the spotter in controlling the wheelchair, during skills when tipping or loss of control is possible. Directions for making a spotter strap are provided on the web-site.
- Barriers: Barriers can be walls, simulated walls or lines. “Standard-height” barriers are preferred. If such barriers are used as simulated walls, they should be ~1.0m high to prevent any part of the subject's body or the wheelchair from extending over them during the tests, but low enough so the tester can look over the top. They should be heavy enough to withstand being displaced by forces of < 60N.
- Skill-specific equipment: other items of equipment are specific to one or more of the skills. These will be described later, in the Specific Skills section, where they are first mentioned.

2.10. Initial Interview

Prior to beginning testing, the tester should screen the test subject for any contraindications to testing and should obtain consent to proceed. Demographic, clinical and wheelchair-related data are recorded. These data may be obtained from the wheelchair user, caregiver and/or health record. The tester instructs the test subject in the general purpose of the test and potential risks (e.g., abrasions, bruises, falls).

2.11. Wheelchair and User Set-up

A Wheelchair Specification Form is completed (see Forms section of web-site). The wheelchair user should be dressed and equipped as usual when using the wheelchair (e.g., wearing prostheses or orthoses). The wheelchair should be set up as usual for that user. This is important because changes in the personal equipment or wheelchair set-up can affect how well the skills are performed and whether some skills are considered "not applicable" (because the wheelchair does not have the part).

If the chair has user-adjustable features that may affect test performance (e.g., rear anti-tip devices), the subject is permitted to adjust them into a more functional position as long as the subject can do so unassisted. If tools are needed to make the adjustment, then they must be carried by the subject. However, the tester must not cue the subject to make the adjustment. Having adjusted the wheelchair to accomplish a skill (e.g., moving the rear anti-tip devices out of the way), the subject may leave the wheelchair in the new configuration for the remainder of the WST. If the subject wishes to restore the wheelchair to its original configuration, he/she must do so without assistance and without cueing from the tester until the test is over. When the test is over, the tester should remind the subject of any adjustment that has been made, especially if the adjustment might affect safety.

2.12. General Instructions to Subject

The subject is instructed not to attempt any task that he/she is not comfortable performing. Generally, skill and safety are the primary considerations, not speed. The tester explains to the subject that he/she is permitted to ask questions about the test requirements before beginning the task, but not during the task. Instructions may include gestures for people with language disorders or be in writing for people with hearing disorders. The tester must not instruct the subject in *how* to accomplish the task. If the tester asks for the task to be performed on both the left and right sides (e.g., "*Move your armrests out of the way*"), but the subject performs only one, the tester may prompt the subject (e.g., "*Now the other side*") without penalty. When giving instructions for each skill, before moving into the best position for observing and spotting the skill, the tester should stand to the front or side of the subject so the subject can see the tester comfortably.

2.13. Getting Out of the Wheelchair to Accomplish a Task

If he/she can do so safely, the subject may get out of the wheelchair to accomplish a task or to adjust a wheelchair feature (e.g., the rear anti-tip devices). This does not include using any sitting surface other than the ground, because such a surface might not always be available when such an adjustment is needed. The decision to permit subjects to get out of the wheelchairs was in recognition that many people who use wheelchairs do so in combination with walking for their mobility. When using the

WST for the testing of clinicians or students, it is useful to ask them to simulate a particular disorder (e.g., paraplegia or hemiplegia).

2.14. Feedback

There should be no feedback regarding the correctness of the skill performance or verbal assistance during the test performance. After the attempt, “knowledge-of-results” (KR) feedback may be given – for instance, “*You did very well*” or “*You had some difficulty with that*”. If the subject fails a test, neither feedback on the reason for the failing grade (“knowledge-of-performance” [KP]) nor instruction on how it might have been performed better may be given prior to completion of the entire test. To do so would not affect the score for the skill already tested, but there may be other skills later in the test that could be influenced by premature feedback. If observers (e.g., students or family members) are present during the test, they should be instructed to remain silent and not to provide cues or feedback. Once the entire test has been completed, the tester may explain the reasons for any failures. Indeed, the tester should warn the subject if he/she performed the test in an unsafe manner.

2.15. Safety

The tester or another person must serve as a spotter (see section 2.21) for any task during which there is a risk of the subject losing control of the wheelchair or tipping over in it. The tester shall not permit the subject to attempt or complete any task that the tester has reason to believe that the subject will be unable to complete without risk to the subject or tester. For some skills (specified later), the tester asks the subject about whether or not he/she feels able to perform the test. If not, a failing grade is awarded. If the subject believes that he/she would be able to perform the skill, the tester inquires about the intended method to be used. If an unsafe method is described, the tester is justified in preventing the objective testing of that skill and awarding a failing grade. The reasons for any intervention should be recorded. Despite these precautions, the tester should generally avoid preemptively disqualifying the subject and should allow him/her to attempt a skill.

If there is spotter intervention during a skill attempt, this should be recorded in the Comments section and may be quantified (if the tester wishes), using the ordinal scale shown in Table 1. Grades of 1 or 2 are automatic failures.

Similarly, potentially dangerous tipping episodes should be recorded in the Comments section and may be quantified (if the tester wishes), using the ordinal dynamic stability scale of the International Organization for Standardization (ISO) (Table 2). Transient tips, in and of themselves, are not sufficient reasons to fail a subject’s attempt at a skill. Indeed, intentional transient tips are necessary to accomplish some skills. Grades 0 and 1 should never occur, because the spotter should intervene. However, if a spotter was needed to prevent these grades, the subject must be awarded a failing grade on this skill.

Table 1. Spotter Intervention Scale

Grade	Nominal	Examples
0	no intervention	

1	partial intervention	Warning a subject to stop or change the approach, or some physical contact from the spotter, even if the subject was able to complete the trial
2	full intervention	The subject required the spotter to prevent him/her from potentially injuring him/herself

Table 2. Dynamic Stability Scale (ISO)

Grade	Definition	Explanation
0	Complete tip	Tips completely over, coming to rest 90° or more from the resting position
1	Partial tip	One or more wheels unintentionally lift from the surface, and remain off the surface after the wheelchair has come to rest
2	Transient tip	One or more wheels unintentionally lift from the surface, but the wheelchair returns to the upright position without spotter intervention
3	No tip	No wheels lift from the surface

2.16. Ergonomics

In addition to injuries due to tips and falls, subjects are at risk of acute or chronic injuries due to poor ergonomic technique (e.g., folding the wheelchair with a bent and twisted back). Although not usually a sufficient problem to warrant skill failure, the tester should note the problem in the Comments section, so that it can be addressed later during training.

2.17. Disclaimer re Safety

Safely performing a skill in the supervised WST environment provides no guarantee that the subject will perform the same or similar skills safely on other occasions in the same or similar settings.

2.18. Disclaimer re Sensitivity and Specificity

The WST is a sensitive test. A change in the subject (e.g., a reduction of spasticity, removal of a prosthesis), a change in the wheelchair (e.g., addition of a rear anti-tip device) and/or a change in the test environment (e.g., fine vs. coarse gravel) may affect the test scores. The WST findings are therefore specific to the situation assessed. Furthermore, the WST is a measure of what a subject *can do* during a specific test administration, in a specific wheelchair and in a specific setting. It is not a measure of what he/she *does do* on a regular basis or *will do* in the future.

2.19. Starting Positions

For all of the skills, unless otherwise noted, the starting position is with the subject seated upright in the wheelchair with all of the wheelchair components in place. The brakes may be locked or unlocked. With the exception of the street-crossing skill (because it is timed), a rolling start is permitted (i.e., there is no need to come to a complete stop before beginning). Unless otherwise specified, when a starting position is defined (e.g., relative to an obstacle), the tester may assist the subject in getting the wheelchair into this position. If the subject expresses the wish to attempt a task by moving the wheelchair backwards, the tester may assist him/her in getting into the requested starting position,

but the tester must not suggest the backward approach.

2.20. Testers

The starting position for the tester/spotter, after initially communicating instructions to the subject, is generally where he/she will be best able to view the skill performance and to respond to any safety concerns. If a starting position for the tester/spotter is recommended for a specific skill, it will be specified under the instructions for that skill. A single person can easily provide the instructions, spot the wheelchair user and score the performance. If video-recording is performed (see section 2.26), an additional person may be needed to operate the camera.

The tester is an important element in the reliability and validity of the test results. The tester may be a rehabilitation clinician (e.g., an occupational therapist or physical therapist) who is regularly involved in wheelchair prescription and training, or a trained assistant. The tester must be thoroughly familiar with all elements of the WST, including the general principles and the specific test elements. It is important that the test elements be administered in a consistent manner. The tester should feel free to refer to the WSP Manual whenever necessary.

Those interested in becoming WST testers should read the WSP Manual and related materials thoroughly, review practice materials (e.g., videos of experienced testers) whenever possible and observe in person how a skilled tester administers the test. Ideally, this test should only be used by testers who have been trained in its administration. We have developed a certification process to facilitate this and workshops are announced on the web-site. However, good results should be possible by careful attention to the WSP Manual, because we have designed the test to be reasonably self-explanatory and to reflect normal clinical practices.

2.21. Spotters

Any person serving as a spotter should have the requisite strength, balance, reaction time, judgment and knowledge needed to fulfill this role. Those interested in becoming spotters should read the WSP Manual thoroughly, review the practice materials and observe how a skilled spotter functions. Ideally, spotting should only be performed by those who have been trained. As noted in the previous section, we have developed a certification process to facilitate this. However, good results should be possible by careful attention to the WSP Manual, because we have designed the test to be reasonably self-explanatory and to reflect normal practices.

2.22. Scoring of Individual Skills

Score the success in accomplishing each skill, using the scale shown in Table 3. For each skill, the subject is permitted up to two complete attempts, if he/she misunderstands the instructions or indicates that an unsuccessful attempt was unrepresentative of the usual performance level. During the course of any single attempt, a subject may use different approaches (e.g., first attempting the gravel forwards, then backwards if unable to proceed). It is only considered a second attempt if the subject clearly starts over (e.g., with a repeat of the instructions). If there was something clearly “unfair” about a test (e.g., someone walked into the room and distracted the subject during the test), it is permissible to repeat the test without penalty.

A second attempt should not be considered a routine; ultimately, this is at the tester’s discretion. If a second attempt is believed to be appropriate, the tester should provide no feedback on the reason for the failure, nor any instruction on how to perform the task, between the two attempts. The task instructions may be repeated. If the skill is performed better on the second trial, record the better score. The entire skill must be performed safely and correctly during the same attempt. If a subject is unsuccessful when asked to perform a task (e.g., locking the brakes) but does it correctly later, incidental to another task (e.g., the transfer), the score may be revised, but the inconsistency should be noted in the Comments section.

Table 3: Scale for Scoring Skill Performance

<p>Pass: (on the Data Collection Form, record “P” or ✓)</p> <ul style="list-style-type: none"> • independently accomplished¹ • safely accomplished • aids are permitted if the subject carries them with him/her <p>Fail: (on the Data Collection Form, record “F” or ✕)</p> <ul style="list-style-type: none"> • task incomplete • subject requires assistance (verbal or physical) • unsafe performance² • likely to be unsafe in the opinion of the clinician or tester • unwilling to try • does not meet the pre-requisite criteria • wheelchair part malfunction <p>No Part: (on the Data Collection Form, record “NP”)</p> <ul style="list-style-type: none"> • the wheelchair does not have the component

¹Unless otherwise specified, the skills may be performed in any safe manner. The focus is on the task requirements, not the method used.

²To be considered “unsafe” for the purposes of this test, there must be the potential for an acute injury. Evidence for such injury potential should include the need for the spotter to intervene. The nature of any potentially dangerous incident should be documented in the Comments section.

2.23. Time Limits

With the exception of the street-crossing skill (for reasons that will be discussed later), there is no

formal upper time limit for each skill or for the entire test. This is to avoid the necessity of the tester timing each skill and to avoid having the subject feel rushed to complete the task. Although, in real life, a skill must be performed within a practical time to be useful, the definition of what such a time limit should be may vary with the circumstances. Fortunately, when administering the WST, this does not usually present a dilemma because the subject usually stops a task when it is taking too long. However, if a subject is perseverating or taking an apparently hopeless approach, the tester may intervene and stop the test of that skill.

2.24. Rests and Breaks

Rests are permitted during the skill attempts, unless precluded by the nature of the skill (e.g., maintaining a wheelie for 10s). If the subject is making progress, he/she should be allowed to continue. It is also permissible for subjects to rest between skills. Indeed, there is no need for all of the skills to be performed on the same day. The WST is a test of individual skills, not a test of endurance. However, if the testing is conducted on more than one day, the tester should document the dates. Also, the wheelchair, its set-up and subject aids (e.g., prosthesis) must remain the same if an overall score is to be calculated.

2.25. Timing

The WST only requires the timing of one skill, the street-crossing test. However, the time required to perform an individual skill, a series of skills or the entire WST can provide an additional level of sensitivity to change (e.g., due to training or a different wheelchair) that clinicians or researchers may wish to use.

2.26. Video-Recording

Video-recording of the tasks is not necessary, but may provide useful qualitative information about how the task is accomplished. A video of the WST lends itself to review (e.g., at a team conference) even at higher than normal speed, a useful time-saver for subjects who perform the tasks more slowly than usual. Video feedback can also be a useful training aid.

2.27. Comments

On the WST Data Collection Form (see Forms file on the web-site), the tester should record any comments that are appropriate (particularly the reasons for any failures). Any comments by the test subject may also be recorded.

2.28. Skill Levels

The three Skill Levels are “Indoor”, “Community” and “Advanced” (Table 4). Breaking the WST and WSTP down into skill levels can simplify testing, training and reporting. The breakdown may make the number of tasks involved seem less intimidating. The levels reflect a combination of the settings in which the skills are most often used and the difficulty levels. Indoor Skill Level skills are usually learned first, for instance, when someone initially becomes a wheelchair user. The Community Skill Level skills are more likely to be addressed during formal initial rehabilitation. Advanced Skill Level skills may or may not be fully addressed until the wheelchair user has completed initial rehabilitation and may be inappropriate for some wheelchair users (e.g., those with

hemiplegia).

2.29. Skill Groups

There are 18 Skill Groups (Table 4). The Skill Groups reflect the wheelchair parts involved (e.g., Armrests, Footrests) or a group of related skills (e.g., Obstacles or Level Changes). In naming the groups (and the individual skills below), we have attempted to be as generic and universal as possible. This is in recognition that the specific environments in which wheelchairs are used vary widely around the world, but share many common characteristics.

2.30. Individual Skills

There are 57 individual skills (Table 4). For instance, under the Armrests Skill Group, there are 4 separately scored skills (moving the left and right armrests out of the way, and then restoring them). The numbering of individual skills primarily reflects the functional groupings of skills, but also approximates the order of difficulty (although this can vary depending upon subject and wheelchair specifications).

2.31. Order of Tests

The tests may be performed in any order. The order of testing may vary from facility to facility, depending on the availability and layout of equipment and test settings. For the advanced test subject, it may be practical to use a “top-down” approach, starting with the more difficult skills. For instance, if the subject can perform the wheelie-turn-in-place skill, then a pass is also awarded for the more general turn-in-place skill, because its evaluation criteria have also been met (see Skill Combinations in section 2.33).

2.32. Skill Pre-requisites

Some of the skills have pre-requisite conditions. This means that, if the pre-requisite is not met, the tester need not formally evaluate that skill (although a failing grade should be recorded). In most cases, the use of a pre-requisite is because the later skill would be of little use without the former (e.g., the ability to move the footrest out of the way is a pre-requisite to testing the ability to replace it). Furthermore, by having some tests serve as pre-requisites to others, the subject is not asked to perform tasks that he/she is virtually certain to fail (e.g., success at ascending the 5cm level change is a pre-requisite to attempting to ascend the 15cm level change). The use of pre-requisites also simplifies the administration of the WST for the tester, who would otherwise need to pointlessly place the wheelchair user and the wheelchair in the new starting position. If the subject meets the pre-requisite on one side but not the other, then the subject may proceed to subsequent skills requiring that pre-requisite on the successful side only. Despite these general rules, if the tester and subject wish to evaluate a skill for their interest, despite the subject having failed the pre-requisite, there is no reason why performance on this skill should not be assessed. However, the result of this assessment should not be included in the Test Report and calculated values.

2.33. Skill Combinations

As noted earlier, for the advanced subject, it may be practical to use a “top-down” approach, starting with the more difficult skills. In such situations, the subject may perform a task that meets the criteria

for more than one skill. For instance, if the subject performs the wheelie-turn-in-place skill, he/she has simultaneously met the criteria for the turn-in-place skill. Similarly, a subject may correctly carry out the brakes skills during the transfer skills. In such situations, a pass may be awarded for all skills successfully completed.

2.34. Left- vs. Right-Sided Skills

In objectively evaluating skill performance, both sides are tested (e.g., removal of footrests on left and right). Although this may be redundant for subjects with symmetrical impairments (e.g., of strength or range of motion), it is valuable for subjects with asymmetrical impairments (e.g., due to hemiplegia or amputation) or for wheelchairs with asymmetrical flaws (e.g., a sticky armrest on one side). A left-sided skill (e.g., application of the left brake) can be performed using the right hand without penalty and vice versa.

2.35. Testing-and-Training Protocol

If a single person is serving as both the tester and trainer, he/she may choose to use the Testing-and-Training Form (see Forms file on web-site). The tester/trainer records both the pre- and post-instruction scores and the dates of the sessions. However, two precautions should be noted if this protocol is used. First, when using the protocol, as much of the pre-training WST should be completed as possible before beginning any training, because the pre-training score of some skills may be artificially inflated by just having learned about a similar skill. Second, to ensure at least short-term retention, the post-training WST should be performed at least 3 days after the training has been completed.

2.36. After the Test

The tester should document any problems or comments by the participant. The data on the Data Collection Form is used to calculate one or more summary scores.

2.37. Calculated Scores

The following scores can be easily calculated by hand (as described below) or by using software developed for the purpose.

Routine

1. **Total Percentage Score:** The numerator is the Total Raw Score (i.e., the number of individual skills awarded a passing score) and the denominator is the number of applicable skills (i.e., the total number of skills [57] minus those awarded NP scores). 100% is the maximum possible percentage score.

Optional

For the optional calculated scores below, it should be recognized that any such subset of skills may have different measurement properties than the entire WST.

1. **Subtotal Percentage Scores for Each Skill Level:** The Indoor, Community and Advanced Skill Level percentage scores may be calculated as for the Total Percentage Score, except

that the included skills are as designated in Table 4.

2. Caregiver-Assisted Percentage Scores: For instances in which the WST is being used to assess the extent to which a caregiver assists a wheelchair user, in addition to reporting the Total or Subtotal percentage scores achieved by the wheelchair user, the scores achieved when the wheelchair user is assisted by the caregiver can be reported. The same formulae are used for the calculation, but the passes in the numerator include both the passes by the wheelchair user alone plus the additional passes due to caregiver assistance.
3. Symmetry Index: To provide information on significant asymmetries (e.g., due to hemiplegia), the tester separates the scoring of left and right skills (e.g., brake application) rather than combining the two. This allows the calculation of a Symmetry Index (SI) of the applicable skills. The numerator is the number of those skills where there was symmetry (i.e., either both left- and right-sided skills were passed or both were failed). The denominator is the number of skills for which pass or fail scores have been entered on both sides (maximum of 14). For instance, a Symmetry Index of 0.8 means that the wheelchair user was successful (or unsuccessful) in performing 80% of bilateral skills symmetrically. The range of possible scores on the SI is 0.00-1.00. If there is “no part” on one side (e.g., due to a missing footrest), the entire skill is excluded from the SI (both the numerator and the denominator). In interpreting the SI, the clinician should look at the individual skills. For instance, a problem with the left arm could cause a difficulty in turning to the right. Furthermore, the clinician should look at the reason for the failure. A mechanical problem with the wheelchair can as easily lead to asymmetry as a unilateral impairment of the subject.
4. Special Purpose: Any subset of individual skills may be selected for a calculated subtotal percentage score. For instance, in a research study exploring different designs of rear anti-tip devices (RADs), a subset of the RAD-Relevant Skills could be selected. Another example would be the calculation of a Goal Attainment Score. The numerator and denominator would apply only to the skills that were considered goals for that subject.

2.38. Test Report

The Test Report includes the scores for individual skills, the calculated scores and comments. It may be completed by hand or generated by software developed for the purpose. The WST results need to be interpreted in light of the demographic, clinical and wheelchair specifications that are recorded on related forms.

3. GENERAL CONSIDERATIONS FOR THE WST-Q TESTER

3.1. When Used

For situations in which objective testing is impractical or impossible (e.g., during telephone follow-up interviews), a questionnaire version (WST-Q) is available. How the testing is adapted for WST-Q administration is described in this general section as well as specific considerations, described later, for individual skills. The suggested scripts are summarized in the Appendix.

3.2. Cognitive and Communication Requirements

The WST-Q is only valid if the subject is able to communicate and understand instructions. As a screening method, ask the potential subject about information (e.g., date of birth, diagnosis, length of time using a wheelchair, and time up in the wheelchair each day) that can be corroborated by chart review, the nursing staff or family members. It is acceptable for a proxy (e.g., a caregiver or family member who knows the subject well) to answer on behalf of the subject, but the proxy's name and relationship to the subject should be recorded.

3.3. Instructions and Questions

The tester reads or otherwise poses the questions and records the answers. The subject should initially be oriented to the questionnaire and general instructions. Suggested scripts are included for the general orientation and for individual skills in each of the individual skill sections and are listed together in Appendix 1. The suggested scripts do not need to be strictly followed. This is a semi-structured interview that keeps the respondent on the topic but free to answer as he/she pleases. The interviewer should strive for a conversational tone. In general, the tester should use open-ended questions initially (e.g., “*Can you do that?*”, “*How would you do it?*”, “*Anything else?*”). When answering the questions, subjects are asked to imagine the situations or obstacles that they would face in their own environment. However, it is often necessary to ask the subject to more directly clarify or elaborate on answers. For example, if the subject failed to mention locking the brakes before transferring from the wheelchair, the tester may inquire “*Does that method you just described include any adjustments that you would have made to your chair?*”

3.4. Evaluation Criteria

The subject must describe a technique that would allow successful performance of the skill based on the evaluation criteria in place for the objective WST and for the type of wheelchair and wheelchair components that are on the subject's wheelchair. For any questions with a left and right component, the subject does not need to fully explain the technique for both the left- and right-handed tasks unless there is a diagnosis present that could cause a unilateral impairment (e.g., stroke or amputation). However, the tester should inquire “*Would that be the same for both sides?*”

3.5. In-Person Administration

If the WST-Q is administered in person, it is acceptable for the tester to point to parts of the wheelchair or otherwise use gestures to illustrate what the subject is expected to do. Similarly, the subject may use gestures, writing or actual demonstration of any of the skills rather than using verbal descriptions alone to explain the method. When some skills are evaluated objectively and some

subjectively, this is referred to as a “blended” WST/WST-Q; in such a situation, the tester must indicate in the Comments section which skills were tested in which way.

3.6. Telephone Administration

If the questionnaire is being administered by telephone, it is helpful to ask the subject to have the wheelchair close by to act as a visual or actual prop when describing the method for performing a skill. Unlike in the objective WST or the WST-Q administered in person, the telephone tester cannot see the wheelchair being used, so the questions include some about the presence and type of wheelchair parts.

4. GENERAL INSTRUCTIONS FOR THE WSTP TRAINER

Education can include one or more of three domains – cognitive (the knowledge required), psychomotor (the motor skills) and affective (the attitudes and motivation) – all three are relevant to wheelchair skills training. The three stages of education – objectives, curriculum and evaluation – are also relevant; these stages may need to be repeated (the “circle of education”).

Many of the following general recommendations are based on the extensive educational and motor-skills-learning literature. Although there is a great deal of science underlying these principles (and much that is, as yet, unknown), the principles are fairly simple. In addition to the general principles summarized in this section, more specific “training tips” are included with the individual skills later. These have been derived from a number of excellent sources in the rehabilitation and wheelchair literature, as well as from our own experience.

4.1. Targets of Training

The training can be directed at the wheelchair user, the caregiver, the wheelchair-user/caregiver combination, clinicians, or those seeking certification as spotters, testers or trainers.

4.2. General Caregiver Considerations

Some general considerations for caregivers as test subjects were discussed earlier in Section 2.2. If the caregiver is the target of training, the caregiver should be cautioned to avoid applying force to the wheelchair user through a flexible backrest or removable part, and to avoid sudden movements. The caregiver should always provide the wheelchair user with verbal cues concerning what he/she intends to do before attempting a skill. When the caregiver is the target of training, the caregiver also serves as the spotter and needs to be instructed in how to perform in this capacity. In addition to these general points, caregiver issues related to specific skills are dealt with later, when those skills are discussed.

4.3. Trainers

The trainer may be a rehabilitation clinician (e.g., an occupational therapist or physical therapist) who is regularly involved in wheelchair prescription and training, or someone specifically trained for the purpose. The trainer should be thoroughly familiar with all elements of the WSTP, including the general principles and the specific elements. The trainer should feel free to refer to the WSP Manual whenever necessary. Those interested in becoming WSTP trainers should read the WSP Manual and related materials thoroughly and observe how a skilled trainer performs. Ideally, the WSTP should only be used by trainers who have been trained in its administration. As noted earlier, we have developed a certification process to facilitate this. Certification workshops are announced on the website. However, good results should be possible by careful attention to the WSP Manual, because we have designed it to be reasonably self-explanatory and to reflect normal practices.

4.4. Self-Training

For some wheelchair users and caregivers who do not have ready access to a trainer, it may be possible to learn the skills by self-training. However, we strongly recommend that careful attention to spotting

be included in any such practice sessions.

4.5. Spotters

Any person serving as a spotter during training should meet the criteria described earlier (section 2.21).

4.6. Attend to Ergonomics

Wheelchair users and caregivers are at risk of acute or chronic injuries due to poor ergonomic technique. The trainer should provide feedback to subjects when poor ergonomic methods are used.

4.7. Use Brief Training Sessions

We recommend, whenever feasible, that training programs adopt an approach in which the training is spread over a series of brief sessions instead of one long session. Brief practice periods are less likely to conflict with other therapy sessions (e.g., for inpatients) or to fatigue the subjects. For wheelchair users, particularly those who are elderly or who have a number of co-morbidities, even 30 minutes at a time may be fatiguing. We have found it practical to use sessions of 30-60 minutes in duration. Such sessions include a warm-up, a period during which instruction is received on the skills that are the focus of the session, and a warm down. Depending upon the setting (e.g., inpatient vs community), sessions can be scheduled at intervals of 1-7 days.

The single-training-session format is commonly used for workshops. However, the use of such an approach, which may require 2-3 hours, may cause subjects to lose focus and to become fatigued. In addition to problems related to motivation and fatigue, this approach may lead to poor retention and consolidation of complex skills.

4.8. Use a High Ratio of Trainers to Learners

We recommend that the ratio of trainers to learners be 1:1 or 1:2, although larger groups have also been successfully trained.

4.9. Use a Partner of Comparable Skill Level

When training in pairs, partner selection should involve, when possible, pairing on the basis of skill level. Subjects may find it intimidating to practice with a partner who is more skilled.

4.10. Demonstrate the Skills

The trainer should demonstrate the skills or use a model, peer or video to do so. The demonstrator need not be highly skilled.

4.11. Segment Complex Skills

It can be helpful to initially break the more advanced skills down into their components. For instance, the stationary wheelie skill can be broken down into three phases – takeoff, balance and landing.

4.12. Identify Limiting Factors

The inability to perform a skill may be due to a variety of limiting factors, alone or in combination. These include such impairments as cognitive limitations, depression, weakness, pain, shortness of breath, limited range of motion, spasticity, incoordination and movement disorders. The trainer should attempt to identify and seek to have any remediable limiting factors addressed.

4.13. Provide Feedback Correctly

When providing feedback, the trainer needs to exercise judgement and to be attuned to the “chemistry” of the training session. However, there are some general rules of thumb.

Encouraging remarks (e.g., “that was a good attempt”) from time to time can help to sustain motivation. Although knowledge-of-results (KR) feedback statements are usually unnecessary, if a learner performs in an unsafe manner and does not appear to be aware of it, the trainer should point this out.

Prescriptive knowledge-of-performance (KP) statements are preferred. Identify the most critical error and suggest what might be done to correct this problem. Video feedback can also be a useful training aid. Offer KP statements no more often than after every second attempt. This gives the subject an opportunity to problem-solve on his/her own. It also decreases repetitive feedback statements, especially in the case of more advanced skills when it can take time to overcome a problem.

Feedback schedules may need to be carefully structured for wheelchair users who have cognitive or behavioral impairments. A self-controlled feedback schedule may be appropriate for some individuals. Gradually fade the frequency of feedback statements as time goes on.

4.14. Choose an Appropriate Focus of Attention

Early in training, the trainer may need to have the subject focus on specific actions (e.g., “*Lean forward*”), if a crucial error has been identified. Be careful not to overwhelm the learner with too many specific actions. More advanced learners, as the skill becomes more automatic, may do better if they focus on the overall goal of the skill performance (e.g., “*Get up the incline onto the platform*”).

4.15. Use Learning Exercises

It can be useful to have learners attempt skills in inappropriate ways (e.g., rolling through gravel while leaning forward, causing the casters to sink into the gravel), to help them understand why a suggestion is being made. Games, competitions and “homework” assignments can also be used.

4.16. Facilitate Consolidation

After providing training on a new and complex skill that has not yet been mastered, increase the chances for consolidation by avoiding the introduction of other new complex skills during the 4-6 hour period thereafter.

4.17. Ensure Retention

Once skills have been learned in a controlled setting, the learner should practice them in random order and in different contexts (e.g., outdoors vs. indoors) to promote retention and transfer into

everyday situations. A common phenomenon is for a subject to regress between one session and the next. The objective of the training is long-term retention. For practical purposes, successful performance after such brief intervals as 3 days may need to be accepted as evidence of short-term retention, but long-term retention (months and years) is the target.

5. SKILL GROUPS AND INDIVIDUAL SKILLS

Organization of the Following Sections

The following sections are organized by skill groups and individual skills (Table 4). For each section, the following headings are used:

- Description: A brief general description of the skill group.
- Rationale: The reason why these skills have been included.
- Pre-requisites: What, if any, conditions must be met or skills must be passed before attempting this skill.
- Skill combinations: Other skills, if any, during which the subject might also meet the criteria for this skill.
- Suggested equipment and set-up: If any. Equivalent alternatives may be used.
- Starting position: For the subject.
- Tester/spotter position: Where the tester/spotter should stand and what to be prepared for in the way of spotter interventions that may be needed.
- Instructions to subject: An example of the language that the tester might use.
- WST-Q considerations: To better allow the skill to be scored by interview alone. This includes examples of the language (“suggested scripts”) that the tester might use.
- Evaluation criteria: What must be accomplished to pass the skill, in addition to the general scoring criteria described in Section 2.22.
- Scores recorded: For instance, scores for left- and right-sided skills.
- Training tips: Primarily aspects that might not be self-evident from the earlier sections for this skill.
- Caregiver considerations: What differences should be recognized if the caregiver is the target of testing or training.

Table 4: Skill Groups, Individual Skills and Skill Levels

Group	Skill #	Individual Skill	Skill Level
Brakes	1	Apply, left	Indoor
	2	Apply, right	Indoor
	3	Release, left	Indoor
	4	Release, right	Indoor
Armrests	5	Move away, left	Indoor
	6	Move away, right	Indoor
	7	Restore, left	Indoor
	8	Restore, right	Indoor
Footrests	9	Move away, left	Indoor
	10	Move away, right	Indoor
	11	Restore, left	Indoor
	12	Restore, right	Indoor
Rolling	13	Forwards	Indoor
	14	Street crossing	Community
	15	Backwards	Indoor
Turns in place	16	Left	Indoor
	17	Right	Indoor
Moving turns	18	Forward, Left	Indoor
	19	Forward, Right	Indoor
	20	Backward, Left	Indoor
	21	Backward, Right	Indoor
Sideways maneuvering	22	Left	Indoor
	23	Right	Indoor
Reaching	24	Ground	Indoor
	25	High object	Indoor
Transfers	26	Out of wheelchair	Indoor
	27	Into wheelchair	Indoor
Fold/unfold wheelchair	28	Fold	Community
	29	Unfold	Community
Doors	30	Open away	Indoor
	31	Open towards	Indoor
Obstacles	32	2cm high	Indoor
	33	13cm high	Community
Cross-slope	34	Left	Community
	35	Right	Community
Increased rolling resistance	36	Carpet	Indoor
	37	Gravel	Community

Pot-holes	38	15cm across	Community
	39	30cm across	Community
Inclines	40	5°, ascent	Community
	41	5°, descent	Community
	42	7.5°, wheelie forward descent	Advanced
Level changes	43	5cm, ascent	Community
	44	5cm, descent	Community
	45	15cm, ascent	Advanced
	46	15cm, descent	Advanced
	47	15cm, wheelie forward descent	Advanced
Wheelies on level terrain	48	No-hands rest	Advanced
	49	Stationary	Advanced
	50	Rolling forwards	Advanced
	51	Rolling backwards	Advanced
	52	Turn in place, left	Advanced
	53	Turn in place, right	Advanced
	54	Moving turn, forward, left	Advanced
	55	Moving turn, forward, right	Advanced
	56	Moving turn, backward, left	Advanced
	57	Moving turn backward, right	Advanced

Classification	#	Name	Skill Level
Skill Group	Brakes		Indoor
Individual Skills	1	Apply, left	
	2	Apply, right	
	3	Release, left	
	4	Release, right	

Description: The subject applies and releases the parking brakes (wheel locks).

Rationale: The ability to use the parking brakes is important to the safety of most wheelchair users (e.g., during transfers, reaching, parking on inclines).

Pre-requisite: None.

Skill combinations: The criteria for this skill may be met while brake-handling during other skills (e.g., transfers, reaching high object).

Suggested equipment and set-up: None.

Starting position: The wheelchair user is seated in the wheelchair with the brakes unlocked.

Tester/spotter position: He/she should be in front of the subject.

Instructions to subject:

- “Apply your brakes.”
- “Release your brakes.”

WST-Q considerations:

- Suggested script:
 - “Does your wheelchair have brakes?”
 - “Can you apply the brakes? How? Would this be the same on both sides?”
 - “Can you release the brakes? How? Would this be the same on both sides?”
- The subject must describe a technique that is appropriate for the type of brakes that are on the wheelchair.

Evaluation criteria:

- The parking brakes should be applied fully.
- After the brake is applied, the tester should attempt to roll the wheel backward, using a force approximately equivalent to what might be applied during a transfer. The force can be applied to the wheel directly or by pulling backward with the push handles. If the brake does not adequately prevent the wheel from rolling, despite being fully applied, a

- failing score should be awarded and the reason for it noted in the Comments section.
- During the release skills, the brakes should be released to the extent that they make no contact with the tires. If the wheel locks are of the retractable type, they need not be fully retracted.

Scores recorded:

- Brake, apply left
- Brake, apply right
- Brake, release left
- Brake, release right

Training tips:

- If the rear wheel moves with the brake locked, the brake may need to be adjusted or the tire may need to be pumped up, if it is pneumatic.
- A wheelchair user with weak trunk muscles can avoid falling forward, by hooking an arm around a push handle or holding onto an armrest or wheel.
- If strength is a limiting factor, the subject may use brake extensions.
- To apply a push-to-lock brake, the subject should grasp the handle of the brake and push it towards the front of the wheelchair until it clicks firmly in place.
- To apply a pull-to-lock brake, the subject should pull the handle backward until it clicks firmly in place.
- To apply a retractable scissor brake, the subject should pull the handle in a sideways motion toward the center of the wheelchair until it clicks firmly in place.
- To release brakes, the subject should reverse the action used to apply them. For a retractable scissor brake, the subject should fold the brake fully out of the way.

Caregiver considerations:

- The caregiver should stoop (bend knees) or lean on the armrest or other wheelchair part, to minimize back strain.

Classification	#	Name	Skill Level
Skill Group	Armrests		Indoor
Individual Skills	5	Move away, left	
	6	Move away, right	
	7	Restore, left	
	8	Restore, right	

Description: The subject moves the armrests out of the way and then restores them.

Rationale: To create more room for a sideways transfer or to approach a low table, it is useful to move one or both armrests out of the way, if such a feature is present on the wheelchair.

Pre-requisite:

- None for the move-away skills.
- Success at the move-away skills (#5,6) are pre-requisites for the restore skills (#7,8).

Skill combinations: The criteria for this skill may be met, at least in part, during the transfer skills (#26,27). However, to accomplish these skills, they must be performed on both sides.

Suggested equipment and set-up: None.

Starting position:

- The starting position for the armrests is with them in the position used for resting the arms on them. The armrest locks (if any) need not be engaged.
- If the wheelchair user's arm is ordinarily attached to the armrest (e.g., by a velcro strap), the arm should be on the armrest and the attachment should be in place.
- For the restore skills, the starting position is with the armrests out of the way, in the position that the subject left them after successfully completing the move-away skills.

Tester/spotter position: He/she should be in front of the subject.

Instructions to subject:

- For the move-away skills:
 - *“Move your armrests completely out of the way.”* If the subject completely removes the armrests, rather than flipping or swinging them away, the tester may instruct the subject to *“Put them where you can reach them.”*
- For the restore skills:
 - *“Restore your armrests.”* If the wheelchair user's arm was attached to the armrest before the move-away skills, and the subject fails to restore the arm to the original

position, the subject may be prompted, without penalty, to “*Put your arm back on the armrest, the way that it was before you began*”.

WST-Q considerations:

- Suggested script:
 - “*Does your wheelchair have armrests? Are they movable?*”
 - “*Can you move the armrests out of the way? How? Would this be the same on both sides?*”
 - “*Can you replace the armrests? How? Would this be the same on both sides?*”
- The subject must describe a technique that is appropriate for the type of armrests that are on the wheelchair.

Evaluation criteria:

- For the move-away skill:
 - If the wheelchair user’s arm is attached to the armrest, the subject must independently detach and remove the arm from the armrest.
 - If the armrest is rotated (i.e., swung sideways or flipped backwards) out of the way, all parts of it should clear the backrest or backrest posts.
 - If the subject attempts to remove the armrests, they must be fully removed.
 - If the subject only removes the top padded component of a height-adjustable armrest, this is a failure.
- For the restore skill:
 - After restoring the armrest to the functional position, the armrest lock (if any) need not be re-engaged.
 - If the wheelchair user’s arm was attached to the armrest before the move-away skill, the arm need not be restored to its original position (consistent with our general ‘altered status’ provision described in section 2.11). If, because the arm is not secured, it subsequently falls off the armrest and interferes with another task or endangers the arm, then a failure should be awarded for the skill being attempted at that time.

Scores recorded:

- Armrest, move away left
- Armrest, move away right
- Armrest, restore left
- Armrest, restore right

Training tips:

- First, the subject should decide which method to use. Generally, it is easier to flip/swing the armrests out of the way than to remove them completely.

- To move the armrests away:
 - For a flip-up armrest, the subject should unlock the front of the armrest from the receptacle and lift the front of the armrest so that it flips behind the chair back.
 - For a swing-away armrest, the subject should lift the armrest up slightly to disengage it and then swing it to the rear far enough to clear the backrest posts.
 - To completely remove an armrest, the subject should unlock whatever locks are necessary. There may be one at both the front and back of the armrest. The subject should lift the armrest straight up so that the armrest is detached from the chair. If the armrest is height-adjustable, be careful that the subject has not just removed the elevating arm pad.
 - For a wheelchair with a tray (e.g., for a person with hemiplegia), the subject should first flip the tray away or slide it forwards to detach it.

- To restore the armrests:
 - The subject should reverse the process.
 - The subject should make sure the armrest posts are lined up with the receptacles before locking them.
 - The subject should check to make sure the armrests are locked in place by pulling up on them.

Caregiver considerations:

- The caregiver should clear the wheelchair user's arms away from the path of the armrests (e.g., in the lap).

Classification	#	Name	Skill Level
Skill Group	Footrests		Indoor
Individual Skills	9	Move away, left	
	10	Move away, right	
	11	Restore, left	
	12	Restore, right	

Description: The subject moves the feet from the footrests and moves the footrests out of the way. Then the subject restores the footrests and feet to their original positions. For the purpose of this test, any movable device that supports the residual limb of a person with a transtibial amputation shall be considered a footrest.

Rationale: This is a necessary task for some types of transfers and to access some objects.

Pre-requisite:

- None for the move-away skills.
- Successes on the move-away skills (#9,10) are pre-requisites for the corresponding restore skills.

Skill combinations: The criteria for these skills may be met during the transfer skills (#26,27).

Suggested equipment and set-up: None.

Starting position:

- For the move-away skill:
 - The wheelchair user is seated in the wheelchair with the feet on the footrests. If toe loops or other restraints are ordinarily used, they should be in place. If the footrests are of the elevating type, they should be in the position in which the wheelchair user ordinarily uses them. The swing locks (if any) should be in the engaged position before starting the task.
- For the restore skill:
 - The footrests should be wherever the subject placed them during the move-away skills.

Tester/spotter position: He/she should be in front of the subject.

Instructions to subject:

- For the move-away skill:
 - *“Move your footrests completely out of the way.”* If the subject fully removes the

footrests, the tester may instruct the subject to *“Put them where you can reach them.”*

- For the restore skill:
 - *“Restore your footrests.”*
 - *“Put your feet on the footrests.”* If appropriate, *“Put the straps back on.”*
 - If the wheelchair user’s foot was attached to the footrest before the move-away skill, and the subject fails to restore the foot to the original position, the subject may be prompted, without penalty, to *“Put your foot back on the footrest, the way that it was before you began”*.

WST-Q considerations:

- Suggested script:
 - *“Does your wheelchair have footrests? Are they movable?”*
 - *“Can you move the footrests out of the way? How? Is this the same on both sides?”*
 - *“Can you replace the footrests? How? Is this the same on both sides?”*
- The subject must describe a technique that is appropriate for the type of footrests that are on the wheelchair.

Evaluation criteria:

- General:
 - It is permissible to use the feet to perform or assist with manipulating the footrests.
 - If the footrests are of the elevating type, they may be lowered or left elevated for these tasks.
- For the move-away skill:
 - The footrests should finish in a position that would not interfere with the wheelchair user’s ability to transfer forwards from the wheelchair.
 - It is permissible for the subject to move the footrests out of the way by flipping the footplates up, swinging the footrests away or removing them.
 - If the footplates are only flipped up to perform the task and if the heel loops need to be bowed forwards to flip the footrests up fully, this must be done.
 - If the footrests are swung away to perform the task, they must be swung far enough away so that there is as little as possible of the footrests or hangers in front of the seat. This is usually at least 90° from the original position.
 - If the footrests are removed, they must be fully removed.
- For the restore skill:
 - When the footrests are returned to their original position, the tester should ensure that the locks are engaged (e.g., by pulling on the footrest).

- On completion, the feet should be fully on the footrests and properly positioned (i.e., no edge or point pressure on the feet, no interference with caster swivel due to the position of the feet on the footrests).
- If there are straps that are ordinarily fastened (e.g., toe loops or ankle straps), the subject must fasten them independently or leave them unfastened (consistent with our general ‘altered status’ provision described in section 2.11). If, because the foot is not secured, it subsequently falls off the footrest and interferes with another task or endangers the foot, then a failure should be awarded for the skill being attempted at that time.

Scores recorded:

- Footrest, move away, left
- Footrest, move away, right
- Footrest, restore, left
- Footrest, restore, right

Training tips:

- Before moving the footrests out of the way, instruct the subject to first remove the feet from the footrests. Later, after restoring the footrests, the subject should remember to put the feet back on the footrests. A person with weak hands may need to use both hands or an extended wrist under the knee to lift the leg. If one leg is stronger, it may be used to assist in lifting the weaker leg.
- To move a swing-away footrest out of the way, the subject should unlock the footrest. The locking mechanisms vary from wheelchair to wheelchair. The subject should swing the footrest completely out of the way. To replace the footrest, the subject should push the footrest back towards the front of the wheelchair until it clicks into place. The subject should check that it is locked in place by pulling on it.
- To completely remove the footrests, the subject may need to first swing the footrest away. The subject should then pull up on the footrest. The subject should pay attention to how the footrest was attached to the chair to simplify restoring it later. To replace the footrest, the subject should start in the swung-out position, line up the post or pins with the hole(s) and put the footrest back in place. The subject should swing the footrest back to the front.
- Some wheelchairs do not allow the footrests to be swung away or removed, but it may be possible to flip the foot-plates up. The subject should pull the foot-plates up until they are fully vertical. To do so on some wheelchairs, it may be necessary to push the heel loops (if any) forward. To replace the footrests, the subject should push the foot-plates down. The subject should push the heel loops back into place, if they were earlier displaced.
- To raise an elevating footrest, the subject should grasp it near the end and lift it slowly to the desired position. To lower the footrest, the subject should support its weight, and hold the position lock open while lowering the footrest. The position lock is often

located at the top of the leg-rest (near the knee).

- For a wheelchair user with weak trunk muscles, to reach the footrests, the arms can be moved to the thighs one at a time, and then to the feet, until the chest is resting on the thighs. To get back into the upright position, the stronger arm can be hooked over the push handle or armrest and the body pulled up through elbow flexion and wrist extension.

Caregiver considerations:

- For this skill, and other skills requiring the caregiver to reach a part of the wheelchair near the ground, the knees should be bent to protect the back, using a hand on the wheelchair for balance.

Classification	#	Name	Skill Level
Rolling			
Individual Skills	13	Forwards	Indoor
	14	Street crossing	Community
	15	Backwards	Indoor

Description: The subject propels the wheelchair a short distance forwards and backwards on a smooth level surface.

Rationale: Forward and backward rolling are skills used during many wheelchair activities. The forward propulsion distance (10m) is intended to simulate moving about indoors or the crossing of a two-lane street. There is no reason to impose a time constraint on the rolling forward skill at the Indoor Skill Level. However, timing this skill provides a means of identifying whether the subject would be able to get across a street quickly enough to be safe (e.g., when traffic flow is controlled by lights for the street-crossing skill). Although there is considerable variability, most traffic signals provide at least 30s for a full cycle. From this, we derived the minimum speed to be considered successful on this skill, 0.33m/s.

Pre-requisite: A pass on the rolling-forward skill (#13) is a pre-requisite for the street-crossing skill (#14).

Skill combinations:

- The criteria for the rolling-forward skill (#13) are met if the street-crossing skill (#14) is passed.

Suggested equipment and set-up:

- A smooth level surface, 1.2m wide and 10m long.
- Starting, halfway and finishing lines at 0, 5 and 10m.
- Space at least 1.5m beyond the starting and finishing lines.
- Stopwatch.

Starting position:

- For the rolling-forward and street-crossing skills:
 - The wheelchair user is seated in the stationary wheelchair, with the caster axles just behind the starting line.
- For the rolling-backward skill:
 - The wheelchair user is seated in the wheelchair with the rear-wheel axles just behind the starting line.

Tester/spotter position: The spotter should be behind the wheelchair because a sudden

acceleration when moving forward, or a sudden stop when moving backwards, can induce a rear tip if the wheelchair is unstable and is not equipped with effective rear anti-tip devices.

Instructions to subject:

- For the rolling-forward and street-crossing skills:
 - “*Push your wheelchair straight ahead across the line (indicate the finish line), staying within the space available (indicate limits). Pretend that you are crossing a two-lane street and you have 30s to do so. Stop when you have crossed the line.*”
- For the rolling backward skill:
 - “*Push your wheelchair straight backwards until you cross the line (indicate the 5m halfway line), staying within the space available (indicate limits).*”

WST-Q considerations:

- Suggested script:
 - “*Can you make your wheelchair go straight forward for 10m on a level surface? How?*”
 - “*Can you push your wheelchair across a two-lane street, in the time it takes for a street light to change from green to red? How?*”
 - “*Can you make your wheelchair go straight backward for 5m? How?*”
- The subject’s answer should include a strategy to keep the wheelchair in a straight line.

Evaluation criteria:

- General:
 - If there is a solid barrier or wall on one or both sides, it is permissible for the subject to slide along or glance off the barrier, if this is not done in a way that is potentially injurious.
 - If a wheel strays outside the lateral boundaries, a failing score should be given.
 - The subject must bring the wheelchair to a controlled stop after crossing the finish line.
- For the rolling-forward and street-crossing skills:
 - Any safe forward propulsion method is acceptable over the 10m.
 - If there is a transient rear tip as the subject accelerates, this is not considered unsafe unless the spotter is forced to intervene.
 - The end of the task is when the caster axles cross the finish line.
 - Time (to the nearest second) from the instant that the caster axles cross the starting line until they cross the finish line.
 - The subject who meets all criteria except for the time criterion receives a pass for the rolling forward skill (#13) at the Indoor Skill Level.
 - The subject who also meets the time criterion (10m in 30s) also receives a pass

for the street-crossing skill (#14) at the Community Skill Level.

- For the rolling-backward skill:
 - The wheelchair must travel 5m.
 - Any safe backward propulsion method is acceptable.
 - The end of the task is when the rear wheels cross the finish line.
 - If there is a transient rear tip as the subject stops, this is not considered unsafe unless the spotter is forced to intervene.

Scores, time and speed recorded:

- Rolling forwards score
- Street crossing:
 - Score
 - Time in seconds to cover 10m forward
 - Speed in m/s (e.g., 10m/30s = 0.33 m/s)
- Rolling backwards score

Training tips:

- Forward
 - Two-Hand-Propulsion Pattern
 - To propel the wheelchair straight forwards, the wheelchair user should grasp the hand-rims and push evenly with both hands.
 - The wheelchair user should avoid jerky accelerations that could cause him/her to tip over backwards.
 - To avoid popping the front wheels off the ground, the wheelchair user should lean forward as he/she pushes.
 - To minimize shoulder strain, the wheelchair user should try to push with longer, less frequent, strokes. This can be illustrated by having the wheelchair user imagine the right rear wheel as the face of a clock; the initial and final contact positions for the wheel might then be referred to as 11:00 and 2:00 o'clock.
 - To stop, the rate of slowing can be controlled by how hard the hand-rims are gripped. The hand-rims should run through the wheelchair user's hands. If the wheelchair user stops too quickly, he/she may fall forward out of the wheelchair or tip over forwards.
- A person With Hemiplegia
 - The wheelchair user should propel the wheelchair with the sound-side arm and leg.
 - To avoid moving to the weaker side, the wheelchair user should use the sound-side foot to help steer the wheelchair.
 - The wheelchair user should use the foot to help stop.
 - If the wheelchair user uses the foot for propulsion, the height of the seat

- should be low enough to allow the full foot to be on the ground when it is directly below the knee.
- If the foot is used for propulsion, the wheelchair user should wear shoes that provide protection for the foot and good traction.
 - To use the foot, the wheelchair user should straighten the leg, push down on the floor with the heel, and then pull the wheelchair forward with the foot.
- Backward
 - General
 - The subject should proceed slowly and look over the shoulder to avoid obstacles.
 - Slowing down will also make it easier for the subject to steer.
 - Two-Hand-Propulsion Pattern
 - To propel the wheelchair straight backward, the wheelchair user should grasp the hand-rims and pull evenly.
 - To avoid tipping back when stopping, the wheelchair user should avoid grabbing the wheels suddenly, or should lean forward.
 - A person With Weak Arm Muscles
 - The wheelchair user should place both hands on the backs of the wheels (about 11:00 o'clock, using the clock analogy) with the arms straight and the shoulders shrugged. Then, the wheelchair user should use the body weight to push down on the wheels.
 - A person With Hemiplegia
 - As for rolling forward above, except the sequence is to first flex the leg, push down on the floor with the foot, then push the wheelchair backwards by straightening the leg.

Caregiver considerations:

- The caregiver should keep the wheelchair close to the body.
- If the caregiver starts or stops suddenly, this may startle the wheelchair user.

Classification	#	Name	Skill Level
Skill Group	Turns in place		Indoor
Individual	16	Left	
Skills	17	Right	

Description: The subject turns the chair 180° in place, both to the left and right.

Rationale: Wheelchair users often encounter situations in which they need to perform tight turns.

Pre-requisite: None.

Skill combinations: The criteria for these skills may be met during the wheelie-turn-in-place skills (#52,53).

Suggested equipment and set-up: Smooth level surface, on which is marked a 1.5m-diameter circle.

Starting position: The wheelchair user is seated in the wheelchair with the wheelchair in the center of the circle.

Tester/spotter position: He/she should be behind the wheelchair (to serve as the target).

Instructions to subject:

- “Keeping all of the wheels within this circle (indicate boundary), turn the wheelchair around to face me.”
- “Turn back the other way to the starting position (indicate turning direction), keeping your wheels inside the circle.”

WST-Q considerations:

- Suggested script:
 - “If you were in a small space that was just large enough to fit your wheelchair, could you turn your wheelchair around so you were facing the opposite direction? How? Is this the same on both sides?”
- The subject’s answer should include a strategy to ensure a tight turn is executed.

Evaluation criteria:

- All wheels of the wheelchair that are on the floor must remain within the circle. Other parts of the wheelchair may protrude beyond the circle.
- If the wheelchair user propels the wheelchair with one or both feet, the feet must also remain within the circle.

- The turn is considered complete if the wheelchair completes at least a 160° turn from its original orientation.

Scores recorded:

- Turn in place, left
- Turn in place, right

Training tips:

- General
 - To make the turn more sharply, the wheelchair user should pull back on one wheel, while pushing forward on the other.
 - The “snap turn” is a more advanced version of the turn in place. To perform it, the wheelchair user positions one hand well forward and the other well back. Then, in a single uninterrupted motion, the wheelchair user “snaps” the wheelchair around.
 - The wheelchair user can use one or both feet to help steer.
 - It may be helpful for the subject to shuttle forwards and backwards to stay inside the circle.
 - When turning around in confined spaces, it can be helpful for the wheelchair user to push or pull on external objects rather than using the hand-rims.
- A person With Hemiplegia
 - To turn to the side away from the stronger hand, the wheelchair user should push forward on the hand-rim.
 - To turn toward the stronger hand the wheelchair user should pull back on the hand-rim.
 - The wheelchair user may use the feet.
 - The wheelchair user may reach across to the opposite wheel with the stronger hand.

Caregiver considerations:

- To turn in a tight space, the caregiver should pull back on one push handle, while pushing forward on the other.
- The caregiver may need to shuttle the wheelchair forwards and backwards.
- The caregiver should stand close to the back of the wheelchair. The caregiver should look behind the shoulder and in front of the wheelchair to make sure that he/she remains in the available space.

Classification	#	Name	Skill Level
Skill Group	Moving turns		Indoor
Individual Skills	18	Forward, left	
	19	Forward, right	
	20	Backward, left	
	21	Backward, right	

Description: The subject turns the wheelchair 90° to the left and right while moving forwards and backwards.

Rationale: Moving turns are often necessary to avoid obstacles or to change direction. The three-point turn (a combination of forward and backward moving turns) is used when turning around in tight quarters (e.g., by entering a doorway and backing out again).

Pre-requisite: None.

Skill combinations: The criteria for this skill may be met during the wheelie-moving-turns skills (#54-57).

Suggested equipment and set-up:

- 1.2m wide level surface with a 90° turn.
- Start and finish lines perpendicular to the line of progression, each 0.5m from the corner.
- At least 1.5m space beyond the start and finish lines.

Starting position:

- The wheelchair user is seated in the wheelchair, facing the starting line, with the leading-wheel axles behind the starting line.
- The leading wheels are the casters for forward turns and the rear wheels for backward turns.

Tester/spotter position: He/she should be in front of the subject for the instructions, then nearby during the task.

Instructions to subject:

- “*Propel forward (or backward) to make a left (or right) turn around this corner (indicate it).*”
- If the subject fails to continue any of the turns past the finish line, the tester may prompt the subject (“*Keep going until you are over the line*”) without penalty.
- Note: The order of the instructions may vary, depending upon whether a single corner is being used or a T-shaped pair of corners. For the latter, it may be efficient to use an order such as: forward left, backward right, forward right and backward left.

WST-Q considerations:

- Suggested script:
 - “*When propelling your wheelchair forward (or backward), can you make your wheelchair turn around a corner? How? Is this the same on both sides?*”
- The subject’s answer should include a strategy to ensure the wheelchair will turn while moving.

Evaluation criteria:

- The subject may touch (or even use) the walls, but should not strike them in a way that might be injurious.
- The endpoint is when the wheelchair is around the corner, 90° from its original orientation and with the leading wheels across the finish line.
- If lines are used to define the limits (rather than solid barriers, which are preferred), to simplify scoring, it is permissible for parts of the wheelchair (e.g., a footrest) to extend beyond the lines, as long as the wheels on the floor stay within the prescribed limits.

Scores recorded:

- Moving turn, forward left
- Moving turn, forward right
- Moving turn, backward left
- Moving turn, backward right

Training tips:

- General
 - The footrests can be moved out of the way in tight spaces.
 - When ready to turn, the wheelchair user should slow down the inside wheel, while pushing forward on the outside wheel.
 - The subject should make sure that the rear axles are past the corner before starting to turn.
 - The fixed environment can be used to assist with turning. In the “drag” turn, the wheelchair user drags a hand, in a rear position, along the wall to turn toward the wall. In the “push-off” turn, the wheelchair user uses a hand, in a forward position, to push away from the wall. Timing, intensity, direction and hand position of the forces applied to the wall are important features of success.
- A person With Hemiplegia
 - The wheelchair user should use the foot to help steer.

Caregiver considerations:

- The caregiver should push harder with the handle on the outside of the turn and pull back slightly on the inside handle.

- The caregiver should be careful to avoid having the wheelchair user's feet hit any barriers.

Classification	#	Name	Skill Level
Skill Group	Sideways maneuvering		Indoor
Individual	22	Left	
Skills	23	Right	

Description: The subject maneuvers the wheelchair sideways parallel to an object. The skill is performed towards both the right and left sides.

Rationale: Positioning oneself in a tight space involves maneuvering of the wheelchair, to move the wheelchair closer to or farther away from an object (e.g., bed, table or wall).

Pre-requisite: None.

Skill combinations: The criteria for these skills may be met, in part, during the transfer (#26,27) or reaching-high-object (#25) skills.

Suggested equipment and set-up:

- Target barrier on at least one side.
- Barriers or lines to limit the extent of forward-backward movement to 2m.
- Start line on floor 30 cm from the target barrier and parallel to it.
- Finish line on floor 10 cm from the target barrier and parallel to it.

Starting position: The wheelchair user is seated in the wheelchair, with the wheelchair parallel to the target barrier and the closest rear wheel at least 30cm from it.

Tester/spotter position: He/she should be in front of subject.

Instructions to subject:

- “*Get the left (or right) wheel as close as you can to this wall (indicate it), using the space available (indicate it).*”
- If the wheelchair is close to the desired finish position, but not quite there (too far away or at an angle), it is permissible to prompt “*Can you get a little closer?*” or “*Can you straighten out the wheelchair?*” without penalty.

WST-Q considerations:

- Suggested script:
 - “*Imagine you are sitting in your wheelchair with a window about a foot away on one side. Could you move your wheelchair so it was right up beside the window? How? Would this be the same if you were moving toward the other side?*”
- If the WST-Q is being administered in person it is sometimes easier to use objects in the environment as props to set the scenario rather than only using words to describe the

skill.

Evaluation criteria:

- Most subjects will use to-and-fro motions (as in parallel parking a car), but “bunny hopping” (described below) is permitted.
- On completion, the rear-wheel hand-rim must be over the finish line (within 10 cm of the barrier) and the fore-aft axis of the wheelchair must not be at an angle of >20 degrees from the wall.
- The subject may touch (or even use) the walls, but should not strike them in a way that might be injurious to the subject.

Scores recorded:

- Sideways maneuvering, to left (the side on which the target wall is, relative to the wheelchair)
- Sideways maneuvering, to right

Training tips:

- General
 - The trainer may suggest that the subject should pretend that he/she is parking a car, if the subject has had such experience. The subject should position the wheelchair ahead of the target position and parallel to it. The subject should then back the rear end of the wheelchair toward the target before straightening the wheelchair out. If the space available is limited, the subject may need to shuttle the wheelchair forward and backward to get into the desired position.
 - An alternative for the wheelchair user with good upper-body strength and coordination is to use the “bunny-hop” method. To do so, the wheelchair user hops to the side by pulling up on the rear wheels and shifting the body weight in the desired direction.
- A person With Hemiplegia
 - The wheelchair user should use the sound-side foot to steer and the sound-side arm to provide the power.

Caregiver considerations:

- The caregiver should not try to lift the wheelchair sideways. Instead he/she should maneuver it.
- The caregiver should be careful that the wheelchair user’s arm or hand is not caught between the barrier and the rear wheel.

Classification	#	Name	Skill Level
Skill Group	Reaching		Indoor
Individual	24	Ground	
Skills	25	High object	

Description: The subject reaches to pick up an object from the ground and to touch an object above shoulder level.

Rationale: Objects that need to be picked up from the ground vary from those as small and light as a coin or a piece of paper to those as bulky and heavy as a young child. We have chosen an object of intermediate size and weight for the test. A combination of upward and sideways or forward reaching is often needed when reaching for a cupboard, light switch, elevator button or fruit on a tree.

Pre-requisite: None.

Skill combinations:

- The criteria for the reaching-ground skill may be met while picking up a removed wheelchair part (e.g., an armrest) from the floor during another task (e.g., the transfer).
- None for the reaching-high-object skill.

Suggested equipment and set-up:

- For the reaching-ground skill:
 - Piece of wood (pine, 5x10x10 cm, weight ~0.2kg). Any object of roughly equivalent size and weight (e.g., a book or a stick) may be used.
- For the reaching-high-object skill:
 - Target no larger than 2.5 cm in diameter, 1.5m above the floor and over a barrier (90cm high and 45cm deep) that makes it necessary for the subject to lean to the side or forward to accomplish the task, as if reaching a cupboard over a countertop.

Starting position:

- For both skills:
 - The wheelchair user is seated in the wheelchair, facing the target with the caster axles at least 0.5m away from the barrier. This gives the subject a choice of sides from which to approach the object and usually requires some ability to maneuver the wheelchair.
- For the reaching-ground skill:
 - The tester places the object to be picked up in the midline of the wheelchair, flat on the ground.

Tester/spotter position: The spotter should stand in a position to limit the extent of any fall or tip in the direction of the reach or any rolling backward of the wheelchair.

Instructions to subject:

- For the reaching-ground skill: *“Pick up the object. You may move your wheelchair.”*
- For the reaching-high-object skill: *“Touch the target (indicate it). You may move your wheelchair.”*

WST-Q considerations:

- Suggested script:
 - *“Imagine you are sitting in your wheelchair and you have dropped something on the ground, (e.g., a paperback book). Can you reach to the floor to pick it up? How?”*
 - *“Now imagine you are sitting in your wheelchair and you need to reach up for something overhead (e.g., an elevator button or a plate on the lower shelf of a kitchen cupboard). Can you do that? How?”*
- The subject must describe how the wheelchair is maneuvered and the appropriate use of any assistive devices such as reaching aids.

Evaluation criteria:

- General:
 - The subject may use either hand.
 - A reaching aid may be used, if carried by the subject.
 - If the subject chooses to remove or reposition parts of the wheelchair (e.g., the footrest) to improve the reach, this is permitted as long as the subject can remove and replace the parts independently. After picking up the object, the subject may be prompted, without penalty, to restore the wheelchair to its original state.
 - If the wheelchair user chooses to stand to accomplish the task, this is permitted. Although strongly recommended, it is not necessary for the brakes to be locked nor the footrests to be cleared away. Some wheelchair users can accomplish the task in a careful and safe manner without these precautions. However, if the subject loses balance, requiring spotter intervention, a failing score is awarded. Similarly, if the wheelchair user stands up without locking the brakes, the wheelchair must not roll backwards > 5cm.
 - If the wheelchair user, in the course of leaning in any direction, induces a sufficient wheelchair tip to require intervention by the spotter, a failing grade is awarded. If the tip is transient and self-contained, feedback should be later provided, but a passing grade should be awarded.
 - The finishing position is with the wheelchair user sitting upright.
- For the reaching-ground skill:

- The finishing position is with the object in the lap, on the lap tray or in the hand.
- For the reaching-high-object skill:
 - The task is to reach up under control, touch the target and then to resume the normal sitting position.
 - A stand-up or elevating wheelchair may be used, as long as the subject can operate the device independently.

Score recorded:

- Reaching, ground
- Reaching, high object

Training tips:

- General
 - The wheelchair should be positioned to take advantage of the subject's reach, strength and balance.
 - Reaching and leaning reduce stability, putting the wheelchair user at risk of falling out of the wheelchair or tipping the wheelchair over.
 - The subject may use a reaching aid.
 - If the wheelchair user chooses to lean forward to accomplish the task, he/she should make sure the casters are trailing forward to decrease the likelihood of tipping forwards. Note: When the casters are trailing forwards, they lie ahead of the portion of the wheelchair frame to which they are attached, as is the case when the wheelchair is rolled backwards.
 - To be safer when leaning or bending over forwards, the wheelchair user should move the footrests out of the way and place the feet on the floor. If standing up, the wheelchair user should first apply the brakes and clear the footrests out of the way.
 - The wheelchair user should keep one hand on the wheelchair to keep from falling.
 - For a person with weak trunk muscles, to avoid falling in the direction he/she is leaning, he/she should hook the opposite arm behind the push handle or armrest.
 - To help right him/herself in the chair after reaching for the object, the wheelchair user should keep the non-reaching arm on the armrest or wheel and use it to pull him/herself upright.
 - If the armrest is moved out of the way, it allows the wheelchair user to bend further sideways.
- For the Reaching-Ground Skill
 - Turning the object on its side may help, to get a better grip.
 - To make it easier to pick up the object, the wheelchair user may want to pull the object up against the wheelchair so that it does not move.
 - If the wheelchair user holds the object against the wheel and rolls the wheel forward, both hands can be used to grasp the object when it rotates to the top of the wheel.

- For a wheelchair user with weak trunk muscles, to reach the ground, he/she should move the arms to the thighs one at a time, and then to the feet, placing the chest on the thighs.

Caregiver considerations:

- With the two exceptions below, this skill is not highly relevant for the caregiver.
- To pick a dropped object off the ground, the caregiver should maneuver the wheelchair so that he/she can keep one hand on the wheelchair, for balance and control. Then, the caregiver can crouch and pick up the object with the other hand.
- To reach a high object on the other side of the wheelchair, the caregiver should walk around the wheelchair rather than reaching awkwardly across it.

Classification	#	Name	Skill Level
Skill Group		Transfers	
Individual Skills	26	Out of wheelchair	Indoor
	27	Into wheelchair	

Description: The wheelchair user transfers from the wheelchair to another surface and back again.

Rationale: A transfer is a commonly used skill to move between the wheelchair and a chair, bed, car or other surface. This skill evaluation, as part of the WST, should only be considered a representative transfer. More difficulty may be experienced when transferring to and from other surfaces (e.g., tub, toilet, car or ground). If a wheelchair user or caregiver can perform a transfer, then repositioning in the wheelchair and unweighting to prevent pressure sores are likely to be possible.

Pre-requisite:

- None for the transfer-out-of-the-wheelchair skill.
- Success at the transfer-out-of-the-wheelchair skill (#26) is a pre-requisite for the transfer-into-the-wheelchair skill (#27).

Skill combinations: The criteria for this skill may not be met while performing other skills.

Suggested equipment and set-up:

- A sliding board (a rectangular piece of wood or plastic with bevelled edges) should be made available for subjects who ordinarily use one. The subject may use his/her own sliding board (if carried).
- The following transfer surface is suggested (although any equivalent one is acceptable): a bench with a flat surface, with little padding, no backrest and no armrests. The sitting surface should be at least 1.0m wide, at least 0.5m deep and 45-47 cm high. The bench legs should have non-slip material (e.g., rubber) on their undersurfaces. The bench should be capable of sustaining the weight of a 200kg subject.

Starting position:

- For the transfer-out skill:
 - The sliding board, if requested by the subject, should be on the transfer bench within the subject's reach.
 - The wheelchair shall initially be positioned squarely facing the transfer bench with the casters at least 0.5m from it.
 - The seatbelt (if any) will be in whatever condition the wheelchair user usually

- uses it.
 - The footrests and armrests should be in their functional positions.
 - The brakes should be off.
- For the transfer-in skill:
 - The wheelchair user is sitting on the transfer bench, in whatever position he/she has achieved during the preceding skills.
 - The wheelchair, brakes, armrests and footrests shall be in whatever position and in whatever state they were in on completion of the ‘transfer out’ phase.

Tester/spotter position: The spotter should be in position to assist if the wheelchair moves, the wheelchair user falls or the wheelchair tips.

Instructions to subject:

- First, ask the subject how he/she usually transfers. If the subject is the wheelchair user and assistance is always required, then there is no need to proceed, because a failing grade will result.
- *"Transfer from your wheelchair to the bench (indicate it). Later, you will be expected to get back into your wheelchair with your equipment (such as your seatbelt, armrests and footrests) the same as they are now."*
- *"Transfer from the bench back into the wheelchair."*
- It is permissible to cue the subject to *"move the sliding board away from you"* without penalty.
- If the subject has transferred back into the wheelchair, but the wheelchair has not been fully restored to its original condition, the tester may cue the subject, without penalty, by inquiring *"Are you ready to move away?"*, *"Are you in the same condition that you were in before you got out of the wheelchair?"* or *"Move your wheelchair away from the bench"*. However, the tester must not mention specific omissions until that attempt has been scored.

WST-Q considerations:

- Suggested script:
 - *"Can you transfer from your wheelchair to another surface (e.g., a bed or seat)? How?"*
 - *"Can you transfer back into the wheelchair? How?"*
 -
- The subject must describe the appropriate use of any assistive devices, including sliding boards or mechanical lifts (see evaluation criteria below).

Evaluation criteria:

- For either phase:
 - Regarding seat belts (or other restraints):
 - If the wheelchair user has a rear-closing seat belt or other restraint that is not

intended for independent use, this is usually considered an automatic fail, unless the WST is being used to assess either caregiver function or the combined function of a caregiver and wheelchair user.

- If a seat belt is intended for independent use and is fastened around the wheelchair user at the beginning of the test, then he/she is expected to be able to undo it for the transfer-out skill. However, it is not necessary for the wheelchair user to fasten it again as part of the transfer-into skill (consistent with our general ‘altered status’ provision described in section 2.11).
- If the wheelchair is equipped with a seat belt, but the wheelchair user is not using it, the subject is not required to be able to use it.
- Regarding footrests, although recommended, the subject need not clear them if the transfer can be effectively and safely completed.
- A transfer performed without locking the brakes is not necessarily unsafe.
- If the subject needs to reposition the wheelchair, apply the brakes or caster locks, undo a seat belt, remove brake extension handles, remove armrests or footrests, position a sliding board, or any other subtask, the subject must perform these tasks independently.
- The transfer is not completed until the wheelchair user is no longer sitting on the sliding board.
- For a standing-pivot transfer, although inefficient, a 270-degree turn (vs. the usual 90 degrees) is not necessarily unsafe.
- If the WST is performed in the subject’s home, other assistive technology may be used (e.g., a mechanical lift), with the usual requirements that such equipment be available at the time and be operated independently and safely by the subject. This reflects the general principle of ‘test specificity’ described in section 2.18. Any such equipment should be noted in the Comments section.
- Regarding safety, the tester should award a failing grade:
 - If the wheelchair rolls away from its starting position by > 5cm.
 - If the subject, in the course of the transfer, induces a sufficient tip to require verbal or physical intervention by the spotter. If the tip is transient and self-contained, feedback should be provided, but a passing grade should be awarded.
 - If the spotter needs to intervene to maintain balance.
 - If the subject trips or staggers during the transfer, even if he/she catches him/herself.
 - If the subject twists or drags an unprotected foot or ankle across a wheelchair part (e.g., footrest) in a way that might lead to injury.
- For the transfer-out skill:
 - On completion of the transfer, the wheelchair user shall be in a position on the transfer bench that could be safely sustained for several minutes.

- For the transfer-into skill:
 - On completion of the transfer, the wheelchair user shall be seated in the wheelchair in a position suitable for propelling the wheelchair.

Scores recorded:

- Transfer out of wheelchair
- Transfer into wheelchair

Training tips:

- Transfer Out of Wheelchair
 - General
 - Which type of transfer will be most suitable for a wheelchair user and/or caregiver will depend on a number of clinical and demographic factors. An experienced clinician should make this determination. A thorough discussion of these options is beyond the scope of the WSP Manual.
 - The subject should clear the footrests, whenever possible. It may be easier to do so before moving the wheelchair into its final position.
 - If possible, the subject should position the wheelchair so that the casters are trailing-forward to reduce the likelihood of the wheelchair tipping forward. To achieve this position, the subject should finish the wheelchair positioning with a slight backward movement.
 - The subject should lock the brakes.
 - The subject should be careful to avoid catching his/her catheter or other collection devices when transferring.
- Standing Pivot Transfer
 - The wheelchair user should angle the chair with its rear about 30 degrees away from the bench.
 - The wheelchair user should leave the armrests in place for a standing-pivot transfer.
 - If the wheelchair user is having trouble getting started, he/she should try to move forward on the seat before beginning the transfer with the feet under the body.
 - To avoid excessive turning when pivoting, the wheelchair user should turn the back towards the bench rather than away from it.
 - The wheelchair user should use the armrest to help maintain balance while transferring.
- A person With Hemiplegia
 - Whenever there is a choice, the wheelchair user should transfer to the stronger side.
- Crouching Transfer

- The wheelchair user may need to move the armrest out of the way on the bench side.
- The wheelchair user may need to remove the brake extension (if any) on the bench side.
- The wheelchair user should stay low, and not try to stand all the way up.
- Sideways Transfer
 - The wheelchair user should move the armrest out of the way on the bench side.
 - The wheelchair user should remove the brake extension (if any) on the bench side.
 - To get the sliding board (if using one) under the body, the wheelchair user should lean away from it.
 - The wheelchair user should push down on the sliding board and wheelchair to unweight the buttocks.
 - The wheelchair user should keep the leading hand far enough away from the body to allow room for the body to move.
 - The wheelchair user should shift sideways, in a step-wise manner, towards the transfer bench.
 - The wheelchair user should move forward enough on the seat, so that the skin is not dragged over or against the tire.
 - Once fully supported by the bench, the wheelchair user should remove the sliding board. The wheelchair user should lean away from it, to do so.

Forward Transfer

- When transferring straight-on (e.g., for a person with amputations of both legs), the wheelchair user should pull the wheelchair as close as possible to the transfer bench.
- Transfer Into Wheelchair (same as transfer out of wheelchair except as noted)
 - General
 - The wheelchair user's feet should be on the ground between the footrests before transferring the back into the chair.
 - The subject should re-fasten the seatbelt, if it is ordinarily used, once the wheelchair user is back in the wheelchair.
 - Once the wheelchair user is back in the wheelchair, the subject should restore the footrests fully and put the feet back on them.
 - The subject should make sure that everything is in the same position it was before the wheelchair user left the wheelchair.
 - A persons With Hemiplegia or Unilateral Amputation
 - If the wheelchair user must transfer back into the wheelchair with the strong side leading, he/she will need to move the wheelchair to the other side.

- If the wheelchair user must grab an armrest, he/she should use the one furthest away from him/her.

Caregiver considerations:

- General
 - This section only deals with transfers for wheelchair users who only require minimal assistance to perform the final movement between the wheelchair and the bench. If the caregiver must perform the majority of the effort, or if a mechanical lift is needed, additional training by experienced rehabilitation professionals is needed. This is outside the scope of this Manual.
- Standing Pivot Transfer
 - To assist the wheelchair user in getting from sitting to standing, the caregiver should stand or sit in front of the wheelchair or stand to one side.
 - The caregiver should apply an assisting force to the wheelchair user's body, near the hips. The caregiver should not pull on the wheelchair user's arms.
 - The caregiver may use a transfer belt around the wheelchair user's waist.
 - The caregiver should bend his/her knees and keep the rest of the body straight to avoid injury to the back.
 - The wheelchair user should not hold the caregiver around the neck.
 - Once standing, the caregiver should ask the wheelchair user to pivot, turning the back, in the shortest possible route, towards the bench.
- Transfer into the wheelchair:
 - The caregiver may simply reverse whatever procedure was used to get the wheelchair user out of the wheelchair.
 - Alternatively, the caregiver may move the wheelchair to the other side, if this is necessary and if there is room. To move the wheelchair away from the bench and reposition it, the caregiver may leave the brakes on. Using the push handles at the rear of the wheelchair, the caregiver should lift the rear wheels slightly off the floor and push or pull the wheelchair on the casters (the "wheelbarrow" method). This will save time, avoid strain on the back and ensure that the brakes are applied when the wheelchair user transfers back into the wheelchair.

Classification	#	Name	Skill Level
Skill Group	Fold/unfold wheelchair		Community
Individual	28	Fold	
Skills	29	Unfold	

Description: The subject folds the wheelchair, and then unfolds it.

Rationale: For transport or storage, the size of the wheelchair may need to be reduced.

Pre-requisite:

- The transfer-out skill (#26) is a pre-requisite for both skills.
- The fold skill (#28) is a pre-requisite to the unfold skill (#29).

Skill combinations: None.

Suggested equipment and set-up:

- Transfer bench.
- Tape measure to measure the width of the folded wheelchair, if necessary.

Starting position:

- For either skill:
 - The subject may be seated on the transfer bench or standing beside the wheelchair.
- For the fold skill:
 - The wheelchair should be in the position and condition in which it ended after the wheelchair user transferred from it.
- For the unfold skill:
 - The wheelchair should be in the position and condition in which it ended after the subject successfully folded it.

Tester/spotter position: The spotter should be near the wheelchair user, in case he/she experiences a loss of balance.

Instructions to subject:

- *“Fold the wheelchair as tightly as you can.”*
- If incompletely folded, it is acceptable to prompt the subject *“can you get it a little tighter?”*
- *“Unfold the wheelchair so that you can get back into it.”*
- It is permissible to cue the subject by inquiring *“Is the wheelchair in the same condition that it was in before you folded it?”*

WST-Q considerations:

- Suggested script:
 - “*Does your wheelchair fold up?*”
 - “*Can you fold your wheelchair? How?*”
 - “*Can you unfold your wheelchair? How?*”
- The subject must describe an appropriate technique for the removal/replacement of any wheelchair components or accessory that would prevent the chair from being folded (e.g. rigid seatback, backrest, knapsack, footrests).

Evaluation criteria:

- For the fold skill:
 - If there are wheelchair components or accessories (e.g., cushion, rigid seat, backrest, knapsack, footrests) that need to be removed to fold the wheelchair, the subject must do so independently.
 - The wheelchair should be folded tightly on completion of the task. For instance, if the folding mechanism narrows the wheelchair, the narrowed width should be < 50% of the open width. If the wheelchair does not appear to be completely folded, this may be measured with a tape measure.
 - It is only necessary to remove the seat cushion and backrest (if removable) if this is necessary to achieve the tightly folded position defined above.
 - For a rigid chair with a backrest that folds forward, the backrest canes and the seat rails should be parallel, or as close to this as is mechanically possible.
 - There is no need to remove the rear wheels (e.g., if they are quick-release) for the purposes of this skill test, although this is a useful way to further diminish the size and weight of the wheelchair.
 - It is acceptable for the subject to use the foot to help fold the wheelchair.
- For the unfold skill:
 - The wheelchair should be opened fully.
 - If there are mechanisms to assist in maintaining the wheelchair in the opened position, they should be fully engaged. It is permissible for the wheelchair user to use his/her weight on the seat to complete this action (after transferring back into the wheelchair), as long as the seat is open enough to align the mechanisms.
 - If there are wheelchair components or accessories (e.g., cushion, rigid seat, backrest or knapsack) that need to be replaced as part of opening the wheelchair and restoring it to a useable state, the subject must do so independently. However, the tester must not mention specific omissions until that attempt has been scored.
 - Putting a contoured cushion in backwards is not acceptable, because of the potential for causing a pressure sore.
 - If the wheelchair has been opened in a way that precludes full use of the

wheelchair (e.g., by tangling a seatbelt strap in a way that will cause it to rub on a wheel), a pass must not be awarded. The tester should correct the problem before the wheelchair user gets back into the wheelchair.

- It is acceptable for the subject to use the foot to help unfold the wheelchair.

Scores recorded:

- Fold wheelchair
- Unfold wheelchair

Training tips:

- Fold Wheelchair
 - General
 - To fold a cross-braced wheelchair, the subject should first flip the foot-plates up, swing them away or remove them.
 - The subject should remove anything that may prevent folding (such as the cushion, rigid seat, backrest or knapsack). The subject should pay attention to each item as he/she removes it, to ensure that he/she will be able to reassemble the chair later.
 - To close the chair more easily, the subject should position the wheelchair so that he/she is on one side of it. The subject should then tip the chair slightly towards him/herself so that the rear wheel on the side away from him/her is off the ground. This eliminates the friction of the far-side rear wheel on the ground and allows gravity to assist in folding the wheelchair.
 - The subject should then pull the seat or seat rails upwards, with one or both hands, to fold the chair.
 - If using the seat rails, the subject should be careful not to pinch the fingers.
 - A persons With Hemiplegia
 - To fold the chair, the wheelchair user should put the stronger arm under the middle of the seat and lift up.
 - Rigid Seat
 - To lift the seat out, the subject may need to release any restraining devices.
 - To remove the rigid seat, the subject should lift it.
 - Removable Rigid Back
 - To fold the wheelchair, the subject will need to remove the back.
 - The subject may need to release any restraining devices before he/she can remove it.
 - Rigid Frame with Fold-Down Back
 - Although the wheelchair cannot be completely folded, the subject can make the

chair easier to transport by folding down the back. The subject may need to release any restraining devices before he/she can do so.

- Unfold Wheelchair
 - General
 - The subject should be careful not to tangle the seatbelt.
 - If the sliding mechanism is not too sticky, all that is necessary is for the subject to lift the rear wheels off the floor and separate the push-handles.
 - The subject may need to push the seat rails back down into the starting position. The subject should keep the fingers on top of the rail to prevent them from being pinched.
 - The subject should remember to put the cushion back in properly before transferring back into the chair.

Caregiver considerations: None.

Classification	#	Name	Skill Level
Skill Group	Doors		Indoor
Individual Skills	30	Open away	
	31	Open towards	

Description: The subject opens, passes through and closes a hinged door that opens away from the subject, then repeats the task in the opposite direction (with the door opening toward the subject).

Rationale: Wheelchair users frequently encounter such swinging doors or gates.

Pre-requisite:

- None for the open-away skill.
- Success at the open-away skill is a pre-requisite for the open-toward skill.

Skill combinations: None.

Suggested equipment and set-up:

- Door ~81cm wide, preferably with little or no resistance to opening.
- Preferably a lever knob >10 cm in length and 75-90cm above the floor.
- Preferably no threshold (obstacles are evaluated elsewhere [#32,33]).
- 1.5m² of space, on both sides of the door, to allow the subject to maneuver.

Starting position: The wheelchair user is seated in the wheelchair, facing the closed door with the casters at least 0.5m from it.

Tester/spotter position: The spotter should be in a position that allows him/her to respond to a fall or tip if the subject leans and reaches forward or backwards for the door.

Instructions to subject:

- *"Open the door, go through it and close it behind you."*

WST-Q considerations:

- Suggested script:
 - *"Imagine a door that swings open away (or towards) from you. Can you open such a door, go through it and then close it behind you? How?"*

Evaluation criteria:

- The subject may use the door-frame to assist in passing through the door.
- The skill is completed when the door closes firmly (with the latch engaged). If the subject leaves the door slightly ajar, he/she may be prompted to finish closing it without

- penalty.
- The subject may close the door by reaching back for it. Alternatively, the subject may proceed away from the door and then turn around and come back to close it.
 - If the subject attempts to close the door by placing the fingers in the gap between the door and the frame on the hinged side of the door, this is considered dangerous. If the spotter needs to intervene pinching, a failing score is awarded.
 - During the course of any single attempt, a subject may use different approaches.

Scores recorded:

- Door, open away
- Door, open toward

Training tips:

- General
 - The subject should use the door handle, or the open edge of the door to close the door. The subject should not put the fingers between the door and door-frame on the hinged side.
 - Judging the width of doorways can require practice. It is common for a wheelchair user to injure the backs of his/her hands by bumping or scraping them between the door frame and the hand-rims. The door-frame can be used to help propel the wheelchair user through the door (the “slingshot” method). This has the advantage of keeping the hands from being injured.
- Door that Opens Away From You
 - To open the door more easily, the wheelchair user should turn sideways in front of it. This allows the wheelchair user to get closer to the door and to resist the tendency of the wheelchair to roll backward when the door is pushed.
 - The wheelchair user can hold onto the door-frame with one hand, as the door is pushed with the other.
 - After going through the door, the wheelchair user may turn around to close it.
 - The wheelchair user should make sure the wheelchair is out of the way before closing the door.
- Door that Opens Towards You
 - The wheelchair user should position the wheelchair to the side of the door before opening it.
 - The wheelchair user should try to back up with the door as he/she opens it.
 - The wheelchair user should push on the door-frame with one hand to open the door more easily with the other.
 - Once the door is open, the wheelchair user should place the wheelchair in front of it to block it open.
 - To close the door, there are several options (if the door does not close fully by itself):

- The wheelchair user may gently swing the door closed behind him/her, moving the wheelchair quickly through the door and out of the way.
- The wheelchair user may turn around once through the doorway and reach forward and pull the door towards him/her using the other hand to push on the door-frame.
- The wheelchair user may go through the door backwards, pulling the door with him/her.
- The wheelchair user may keep one hand on the door handle and use the other to push both wheels, one at a time.

Caregiver considerations:

- General:
 - Before pushing a wheelchair through any type of door or narrow space, the caregiver should make sure that the wheelchair user's hands or elbows are not extending off the sides of the wheelchair where they could be injured.
- Door that opens away:
 - The caregiver should open the door, grasp the push handles at the rear of the wheelchair and pull the wheelchair backwards through the doorway.
 - The caregiver should use his/her body to prevent the door from closing on the wheelchair.
 - When the wheelchair and caregiver are completely out of the way, the caregiver should close the door.
- Door that opens toward:
 - The caregiver should leave enough room to open the door.
 - If there is room, the caregiver should angle the wheelchair away from the door on the side that will open.
 - The caregiver should open the door and use his/her body to keep it open while he/she orients the wheelchair and pushes it forwards through the door.

Classification	#	Name	Skill Level
Skill Group		Obstacles	
Individual Skills	32	2cm high	Indoor
	33	13cm high	Community

Description: The subject propels the wheelchair over a low and a high obstacle.

Rationale: Wheelchair users often encounter low obstacles (e.g., door jams) or higher ones (e.g., sticks, uneven sidewalk sections) that they cannot get over by merely rolling over them.

Pre-requisite:

- For the 2cm-obstacle skill: either the rolling-forward (#13) or rolling-backward (#15) skills, depending upon the method used.
- For the 13cm-obstacle skill: the 2cm-obstacle skill (#32).

Skill combinations: The criteria for the 2cm-high obstacle skill will have been simultaneously met if the subject meets the criteria for the 13cm-high obstacle skill.

Suggested equipment and set-up:

- Spotter strap.
- Both obstacles:
 - The obstacles should be secured so that they can withstand horizontal forces.
 - 1.0m wide and 10 cm deep in the line of progression.
- 2cm-high obstacle: 2cm high.
- 13cm-high obstacle: 13cm high.

Starting position: The wheelchair user is seated in the wheelchair, facing the obstacle with the casters at least 0.5m from it.

Tester/spotter position: The spottier should be behind the wheelchair user, holding the spotter strap in one hand and with the other hand ready at the wheelchair user's shoulder to resist a forward pitch.

Instructions to subject:

- *“Push your wheelchair over the obstacle.”*

WST-Q considerations:

- Suggested script:
 - *“Can you push your wheelchair over a 2cm-high obstacle (e.g., a door threshold)? How?”*
 - *“Can you push your wheelchair over a 13cm-high obstacle (e.g., a tree branch or*

railroad track)? How?”

- The subject must describe an appropriate technique to manage the anti-tips, if necessary, and the appropriate and safe method to perform a wheelie or partial wheelie to receive a pass.

Evaluation criteria:

- The obstacle may be approached in the forward or backward direction.
- The finish is when the all parts of the chair have passed beyond the obstacle.
- The wheelchair user is permitted to use his/her feet or even stand to get over the obstacle.

Scores recorded:

- Obstacle, 2cm high
- Obstacle, 13cm high

Training tips:

- General
 - Intermediate obstacle heights may be useful for training.
 - This is the first of several skills during which it may be necessary to reposition the rear anti-tip devices to allow the wheelchair to be tipped backwards sufficiently to perform a partial or full wheelie. To reposition most rear anti-tip devices, the subject will need to press the button or release mechanism on the wheelchair frame that locks the anti-tip device in place. The subject should note the position of the anti-tip devices, so that he/she will be able to restore them later. Then, the subject can either reposition the anti-tip devices so that they face upwards or remove them altogether. To restore the anti-tip devices, the subject should simply reverse the steps.
Note: Whenever the rear anti-tip devices have been inactivated, the wheelchair user is at increased risk of a rear tip. The spotter should be vigilant to spot the wheelchair user closely until he/she becomes used to this new condition.
 - Before attempting to negotiate a high obstacle, the subject should be aware of how much space exists between the casters and the rear wheels, to avoid getting hung up on the obstacle. If the subject does get hung up, he/she may be able to escape by backing up slightly (which swings the casters from the rear-trailing position to the side- or forward-trailing one, where there is more space).
- Forward Approach, Stationary Wheelie Method
 - The wheelchair user should approach the obstacle and stop with the casters near (or just touching) it. For many wheelchairs, the casters are farther back than the footrests, so the footrests may limit forward movement.
 - The wheelchair user should pop the casters from the floor (although not necessarily into a full wheelie position). To do so, the wheelchair user can roll backwards slightly, then quickly forwards, or just push quickly forward while leaning back.

Alternatively, the wheelchair user can use his/her foot/feet to pop the casters.

- While popping the casters, the wheelchair user should simultaneously roll the wheelchair forward so that the casters land back on the floor beyond the obstacle.
 - The wheelchair user should then lean forward and power the rear wheels over the obstacle.
 - Once the rear wheels are on top of the obstacle, the wheelchair user should lean back to decrease the likelihood of a forward tip or falling forward out of the wheelchair.
- Forward Approach, Momentum Method
 - The wheelchair user should approach the obstacle squarely.
 - The wheelchair user should approach at a slow speed. It is simpler to pop the casters when moving slowly. Also, if the wheelchair user fails to pop the casters high enough to clear the obstacle, the sudden stop will be less jarring.
 - To pop the front wheels while the wheelchair user moves forward, two strategies can be used, alone or in combination:
 - In anticipation of the popping action, the wheelchair user can briefly coast and place the hands in the power-stroke ready position, to be in the right position when he/she is at the proper distance from the obstacle. The power-stroke ready position is when the hands are ready to grasp the hand-rims, behind top dead center (11:00 o'clock on the right wheel, using the clock analogy). Then, the wheelchair user should accelerate the chair even faster than it is coasting, by using a powerful stroke.
 - The wheelchair user can flex the hips, keeping the body upright. The wheelchair user should not lean forward to look at the feet when he/she approaches the obstacle, because that will increase the weight on the casters. Although leaning back into the backrest will also pop the casters off the ground, there is an increased risk of the wheelchair user tipping over backwards and the body will not be well positioned for the forward lean needed during the second half of this skill.
 - Once the casters have cleared the obstacle, and the rear wheels strike the obstacle, the wheelchair user should lean forward and propel the rear wheels to bring the rear wheels over.
 - The forward hand forces on the rear wheels can be thought of as a “double pump”, the first to pop the casters and the second to help the rear wheels over the obstacle.
 - To practice getting the timing correct, the wheelchair user may practice propelling the wheelchair forward and transiently popping the casters at a predetermined point on the floor. The wheelchair user should start “slow and low”, then increase the speed of propulsion and the extent of caster clearance as he/she masters the skill.
 - Once the rear wheels are on top of the obstacle, the wheelchair user should lean back to decrease the likelihood of a forward tip or falling forward out of the wheelchair.
 - Forward Approach, Full Wheelie Method

- As for the momentum method, except that the wheelchair users should get into the stationary-wheelie position (#49) first and then approach the obstacle slowly (using the wheelie-rolling-forward skill [#50]).
- The wheelchair user should propel forward in the wheelie position until the rear wheels contact the obstacle.
- The wheelchair user should then lean forward, allowing the casters to land on the floor beyond the obstacle. It may be dangerous to roll the rear wheels over the obstacle while still in the wheelie position.
- Then, the wheelchair user should power the rear wheels over the obstacle.
- Once the rear wheels are on top of the obstacle, the wheelchair user should lean back to decrease the likelihood of a forward tip or falling forward out of the wheelchair.

- **Backwards Approach**
 - The wheelchair user may find it easier to back over a low obstacle.
 - The wheelchair user should approach the obstacle slowly, to avoid a rear tip.
 - If the rear anti-tip devices prevent the rear wheels from contacting the obstacle, they need to be removed or repositioned to allow the backwards approach.
 - As the wheelchair user approaches the obstacle backwards, he/she may find it easier if he/she leans forward to unweight the rear wheels.
 - Using the foot might give the wheelchair user additional power to get over the obstacle.
 - The wheelchair user should pull the wheelchair straight backward by applying equal force to both wheels. Otherwise, the casters may turn and catch sideways on the obstacle.
 - Once the rear wheels are over the low obstacle, the wheelchair user should lean back enough to unweight the casters as they reach the obstacle, but not so much as to cause a rear tip.

Caregiver considerations:

- The caregiver should always let the wheelchair user know before he/she tips the wheelchair backwards.
- To tip the wheelchair backwards, the caregiver should use the foot on the tipping lever (an extension of the wheelchair frame, to which the rear anti-tip device may be attached) while pulling backwards with the hands on the push handles.
- For a low obstacle, the partial wheelie position may be sufficient. The caregiver only needs to lift the casters enough to clear the obstacle.
- For the full wheelie position, which can more easily be sustained, the caregiver should tip the wheelchair back far enough so that it is balanced over the rear wheels. How far back the chair needs to be tipped will vary depending on the wheelchair user and the wheelchair. If the wheelchair has elevating footrests, it will be easier to tip the wheelchair backward if they are lowered.
- To land after the wheelie, the caregiver should slowly allow the casters to return to the

- floor using a foot on the tipping lever to help slow the landing.
- To get the wheelchair over a small obstacle, the caregiver may be able to simply push the wheelchair forward over the obstacle. The caregiver should not simply increase the speed, in the hope that the wheelchair will bounce up over the obstacle. This approach can be jarring to the wheelchair user and, when the wheelchair decelerates, the wheelchair user may be pitched forward out of the wheelchair. The caregiver will find it easier and less jarring to use a partial wheelie to lift the casters over the obstacle. The caregiver should then lower the wheelchair down slowly with the casters over the threshold and roll (do not lift) the rear wheels over the obstacle.
 - Alternatively, the caregiver can go over a obstacle backwards. The caregiver should be careful not to trip over the obstacle. After pulling the rear wheels over the obstacle, the caregiver may wish to tip the wheelchair back to get the casters over the obstacle.

Classification	#	Name	Skill Level
Skill Group	Cross-slope		Community
Individual	34	Left	
Skills	35	Right	

Description: The subject propels the wheelchair across a side slope without turning downhill significantly.

Rationale: Cross slopes are frequently encountered in man-made and natural environments. Sidewalks, for instance, are usually sloped $\sim 2^\circ$ (1:50) toward the street to allow water to run off, although steeper grades (4-10°) are often found (e.g., where sidewalks cross driveways).

Pre-requisite: The rolling-forward skill (#13).

Skill combinations: None.

Suggested equipment and set-up:

- Spotter strap.
- Incline of 5° , 4m long (in the line of progression) and at least 1.2m wide.
- At least an extra 1.5m at each end, to allow wheelchair positioning.
- Start and finish lines perpendicular to the line of progression.

Starting position:

- The wheelchair user is seated in the wheelchair with the brakes off, hands on the hand-rims and all wheels on the sloped surface, oriented in the line of progression across the slope. The downhill rear wheel should be positioned with respect to the slope-level transition where it will be possible to detect if the wheelchair has turned or drifted downhill by $> 10\text{cm}$. The slope-level transition can be used, or any line parallel to it. The caster axles must be behind the starting line.

Tester/spotter position: The spotter should spot the subject, holding the spotter strap with the uphill hand to slow a downhill runaway, while leaving the downhill hand free to intervene if the wheelchair tips sideways.

Instructions to subject:

- *“Push your wheelchair across the slope to the finish line (indicate it) without letting your wheels turn downhill.”*

WST-Q considerations:

- Suggested script:
 - *“Imagine you are going across a slope (e.g., a hill or driveway) and you notice that*

your wheelchair starts to turn downhill. Can you manage your wheelchair so it keeps going straight? How? Is this the same for slopes on either side?"

- The subject's method must explicitly contain a strategy to prevent the wheels from turning downhill such as pushing harder on the downhill wheel or use of feet to steer.

Evaluation criteria:

- The finish point is when the caster axles cross the finish line. The rear wheels need not cross the line.
- The downhill wheels may not turn or drift >10cm downhill from the starting level.

Scores recorded:

- Cross slope, left
- Cross slope, right

Training tips:

- To avoid turning downhill, the wheelchair user should push harder on the downhill wheel.
- The wheelchair user may use the feet to help him/her steer away from the downhill tendency.
- The wheelchair user should lean backwards to keep the weight away from the casters. A useful drill to demonstrate this effect is to have the wheelchair user lean forward, to illustrate how the downhill-turning tendency increases.
- In the wheelie position facing across a slope, there is no downhill-turning tendency, because the center of gravity is between the rear wheels.

Caregiver considerations:

- To push the wheelchair across a side slope, the caregiver needs to push harder on the downhill push-handle and pull back on the uphill push-handle, to resist the downhill-turning tendency.
- For a steeper slope, the caregiver may choose to use the wheelie position.

Classification	#	Name	Skill Level
Skill Group	Increased rolling resistance		
Individual Skills	36	Carpet	Indoor
	37	Gravel	Community

Description: The subject propels the wheelchair over a length of increased rolling resistance.

Rationale: There are many surfaces (e.g., carpet, dirt, grass, gravel, sand or snow) with increased rolling resistance. Propulsion is more difficult on such surfaces and the casters tend to sink into the surface.

Pre-requisites:

- For the carpet skill:
 - Either rolling forward (#13) or rolling backward (#15), depending upon whether the subject chooses to negotiate the increased rolling resistance surface in the forward or backward directions.
- For the gravel skill:
 - Success at the carpet skill (#36).

Skill combinations: If the gravel skill (#37) is passed, this meets the criteria for the carpet skill (#36).

Suggested equipment and set-up:

- For both skills:
 - Spotter strap.
 - Pathways with increased rolling resistance surfaces 1.2m wide and 2.0m long, plus 1.5m before the starting line and 1.5m after the finish line.
 - Start/finish line (or other indicator), where the increased rolling resistance surfaces begin and end.
- For the carpet skill:
 - Low-pile carpet on top of a 2.5cm-thick foam underlay.
- For the gravel skill:
 - 150kg of medium-grade gravel, spread over the pathway surface such that it is 5-6 cm deep in the middle and sloping down to the bare ground at both ends.
 - Lateral barriers at least 10cm high can be used to keep the gravel from spreading to the side.
 - A rake, broom and dustpan are useful to help control the gravel.

Starting position: The wheelchair's leading wheels are behind the starting line.

Tester/spotter position:

- The spotter should be behind the subject with a spotter strap and a hand ready near the shoulder to limit the extent of a forward tip.

Instructions to subject:

- “*Propel your wheelchair over the finish line (indicate it).*”

WST-Q considerations:

- Suggested script:
 - “*Can you push your wheelchair on a soft surface (like a thick carpet)? How?*”
 - “*Can you push your wheelchair on gravel? How?*”
- The subject's answer should include a strategy to ensure more force is applied to the wheels.
- If the use of a wheelie is described then the subject must describe an appropriate and safe method to perform the wheelie or partial wheelie to receive a pass.

Evaluation criteria:

- All techniques are permitted, such as forward or backward approaches, using the feet or even standing. Sustained or transient wheelies are often necessary.
- No wheel may stray outside the designated lateral limits.
- During the course of any single attempt, a subject may use different approaches.
- The finish is when all parts of the wheelchair are off the increased-rolling-resistance surface.

Scores recorded:

- Carpet
- Gravel

Training tips:

- General
 - Because there is more rolling resistance, more force is required by the subject.
 - Leaning forward slightly may help the wheelchair user to apply more force, and to prevent the additional force from causing a rear tip. However, keeping the weight on the rear wheels, or with the wheelchair user performing partial or full wheelies, will improve traction and keep the front wheels from digging in. As a learning exercise, the wheelchair user should try the skill while leaning forward and backward to different extents, to find the optimum position for him/her and the wheelchair.
 - The wheelchair user should take long slow strokes to keep the wheels from slipping in loose surfaces.
 - The wheelchair user should not rely on the rear anti-tip devices because they might

sink into a soft surface.

- Forwards approach
 - The forward approach is preferred because the wheelchair user can see where he/she is going.
 - If the resistance is high, the wheelchair user should use the partial or full wheelie position, moving the wheelchair forward in this position.
 - Partial wheelies are a good option for the wheelchair user, lifting the casters off the surface during each push, but letting them touch down as the hands recover for the next push.
 - If using the full wheelie position, the wheelchair user needs a strong forward ‘dip’ to get going. If the casters touch the surface during the ‘dip’, the wheelchair user can lean forward slightly. This allows the casters to lift off further during the wheelie to allow better clearance during the ‘dip’.
- Backwards approach
 - Some subjects may find it easier to get started in the backwards direction, because there is less rolling resistance with the large rear wheels than the smaller casters.
 - It may be easier for the wheelchair user to pull than to push the hand-rims and it is easier to push with the feet than to pull.

Caregiver considerations:

- It may be necessary for the caregiver to lean forward to apply the extra force needed.
- The caregiver should not use the knee or body against the backrest of the wheelchair to apply more force, because this may be uncomfortable for the wheelchair user (if the backrest is flexible) or dislodge a rigid removable backrest.
- The caregiver may find it easier to pull the wheelchair backward.
- The caregiver may find it easier to tip the wheelchair back into the full wheelie position, so that all of the weight is on the rear wheels. The caregiver should be sure to find the wheelie balance point before starting. The caregiver may need to reposition the rear anti-tip devices or remove them.

Classification	#	Name	Skill Level
Skill Group	Pot-holes		Community
Individual	38	15cm across	
Skills	39	30cm across	

Description: The subject negotiates the wheelchair over small and large pot-holes.

Rationale: Such loss of surface support is a commonly encountered barrier.

Pre-requisite:

- For either skill:
 - Rolling forward (#13) or backward (#15), whichever technique is used.
- For the 30cm-across skill:
 - Success at the 15cm-across skill (#38) is a pre-requisite.

Skill combinations:

- The criteria for the 30cm-across skill may not be met during any other skill.
- The criteria for the 15cm-across skill (#38) may be met by success on the 30cm-across skill (#39).

Suggested equipment and set-up:

- Spotter strap.
- Runway: 1.2m wide, at least 1.5m before and after each of the 2 potholes.
- Potholes: 5.1cm deep, the full width of the runway and either 15cm or 30cm across (in the line of progression)

Starting position: The wheelchair user is seated in the wheelchair, at least 0.5m in front of the pot-hole.

Tester/spotter position:

- The spotter should be behind the wheelchair, holding the spotter strap.
- The spotter should also be prepared to react to a forward pitch of the trunk or a forward tip, by placing a hand near the wheelchair user's shoulder.

Instructions to subject:

- *“Get your wheelchair over the pot-hole (indicate it).”*

WST-Q considerations:

- Suggested script:
 - *“Imagine you are propelling your wheelchair and you are confronted with a small*

pothole, the width of your wheelchair, about 5cm deep and about the size of a paperback book (i.e., 15cm) across. Can you push your wheelchair over such a pot-hole? How?"

- *“Now imagine that the pot-hole is even larger – approximately twice the size across of the previous one (i.e., 30cm). Can you push your wheelchair over such a pot-hole? How?”*
- If the use of a full or partial wheelie is described then the subject must describe an appropriate and safe method to perform this to receive a pass.

Evaluation criteria:

- The skill has been completed when all components of the wheelchair are on the level surface beyond the pot-holes.

Scores recorded:

- Pot-hole, 15cm across
- Pot-hole, 30cm across

Training tips:

- Pot-hole, 15cm across
 - The subject should use a partial or full wheelie to clear the casters over the 15cm-across pot-hole.
 - If a partial wheelie is used, the wheelchair will need to be moving quickly enough for the casters to clear the pot-hole before landing.
 - Most rear wheels will drop partially into the 15cm-across pot-hole.
- Pot-hole, 30cm across
 - Most rear wheels will drop fully into the 30cm-across pot-hole. Therefore, it is recommended that the full wheelie not be used for the 30cm-across pot-hole, to reduce the likelihood of the wheelchair user sustaining a rear tip.
 - Momentum can be used to carry the rear wheels out of the pot-hole, but this may be jarring to the wheelchair user. If the wheelchair user moves forward more slowly, this will allow the rear-wheel drop to occur with minimal jarring.
 - To get the rear wheels out of the pot-hole, the wheelchair user should lean forward and power out of it. Some rocking may be needed.

Caregiver considerations:

- The caregiver should use the full wheelie position.
- The backward direction may be easier for the caregiver.

Classification	#	Name	Skill Level
Skill Group	Inclines		
Individual Skills	40	5°, ascent	Community
	41	5°, descent	
	42	7.5°, wheelie forward descent	Advanced

Description: The subject propels the wheelchair up and down inclines.

Rationale: Natural inclines are encountered frequently in everyday life. Ramps allow persons in wheelchairs to move from one level to another. Descending a moderate or steep incline in the forward wheelie position has a number of benefits. This method allows the wheelchair user to continue moving forward, looking out for any potential hazards. It eliminates the problem of loss of traction (affecting braking and control) when the uphill wheels become unweighted. This technique also reduces the likelihood of forward tips or digging the footrests into the floor at the transition between the bottom of the incline and the level surface.

Pre-requisite:

- For all skills:
 - Rolling forward (#13) or rolling backward (#15), depending upon approach used.
- For the 7.5°-incline-wheelie-descent skill:
 - The stationary wheelie (#49) and wheelie, rolling forward (#50) skills.

Skill combinations: The criteria for the 5°-incline-descent skill (#41) may be met during the 7.5°-incline-wheelie-descent skill (#42).

Suggested equipment and set-up:

- For all skills:
 - A lip and a handrail on both sides of the incline are desirable.
 - The inclines should end at the upper end on a level surface or platform that is at least 1.5m square. A 15cm-high lip around the open edges of the platform is recommended. The platform allows the subject to turn around before descending.
 - Minimal floor-incline lip.
 - Barrier or line at the bottom of the incline, 1.5m from the incline-floor transition.
 - Spotter strap.
- For the 5° incline:
 - Incline at least 2.5m long and at least 1.2m wide.
- For the 7.5° incline:

- Incline at least 1.0m long and at least 1.2m wide.

Starting position:

- For the 5°-incline-ascent skill:
 - The wheelchair user is seated in the wheelchair, on the level at the bottom of the incline, with the front wheels of the wheelchair facing the incline.
- For both incline-descent skills:
 - All wheels are on the level platform at the top of the incline with the leading wheels of the wheelchair facing the incline.

Tester/spotter position:

- For the 5°-incline-ascent skill:
 - The spotter should be behind the wheelchair user, with a spotter strap.
- For both incline-descent skills:
 - The spotter should be behind the wheelchair user with a spotter strap that can be used to prevent the wheelchair from “running away” or submarining (if done in a wheelie position).
Note: It is the spotter’s responsibility to brake a wheelchair user who is descending the incline too quickly.
 - The spotter should also be prepared, by placing a hand near the wheelchair user’s shoulder, to react to a forward pitch of the trunk or a forward tip during the descent.

Instructions to subject:

- For the 5°-incline-ascent skill:
 - *“Push your wheelchair up the ramp, without using the ramp handrails.”*
- For the 5°-incline-descent skill:
 - *“Go down the ramp, without using the ramp handrails. Stop before you get to the line (indicate it).”*
- For the 7.5°-incline-descent-in-forward-wheelie-position skill:
 - *“Get your wheelchair into the wheelie position. Now, proceed under control down the ramp, and stop before you get to the line (indicate it).”*

WST-Q considerations:

- Suggested script:
 - *“Can you get your wheelchair up a moderately steep (5°) incline (e.g., a wheelchair ramp)? How?”*
 - *“Can you get your wheelchair down a moderately steep (5°) incline (e.g., a*

wheelchair ramp)? How?”

- *“Can you get your wheelchair down a steep (7.5°) incline, using a wheelie in the forward direction? How?”*
- If the subject has rear anti-tip devices, it may be necessary to reposition them to perform these skills. In this situation the subject must recognize this and describe an appropriate technique to manage the anti-tip devices to receive a pass. If the subject has already described the actual technique for the appropriate repositioning of the anti-tip devices during another skill, it is not necessary to do so again.
- If the use of a wheelie is described for the incline-descent skills, then the subject must describe an appropriate and safe method to perform the wheelie to receive a pass.

Evaluation criteria:

- For all skills:
 - The subject or wheelchair may make contact with the ramp lips or rails without penalty, as long as the rails are not grasped.
- For the 5°-incline-ascent skill:
 - The subject may use any type of propulsion (e.g., arm and leg, feet only, forward or backward).
 - The finishing point is when there is no part of the wheelchair in contact with the incline.
 - Grade aids may be used, but the wheelchair user must be able to independently activate and inactivate them.
 - For the purposes of this test, a transient wheelchair tip is not considered unsafe.
- For the 5°-incline-descent skill:
 - The subject may use any type of propulsion (e.g., arm and leg, feet only, forward or backward).
 - The finish point is when all wheelchair parts are completely off the incline at the bottom.
 - The wheelie position may be used for descending the incline.
 - The subject must be under control during the full descent and the stop thereafter.
 - The subject may stop during the descent.
 - The leading wheels must not extend beyond the line or barrier 1.5m beyond the incline-ground junction.
 - It is permissible for the subject to use the bottoms of the shod feet as brakes, but dragging the toes is considered unsafe.
 - It is permissible for the subject to use the parking brakes as rolling brakes (e.g., by partially or repeatedly applying them).
- For the 7.5°-incline-descent-in-forward-wheelie-position skill:
 - As for the mild incline descent, except:

- The subject is first required to achieve the stationary-wheelie position (#49) on the platform above the incline.
- The subject must descend the incline in the forward direction.
- The subject must maintain the wheelie until the rear wheels are on the level ground below the incline.

Scores recorded:

- 5° incline, ascent
- 5° incline, descent
- 7.5° incline, forward wheelie descent

Training tips:

- Incline Ascent
 - Forwards
 - If the wheelchair user strikes the floor-ramp transition too quickly, he/she may tip the wheelchair forward or fall forward out of the wheelchair.
 - The subject may need to adjust the height of the rear anti-tip devices so they do not catch during the transition.
 - The wheelchair user should lean forward as he/she goes up the ramp to apply more force and to avoid tipping backwards.
 - If the subject gets tired half way up, he/she should put on the brakes or, if there is sufficient room to do so, turn the wheelchair to the side and rest.
 - If the wheelchair is equipped with “grade aids” (or “hill holders”), the subject may apply them before he/she starts up the incline. This will allow the subject to rest on the incline without rolling back.
 - Backwards/ A Person With Hemiplegia
 - It might be easier for a wheelchair user with hemiplegia to go up the ramp backwards.
 - The wheelchair user should use the foot to generate the power to ascend the ramp and use the hand to do most of the steering.
 - Slalom
 - If a ramp is wide enough, the subject can cut back and forth across the incline, to decrease the apparent slope.
- Incline Descent
 - Forwards
 - The wheelchair user should not go too quickly, should stay in control and should be prepared to stop at anytime.
 - To slow down, the wheelchair user should hold the hands still and let the hand-rims slide through his/her grip to control the speed and direction. If the

wheelchair is allowed to descend too rapidly, the hands of the wheelchair user may get injured due to friction burns or lacerations due to hand-rim irregularities.

- The wheelchair user can also use the foot to slow down.
- If the wheelchair user strikes the ramp-floor transition too quickly, he/she may tip the wheelchair forward or fall forward out of the wheelchair.
- Backwards
 - If the subject has weak trunk muscles, he/she may feel more comfortable descending the incline backwards.
 - If, on a steeper incline, the subject experiences loss of traction due to the unweighting of the uphill wheels, the backwards approach may be used.
 - When going downhill backwards, the wheelchair user should lean uphill to reduce the chance of tipping over backwards.
- Slalom
 - If a ramp is wide enough, the wheelchair user can slalom down it by letting the hand-rim of one wheel at a time slide through the fingers. By descending using the slalom method, the apparent slope of the incline is lessened.
- Wheelie Descent
 - This is the preferred method for the descent of a steep incline, for the reasons described in the rationale.
 - The wheelchair user should let the hand-rims run through the hands to control the speed, direction and the wheelchair pitch angle. Letting the hand-rims run more quickly through the hands will allow the wheelchair to pitch farther back. Slowing the rate at which the hand-rims slide through the fingers will cause the wheelchair to pitch forward.
 - The subject should have the casters touch down shortly after the rear wheels reach the level surface.
 - An advanced exercise is for the wheelchair user to practice achieving wheelie take-off while on the incline. If the wheelchair user is facing downhill, more force is needed for takeoff and the wheelchair may accelerate rapidly downhill. If the wheelchair user is facing uphill, less force is needed. Ascending inclines in a wheelie position is not recommended for the wheelchair user, although it may be necessary to overcome obstacles or rough terrain.

Caregiver considerations:

- When negotiating the incline-floor transition, during either ascent or descent, with all wheels on the surface, the caregiver should be careful not to catch the wheelchair user's feet.
- When getting the casters onto the bottom of an incline, the caregiver may need to tip the wheelchair into the partial wheelie position. If the rear anti-tip devices interfere with getting the wheelchair fully on the incline, they may need to be repositioned.
- To push the wheelchair up an incline, the caregiver should bend the knees and lean towards the wheelchair. Do not apply pressure to the backrest, for the reasons described earlier.
- If the wheelchair has grade aids (hill holders), the caregiver can activate them before he/she starts. This will allow the caregiver to rest on the incline without the wheelchair rolling backwards.
- If a rest is needed, the caregiver can turn the wheelchair crossways.
- To descend an incline, there are three options:
 - The first is the forward technique with all four wheels on the incline. The caregiver should hold the push-handles firmly and allow the wheelchair to roll down the ramp while controlling the speed. The caregiver should avoid sudden stops and slow down as he/she reaches the bottom transition to level ground.
 - The second method is to descend backwards. This ensures that the wheelchair does not run away from the caregiver and that the wheelchair user does not fall forward. The caregiver should be sure to look over the shoulder for obstacles.
 - The third method is performed in the wheelie position. This is useful on steep inclines, to prevent the wheelchair user from falling forwards. The wheelie forward is not often recommended because it may require the caregiver to bend too far forwards, which may strain the back. Coming down backwards in this position may be better tolerated by the caregiver.

Classification	#	Name	Skill Level
Skill Group	Level changes		
Individual Skills	43	5cm, ascent	Community
	44	5cm, descent	
	45	15cm, ascent	Advanced
	46	15cm, descent	
	47	15cm, wheelie forward descent	

Description: The subject negotiates small and large level changes in the wheelchair.

Rationale: Level changes (e.g., curbs, steps) are very common obstacles for wheelchair users. Descending a level change in the forward direction allows the wheelchair user to maintain forward movement and to see any dangers that may lie ahead. Also, the wheelie position prevents the footrests from making contact with the lower level, which can decelerate the wheelchair and cause a forward tip or fall.

Pre-requisite:

- For the 5cm-level-change skills (#43,44): None.
- For the 15cm-level-change skills (#45,46,47):
 - Successes at the corresponding 5cm-level-change skills (#43,44) are pre-requisites.
 - Unless there is a language problem, the subject must be able to verbally describe a safe method of ascending or descending from the high curb before being allowed to attempt it.
- For the 15cm-level-change-wheelie-forward-descent skill: The stationary wheelie (#49) and wheelie-rolling-forward (#50) skills.

Skill combinations:

- The criteria for the 5cm-level-change skills (#43,44) will have been simultaneously met if the subject meets the criteria for the 15cm-level-change skills (#45,46,47).
- The criteria for the 15cm-level-change-descent skill (#46) will have been simultaneously met if the subject meets the criteria for the 15cm-level-change-wheelie-forward-descent skill (#47).

Suggested equipment and set-up:

- For both level changes:
 - The nosing of the level changes should be gently rounded and covered with a non-slip material (e.g., gritted paint).
 - The surface on top of the curb should be at least 1.2m wide and 1.5m long.
 - Bracing or weighting is used to prevent the level changes from moving when struck

by the wheelchair.

- The minimum run-up available before the level change ascent should be 3m, for subjects who use the momentum method.
 - Because many subjects can descend level changes from a higher level than they can ascend, some alternative means (e.g., an incline) of getting to the top is needed.
 - Spotter strap.
- For the 5cm level change: 5cm high.
 - For the 15cm level change: 15cm high.

Starting position:

- For the ascent skills:
 - All wheels are on the level surface below the level change, facing the edge. If the subject uses the momentum method, the subject may reposition the wheelchair farther from the level change before starting.
- For the descent skills:
 - All four wheels are on the level surface above the level change, with the leading wheels ~0.5m away from it.

Tester/spotter position:

- For the ascent skills:
 - The spotter should be behind the wheelchair.
 - The spotter strap should be used.
 - If the momentum method is used, the spotter should be alert to the possibility that the wheelchair user could pitch forward if the casters strike the level change rather than mounting it. The spotter should, therefore, have one hand near the wheelchair user's shoulder.
- For the descent skills:
 - If a backward descent is used, the spotter should be below the level change with the spotter strap to limit the extent of a fall or tip.
 - If a wheelie is used, the spotter should be behind the subject with a spotter strap in one hand and the other hand near the shoulder to limit the extent of a forward pitch. The spotter should stay close to the wheelchair so as not to bend the back much when the wheelchair drops to the lower level.

Instructions to subject:

- For the 5cm-level-change skills:
 - *“Get your wheelchair up on the upper level.”*
 - *“Get your wheelchair down on the ground.”*

- For the 15cm-level-change skills:
 - “Are you able to get your wheelchair up on the upper level?”
 - If the answer is “yes”, “How would you do that?”
 - If a safe method is described: “Go ahead.”
 - “Are you able to get your wheelchair down onto the ground?”
 - If the answer is “yes”, “How would you do that?”
 - If a safe method is described: “Go ahead.”
- For the 15cm-level-change-wheelie-forward-descent skill:
 - “Get your wheelchair into the wheelie position. Now, proceed forwards down the curb under control.”

WST-Q considerations:

- Suggested script:
 - “Can you get your wheelchair up over a small level change (e.g., a 5cm curb)? How?”
 - “Can you get your wheelchair down a small level change (e.g., a 5cm curb)? How?”
 - “Can you get your wheelchair up over a large level change (e.g., a 15cm curb)? How?”
 - “Can you get your wheelchair down a large level change (e.g., a 15cm curb)? How?”
 - “Can you get your wheelchair down a large level change (e.g., a 15cm curb) using a wheelie in the forward direction? How?”
- If the use of a wheelie is described then the subject must describe an appropriate and safe method to perform the wheelie to receive a pass.
- If the subject has rear anti-tip devices, it is usually necessary to reposition them to perform the level-change skills, especially the large-level-change skills. In this situation the subject must recognize this and describe an appropriate technique to manage their anti-tips to receive a pass. If the subject has already described the technique for the appropriate repositioning of the anti-tips during another skill it is not necessary to do so in detail again, but it is necessary to state that they would be repositioned.
- If the use of curb climbers is described then the subject must describe the method for their appropriate and safe use.

Evaluation criteria:

- For all skills:
 - The subject may remove the footrests and reposition the rear anti-tip devices but must be able to do so independently.
 - The wheelchair user may get out of the wheelchair to accomplish the task, if he/she can do so safely.

- For the 15cm-level-change skills:
 - If the subject has successfully completed the 5cm-level-change skills, the tester should ask the subject how he/she plans to attempt the task of ascending and descending the 15cm level change. If an unacceptable technique is described, the tester will explain that this is not a permitted method. A failing grade will usually be awarded.

- For the ascent skills:
 - Curb-climbing aids may be used if the wheelchair is equipped with these devices, but the subject must be able to activate and inactivate the aids independently.
 - The level change is successfully ascended if all wheels are on the top surface, with the wheelchair user seated upright in the wheelchair.

- For the descent skills:
 - General:
 - The level change is successfully descended when all wheels are on the lower level, the wheelchair user is seated in the wheelchair and the wheelchair is free to roll away (i.e., not hung up on the footrests or rear anti-tip devices).
 - Mild to moderate jarring is not considered unsafe, for the purposes of the test.

- For the 5cm-level-change-descent skill:
 - Any technique is permitted.

- For the 15cm-level-change-descent skill:
 - If performed in the wheelie position, the subject is required to achieve a controlled wheelie on the upper level, approach the edge by moving forward in this position and then lower the rear wheels under control with the rear wheels striking the lower level before the casters.
 - Although ‘flying’ off the curb (using momentum to land all wheels at about the same time) is not permitted, because it is potentially hazardous for subjects or testers, it is sometimes safe and effective for advanced wheelchair users. Therefore, if this method is described, the wheelchair user will be given an opportunity to select another method, without penalty. If the wheelchair user describes an acceptable approach (e.g., backing off the upper level while leaning forward or proceeding down the level change forward in the wheelie position [and the pre-requisites are met]), the skill may be attempted.
 - A forward descent, other than by using the forward wheelie position, can be acceptable in some circumstances (e.g., without footrests but with at least one good leg to control the caster descent and two good arms to control the rear wheels).

- If a subject attempts to go off the edge of the large level change at an approach angle of more than 5 degrees, the tester should intervene and award a failing grade.

- Scores recorded:
- 5cm level change, ascent
- 5cm level change, descent
- 15cm level change, ascent
- 15cm level change, descent
- 15cm level change, wheelie forward descent

Training tips:

- For the 5cm-level-change-ascent skill:
 - General
 - It may be necessary for the subject to adjust the height of the rear anti-tip devices.

 - Stationary Approach
 - The wheelchair user should pop a partial or full wheelie, to get the casters on the upper level.
 - Once the casters are on the upper level, the wheelchair user should lean forward and push forcefully to get the rear wheels on the upper level.
 - If the wheelchair user has difficulty getting the rear wheels up, the wheelchair user should roll the wheelchair backwards until the front wheels are almost off the edge of the level change. Then, the wheelchair user should lean forward and push the rear wheels up onto the upper level.

 - Momentum Method
 - The wheelchair user should pop the front wheels just before he/she hits the level change.
 - The wheelchair user should shift his/her weight over the front wheels as the rear wheels hit the lip of the level change to ensure the casters are on the upper surface.
 - Then, the wheelchair user should flex the trunk and apply a strong force on the rear wheels.

 - Backwards
 - The wheelchair user might find it easier to attempt to go up the 5cm-high level change backwards.

 - Backwards approach, wheelie hitch method
 - This is primarily a training exercise.

- This method requires good traction between the rear wheel and the edge of the level change.
 - The wheelchair user should roll backwards in the wheelie position until the rear wheels contact the edge.
 - The wheelchair user should lean back against the edge.
 - The wheelchair user should move the hands forward on the wheels.
 - The wheelchair user should dip backwards, pull hard on the rear wheels and hitch up onto the upper level.
 - After stabilizing in the wheelie position, the wheelchair user should roll backwards away from the edge before bringing the casters down onto the upper level.
- For the 5cm-level-change-descent skill:
 - The wheelchair user may be able to simply roll forward slowly off the upper level.
 - If the footrests catch on the ground or there is the danger of a forward tip or fall from the wheelchair, see “descending a 15cm level change” (below).
 - For the 15cm-level-change-ascent skill:
 - General:
 - Medium-height level changes (e.g., 10cm high) may be used for training.
 - Stationary Method
 - First, the wheelchair user should pop a wheelie to get the casters on the upper level. If the wheelchair is relatively unstable, the wheelchair user may need to lean forward to get enough caster clearance to permit this.
 - After the casters are on the upper level, if the wheelchair user finds the wheelchair is tending to tip over backward, he/she should lean forward. The wheelchair user can also roll backward slightly to get the casters trailing forwards; as this reduces the extent of rear tilt. By rolling backwards slightly, the wheelchair user also allows more momentum to be used during the second phase of the ascent.
 - The wheelchair user should make sure the hands are back far enough on the hand-rims. The wheelchair user should not move the hands until he/she is forcefully flexed at the trunk.
 - The wheelchair user should then lean forward quickly and push the rear wheels forward to get the rear wheels up on the upper level.
 - If not initially successful, the wheelchair user should try rocking the wheelchair to get the rear wheels onto the upper level.
 - Momentum Method
 - There are many similarities between this method and the technique described earlier to handle the 13cm-high obstacle (#33).

- The wheelchair user should achieve the desired approach speed, then position the hands in advance for the power stroke to pop the wheelchair casters off the floor at the right time. The wheelchair user should position the hands about 30 degrees behind top dead center of the hand-rim (11:00 o'clock for the right wheel, using the clock analogy described earlier) to avoid catching the thumb in the brakes on the wheelchair.
- Once the casters are on the upper level, the wheelchair user transfers the weight onto the front casters as the rear wheels hit the edge of the level change.
- To practice getting the timing correct, the wheelchair user should practice propelling the wheelchair forward and transiently popping the casters at a predetermined point on the floor. The wheelchair user should start “slow and low”, and then increase the speed of propulsion and the extent of caster clearance as he/she masters the skill.
- Backwards Method
 - If the wheelchair user uses one or both legs, it may be possible to back the wheelchair up a large level change.
- Forward Hitch Approach
 - The wheelchair user should approach the curb slowly and use the wheelie position to get the casters on top of the upper level.
 - The wheelchair user should pull the rear wheels up against the edge of the level change.
 - Using at least one hand on a rear wheel to keep the wheelchair from rolling backwards, the wheelchair user should shift the feet and buttocks as far forward as possible.
 - Then, the wheelchair user should reach back and grab the tires and hand-rims.
 - Finally, the wheelchair user should hitch (“bunny hop”) the body and the wheelchair up onto the upper level.
- For the 15cm-level-change-descent skill:
 - Backwards
 - The wheelchair user should line the rear wheels up with the edge of the level change.
 - The wheelchair user should lean as far forward as possible (chest on lap), and reach forward on the hand-rims.
 - The wheelchair user should move backwards very slowly and let the rear wheels roll evenly down off the upper level under control.
 - Once the rear wheels are on the lower level, if necessary, the wheelchair user can turn to the left or the right to get the casters off the upper level without getting the footrests stuck.

- Wheelie Forward
 - This is the preferred method for the descent of a large level change, for the reasons described above under Rationale.
 - The wheelchair user should get into the wheelie position away from the edge of the level change.
 - The wheelchair user should roll forward, in the wheelie position to the edge, staying as square as possible to the edge.
 - The wheelchair user should place the hands in the 11 o'clock position (clock analogy), so that he/she can firmly grip the hand-rims until the rear wheels reach the lower level.
 - As slowly as possible, the wheelchair user should lower the rear wheels from the upper to the lower level.
 - The wheelchair user should let the rear wheels hit the lower level before the casters.
 - As soon as the rear wheels touch the ground, the momentum should bring the casters down, but the wheelchair user should lean forward as a precaution.

Caregiver considerations:

- General:
 - To ascend or descend level changes, the caregiver may need to reposition or remove the anti-tip devices.
- Level Change Ascent:
 - For a small level change, the caregiver can ascend backwards, if preferred. If the level change is large enough, the caregiver may need to tip the wheelchair into the full wheelie position (to avoid tipping the wheelchair user forward out of the wheelchair) and pull the wheelchair up onto the upper level. The caregiver should step well away from the edge of the level change before lowering the casters. The caregiver should not use this technique for a large level change, because he/she would need to bend forward too far and might injure you're his/her back.
 - To ascend a level change forwards, the caregiver should put the wheelchair into the full or partial wheelie position to get the casters onto the upper level. Then, the caregiver should roll the chair forwards until the rear wheels touch the edge of the level change. The caregiver should ask the wheelchair user to lean or shift forward to reduce the weight on the rear wheels. Then, the caregiver should apply a forward and upward force to help the rear wheels roll up onto the upper level. The caregiver should not lift the wheels clear of the surface. The caregiver should stand close to the wheelchair, but he/she should not use the knee against the backrest.
- Level Change Descent:
 - The caregiver must not attempt to descend the level change backwards in the wheelie position, because this causes severe jarring of the wheelchair and its user.

- To descend a level change backwards, the caregiver should turn the wheelchair around so that the rear wheels will go off the edge first. The caregiver should stand close behind the wheelchair and on the lower level. The caregiver should align the rear wheels so that they are both on the edge of the upper level. The caregiver may ask the wheelchair user to lean or shift forward to reduce the weight on the rear wheels. Controlling the movement of the chair, the caregiver should slowly and evenly roll the rear wheels down onto the lower level, avoiding any jarring. Once the rear wheels are on the lower level, the caregiver may need to tip the wheelchair back into the wheelie position to avoid the footrests from getting caught on the upper level. Alternatively, the caregiver can turn the chair sideways to prevent the footrests from getting caught.
- To descend a small level change, the caregiver may do this in the forward direction. The caregiver should slowly push the wheelchair off the upper level, allowing the casters to gently land on the lower level, followed by the rear wheels. It is dangerous for the caregiver to use this technique for medium or large level changes – the wheelchair user may tip forward out of the wheelchair or the footrests may dig in and prevent a smooth descent.
- Alternatively, to descend a low or medium height level change forwards, the caregiver can tip the wheelchair back into the full wheelie position. The caregiver should not use this technique for a large level change, because he/she would need to bend forward too far and might injure you're his/her back.

Classification	#	Name	Skill Level
Skill Group	Wheelies on level terrain		Advanced
Individual Skill	48	No-hands rest	

Description: The wheelchair user tips the wheelchair back into the wheelie position and places the hands in the lap. If the wheelchair is equipped with rear anti-tip devices that permit the wheelchair to be tipped back far enough, no external object is needed. If the wheelchair has no rear anti-tip devices, it is necessary to rest the tipped wheelchair against an immovable object (e.g., wall, table, curb) and to apply the brakes.

Rationale: This comfortable position can be used to reduce postural problems (e.g., talking to standing people) that can cause neck strain. This position can also be used to decrease the likelihood of pressure sores on the ischial tuberosities. It can also be a comfortable and stable resting position when the trunk extensor muscles are weak. The position allows the hands to be free for other activities.

Pre-requisite:

- A safe and effective method must be described.
- Unless the subject plans to use rear anti-tip devices to rest against, the brake-application skill (#1, 2) must have been passed. The applied brakes must not allow any movement of the rear wheels.
- If the subject plans to roll backward in the wheelie position, then the stationary-wheelie (#49) and wheelie-rolling-backward (#51) skills are pre-requisites.

Skill combinations: None.

Suggested equipment and set-up: If the subject needs an object to lean against, he/she is free to choose it from what is available in the immediate vicinity (e.g., wall or obstacle).

Starting position: This is the subject's choice, because it will be affected by the technique used.

Tester/spotter position:

- If the subject leans the wheelchair against an external object, the spotter should crouch by the front of the wheelchair with a hand near the lower frame, to block the potential forward movement ("submarining") of the rear wheels if the brakes are inadvertently released.

Instructions to subject:

- "Are you able to tip your wheelchair back into a position where you can rest with your hands in your lap?"
- If the answer is "yes", ask "How would you do that?"

- If an acceptable answer is given, “*Go ahead. I’ll tell you when to come down.*”
- After 10s, “*You may come down now.*”

WST-Q considerations:

- Suggested script:
 - “*Do you know what a wheelie is? Can you tip the wheelchair back into a wheelie position and then place your hands in your lap? How?*”

Evaluation criteria:

- The subject may use rear anti-tip devices to rest against.
- The subject is required to achieve a stable wheelie-rest position, to rest in that position for 10s with the hands in the lap and to return the wheelchair to the upright position.
- If the subject describes an external object to lean against that the tester believes will not be sufficiently immobile, the tester should award a failing grade.

Score recorded:

- Wheelie no-hands rest

Training tips:

- General
 - Wheelchair users learning this skill should be discouraged from leaning back against objects that do not provide much room for error (e.g., an object that is less than 5cm high). Make sure any object that the wheelchair user plans to lean against will not move.
 - If the wheelchair user uses the brakes and an external object rather than the rear anti-tip devices to maintain position, the brakes should work well.
 - The wheelchair user should return to the upright (un-tipped) position without releasing the brakes (releasing the brakes would cause the wheelchair to submarine).
- Rear anti-tip devices method:
 - The rear anti-tip devices must permit enough rear pitch (usually 5-10° past the balance point) that the wheelchair does not unintentionally return to the upright position.
 - The rear anti-tip devices must provide enough stability that the wheelchair does not tip over backward. This can be clinically assessed by having the wheelchair user lean and reach backwards while in the no-hands-rest position with a spotter present.
 - If these conditions are met, this method of performing the no-hands-rest skill is very useful, because the skill requires no external object to lean against.
 - If the rear anti-tip-devices method is used, the wheelchair user can get into the position in the same way that the stationary-wheelie (#49) takeoff is performed. Alternatively, the wheelchair user can lock the brakes and use an external object to push against or pull on to induce the rear tip needed.

- Pull or push on an external object method:
 - This is the preferred (safer) of the methods involving leaning against an external object.
 - The wheelchair user should position the wheelchair facing away from an external object (if any) that the wheelchair will be rested against. How far away will require some experimentation.
 - The wheelchair user should lock the brakes.
 - The wheelchair user should push or pull on an external object to tip the wheelchair back to rest against an object or to rest on rear anti-tip devices.

- Hitch-back method:
 - The wheelchair user should position the wheelchair facing away from an external object (if any) that the wheelchair will be rested against. How far away will require some experimentation.
 - The wheelchair user should lock the brakes.
 - The wheelchair user should throw the upper body back to tip the wheelchair over far enough to rest against the target object.

- Wheelie roll-back method:
 - The wheelchair user should start with a conventional wheelie.
 - The wheelchair user should roll backward in the wheelie position. The wheelchair user should stop just before the rear wheels reach the object that he/she plans to rest against.
 - The wheelchair is then allowed to tip backwards until the back of the wheels or some other part of the wheelchair or the back contacts the surface to be rested against.
 - The wheelchair user should then lock one brake at a time, using the other hand to prevent the rear wheels from submarining forward.

Caregiver considerations:

- The caregiver should not leave the wheelchair user in this position if there is any concern about the wheelchair user releasing the brakes or rocking backwards and tipping over.

Classification	#	Name	Skill Level
Skill Group		Wheelies on level terrain	
Individual Skill	49	Stationary	Advanced

Description: The subject achieves the wheelie position, maintains it and brings the casters back to the floor.

Rationale: The stationary wheelie position can be used to avoid postural problems that can cause neck strain or to decrease the likelihood of pressure sores on the ischial tuberosities. The stationary wheelie is also a foundation skill for a number of functional skills (e.g., #33,36-39,42,45-47,50-57) that can be best performed in the partial or full wheelie position.

Pre-requisite: None.

Skill combinations: None.

Suggested equipment and set-up:

- Smooth level surface
- 1.5m-diameter circle
- Spotter strap

Starting position: The wheelchair user is seated in the wheelchair in the center of the circle.

Tester/spotter position: The spotter should be behind the wheelchair with the spotter strap.

Instructions to subject:

- “Get yourself into the wheelie position and hold it until I tell you to come down. Keep your rear wheels within the circle (indicate it).”
- After 10s, “Come down now.”

WST-Q considerations:

- Suggested script:
 - “Can you do a wheelie and hold the position for at least 10 seconds? How?”
- If the subject has rear anti-tip devices, it is usually necessary to reposition them to perform this skill. In this situation, the subject must recognize this and describe an appropriate technique to manage the anti-tip devices to receive a pass. If the subject has already described the technique for the appropriate repositioning of the anti-tip devices during another skill, it is not necessary to do so again in detail.

Evaluation criteria:

- The subject must achieve the wheelie position and hold this position in a controlled

- manner for 10s, while all wheels that are in contact with the floor (rear wheels +/- rear antitip-device wheels) remain within the circle.
- After 10s, a controlled return to the horizontal position should be made. The subject must wait for the instruction to bring the casters back to the floor before doing so.
 - Note: For the purposes of this and other full wheelie skills, wherever the term ‘wheelie’ is used, it includes the aided-wheelie position (casters off the floor, balanced on rear antitip devices) as an acceptable alternative. The use of rear anti-tip devices is permitted, as long as the wheelchair is equipped with them and the subject can independently handle them.
 - It is permissible to use the feet to achieve the wheelie position but not to maintain it.

Score recorded:

- Stationary wheelie

Training tips:

- General
 - When learning the wheelie, the main risk is of injury due to a backward tip and striking the head on the floor. This skill should not be practiced without a spotter or a rear anti-tip device that permits enough rear tip to achieve the wheelie balance point but prevents a full rear tip.
- Take-Off Phase
 - The wheelchair type and set-up influence the ease with which the wheelchair can be tipped backward into the wheelie position. It is easier to achieve wheelie take-off in a wheelchair that is less stable to begin with – e.g., removing the footrests and allowing the feet to dangle, moving the rear axle position forward, raising the rear axle position or switching to a less stable wheelchair.
 - It may be useful to use simulation. For instance, the trainer may tip the wheelchair back into the balance position, to give the wheelchair user a sense of how far back this is.
 - If properly timed, the wheelchair user should require little force to perform this skill.
 - For the stationary wheelie take-off, many wheelchair users roll backward slowly, then quickly forward. If using this method, the wheelchair user should start with the hands near the top center of the wheel (i.e., ~12:00 or 1:00 o’clock, using the clock analogy). The wheelchair user should try to not pause between rolling back and pushing quickly forward, otherwise he/she may lose momentum and will not tip backwards as easily.
 - The forward-only approach is also effective, but the hands will need to start farther back on the wheels (i.e., ~10:00 o’clock) and more force will be needed by the wheelchair user than for the backward-forward method.
 - The forward motion that is common to both methods can be thought of as an action to get the base of support (the rear wheels) under the center of gravity (located near

- the lap).
- Some wheelchair users may find it easier if they lean back into the backrest to cause or help with the initial rear tip. However, skilled wheelie performers can achieve the wheelie position while maintaining an upright (or even forward-leaning) body position.
 - Whichever method is used, the wheelchair user should try to induce enough of a rear tip to reach and slightly overshoot the wheelie balance point. Once past the balance point, the wheelchair user then should pull back on the wheels to prevent tipping too far and return to the balance point.
 - If the wheelchair user is having difficulty getting tipped far enough backward to reach the balance point, he/she should push forward more forcefully to pop the casters higher. A learning exercise is for the wheelchair user to practice popping the casters up onto a 10-15cm-high object.
 - If the wheelchair user is overshooting the balance point too vigorously, a learning exercise is for him/her to practice popping the casters up onto a small object (~5cm high).
- Balance Phase
 - General:
 - The wheelchair user does not need to use a lot of force. It is preferable for the wheelchair user to keep a light grip on the wheels. A learning exercise is for the wheelchair user to use only two fingers and a thumb of each hand.
 - The wheelchair user should try to relax and remember to breathe.
 - During the early learning stage, some wheelchair users might find it useful to isolate the variations of pitch from those of rear-wheel displacement. This can be done by reducing the extent to which the rear wheels can move (e.g., using loose gravel into which the rear wheels can sink or obstacles in front of and behind the rear wheels).
 - Proactive balance strategy:
 - This strategy is similar to balancing a long stick on the hand, keeping the base of support (the rear wheels) under the center of gravity.
 - The wheelchair user should try to move the hands only between the 11:00 and 2:00 o'clock positions. This will allow a safety margin, so that the wheelchair user can react to a loss of balance in either direction. If the wheelchair user wants the wheels to move farther than the intermediate hand position permits, the hand-rims can be allowed to slide through the grip.
 - Simulation may be helpful for the wheelchair user. While in the simulated balance position, the trainer can ask the wheelchair user to put the hands on the hand-rims and move the wheels forwards and backwards on the floor (about 2-5cm in each direction) to try to maintain the balance position.

- Reactive balance strategy:
 - If the wheelchair user begins to tip too far forward, he/she should roll the rear wheels forward to re-establish balance (“when you fall forward, push forward”). The worst that can happen in this direction is that the wheelchair lands prematurely.
 - If the wheelchair user imbalances backwards, he/she should roll the rear wheels backwards to re-establish balance (“when you fall back, pull back”). Even if past the point of no return, the preferred strategy, to minimize injury due to striking the back of the head on the ground, is for the wheelchair user to pull back hard on the rear wheels and flex the neck until the back hits the ground. Immediately thereafter, the wheelchair user should use the hands or forearms to prevent the knees from striking the face.
 - In the balance position, the trainer can simulate a rear or forward tip and instruct the wheelchair user to respond by pulling or pushing the rear wheels in the direction of the tip.

- Landing Phase:
 - To land, the wheelchair user pulls back on the wheels, or leans forward to bring the front wheels to the ground gently.

Caregiver considerations:

- To achieve a caregiver-induced wheelie, the caregiver should pull on the push handles, with one foot on a tipping lever, to tip the wheelchair back.
- The caregiver should tip the wheelchair back until it is balanced over the rear wheels. It may be necessary for the caregiver to inactivate the rear anti-tip devices, to achieve enough rear tip to reach the balance point.
- Once in the wheelie balance position, only minimal force is needed by the caregiver to maintain balance.
- To lower the wheelchair to the horizontal position, the caregiver should put one foot on the tipping lever at the back of the wheelchair to keep the wheelchair from pitching forward too abruptly.

Classification	#	Name	Skill Level
Skill Group	Wheelies on level terrain		Advanced
Individual	50	Rolling forwards	
Skills	51	Rolling backwards	

Description: The wheelchair user achieves the wheelie position, and then moves the wheelchair forwards (and later backwards) a short distance in this position.

Rationale: The purpose of the wheelie-rolling-forward skill is to assist in approaching obstacles (e.g., potholes, soft or rough terrain, level changes, inclines) for which it is advantageous to have the casters off the surface. For the wheelie-rolling-backward skill, in tight spaces, where it is not possible to turn around, this ability may allow a subject to raise the casters over an obstacle (e.g., a stick on the ground). Also, the wheelie-backward skill allows the wheelchair user to ease up to a wall or object against which he/she can lean (i.e., for the wheelie no-hands rest skill).

Pre-requisite: The stationary-wheelie skill (#49).

Skill combinations: The criteria for this skill may be met by slightly extending the distances while carrying out some of the other wheelie skills.

Suggested equipment and set-up:

- As for the rolling-forward skill (#13), except that the distance is 5m for both the forward and backward directions.
- Spotter strap.

Starting position: The wheelchair user is seated in the wheelchair with the leading wheels behind the starting line.

Tester/spotter position: The spotter should be behind the wheelchair with the spotter strap.

Instructions to subject:

- *“Get into the wheelie position. Now, push the wheelchair straight ahead (or backwards) until I ask you to stop. Do not let the casters touch the floor until I tell you.”...*
- After crossing the finish line, *“Stop.”...* *“You may land now.”*

WST-Q considerations:

- Suggested script:
 - *“Can you propel your wheelchair forwards (or backwards) 5m (e.g., across a room) while in a wheelie position? How?”*

Evaluation criteria:

- The subject is required to achieve the wheelie position before crossing the starting line and then travel 5m, staying within the 1.2m-wide path.
- The subject must come to a stop beyond the finish line, at the tester's command, before allowing the casters to touch the floor.
- The subject may bring the casters back to the floor between the forward and backward skills, but need not do so.

Scores recorded:

- Wheelie, rolling forwards
- Wheelie, rolling backwards

Training tips:

- General
 - The wheelchair user should allow the wheelchair to begin to fall (dip) slightly in the direction in which he/she wishes to move, and then roll the rear wheels in the same direction to catch up. This is like the reactive balance strategy described in the stationary wheelie skill (#49), but the imbalance is intentional.
 - To initiate the dip, the wheelchair user can move the head or lean slightly in the direction he/she wishes to move. Alternatively, the wheelchair user can initiate the dip by pushing the wheels slightly in the opposite direction.
 - The wheelchair user should be encouraged to take his/her time to achieve control and to move slowly.
 - The wheelchair user should grip the wheels lightly, giving a light push on the wheels and letting the hand-rims slide through the fingers.
 - In catching up to the center of gravity after the dip, there is no need for the wheelchair user to catch up completely. By undershooting slightly or by gripping the wheels more firmly if overshooting, the wheelchair user can initiate the next dip.
- Backwards
 - To build confidence for the rear dip, the wheelchair user can deliberately fall backwards and let the spotter catch him/her a few times. Allowing oneself to fall backwards is more frightening than forwards and the consequences of failure are greater.
 - Some wheelchair users may find it easier to move backwards with one hand at a time.

Caregiver considerations:

- The caregiver should allow the wheelchair to tip back far enough so that it is just beyond the balance position for both the forward and backward rolling skills.

Classification	#	Name	Skill Level
Skill Group	Wheelies on level terrain		Advanced
Individual	52	Turn in place, left	
Skills	53	Turn in place, right	

Description: While in the wheelie position, the subject turns the chair 180° within a tight space, both to the left and to the right.

Rationale: Wheelchair users often encounter situations in which they need to perform a wheelie to make a tight turn.

Pre-requisite: The stationary-wheelie skill (#49).

Skill combinations: There are no other skills that include the criteria for this skill. However, this skill meets the criteria for the turn-in-place skills (#16, 17).

Suggested equipment and set-up:

- As for the stationary-wheelie skill (#49).
- Spotter strap.

Starting position: The wheelchair user is seated in the wheelchair in the center of the turning circle.

Tester/spotter position: The spotter should be behind the wheelchair with the spotter strap.

Instructions to subject:

- “Get into the wheelie position. Now, turn your wheelchair so that it is facing in the opposite direction. Keep your rear wheels (and rear anti-tip wheels, if they touch the floor) inside the circle (indicate it).”

WST-Q considerations:

- Suggested script:
 - “While maintaining a wheelie position can you turn in a tight circle so you are facing the opposite direction, i.e., do a 180-degree turn? How? Would this be the same to the left and right?”
- The subject’s answer should include a strategy to ensure a tight turn is executed.

Evaluation criteria:

- The subject is required to achieve the wheelie position and to turn 180° to the left and right while keeping all wheels that are in contact with the floor (rear wheels +/- rear anti-tip device wheels) within the 1.5m-diameter circle.

- The turn is considered complete if the wheelchair ends $>160^\circ$ from its original orientation.
- The 180° turn may be accomplished in a single move (the “snap turn”) or a series of smaller ones, as long as the wheelie position is maintained throughout.
- The subject is permitted to return the casters to the floor between the turns to the left and right, but need not do so.

Scores recorded:

- Wheelie, turn in place, left
- Wheelie, turn in place, right

Training tips:

- The subject should be encouraged to get good control and balance in the stationary wheelie first.
- The wheelchair user should keep the body quiet and let the hands do the work.
- The wheelchair user should let the hands move opposite each other, pulling back with one hand and pushing forward with the other.
- It may be helpful if the wheelchair user starts with small hand movements and graduates to bigger ones.
- For the snap turn, the wheelchair user positions one hand well forward on the hand-rim and the other well back. Then, the wheelchair user uses a single smooth and moderately forceful movement to spin the wheelchair around.

Caregiver considerations:

- The caregiver should keep his/her feet inside the circle.
- The caregiver should be careful not to let the wheelchair user’s feet hit anything.

Classification	#	Name	Skill Level
Skill Group	Wheelies on level terrain		Advanced
Individual Skills	54	Moving turn, forward, left	
	55	Moving turn, forward, right	
	56	Moving turn, backward, left	
	57	Moving turn, backward, right	

Description: The subject achieves the wheelie position and turns to the left and right while moving forwards and backwards in the wheelie position.

Rationale: This skill is of use when negotiating closely spaced obstacles.

Pre-requisites:

- For all skills: the stationary-wheelie skill (#49).
- For the forward-turn skills: the wheelie-forward skill (#50).
- For the backward-turn skills: the wheelie-backwards skill (#51).

Skill combinations: There are no other skills that include the criteria for this skill.

Suggested equipment and set-up:

- As for the moving-turns skills (#18-21).
- Spotter strap.

Starting position: The wheelchair user is seated in the wheelchair, facing the starting line, with the leading-wheel axles behind the line.

Tester/spotter position: The spotter should be behind the wheelchair with the spotter strap.

Instructions to subject:

- “*Get into the wheelie position. Now, propel forward (or backward) to make a left (or right) turn around this corner (indicate it), staying within this space (indicate it).*”
- If the subject fails to continue any of the turns past the finishing lines, the tester may prompt the subject (“*Keep going until you are over the line*”) without penalty.
- Note: The order of the instructions may vary, depending upon whether a single corner is being used or a T-shaped pair of corners. For the latter, it may be efficient to use an order such as: forward left, backward right, forward right and backward left.

WST-Q considerations:

- Suggested script:

- *“Can you turn a corner while moving forwards (or backwards) in the wheelie position? How? Would this be the same to the left or right?”*

Evaluation criteria:

- The subject is required to achieve the wheelie position before the rear wheels cross the starting line and maintain it until the rear wheels cross the finishing line.
- The casters may be brought to the floor between each turn and the next, but this is not required.
- Otherwise, as for the stationary-wheelie skill (#49) and moving-turns skills (#18-21).

Scores recorded:

- Wheelie moving turn forward, left
- Wheelie moving turn forward, right
- Wheelie moving turn backwards, left
- Wheelie moving turn backwards, right

Training tips:

- Generally, the wheelchair user should use the outside hand to turn, and use the inside hand to maintain balance.
- When the wheelchair user is ready to turn, he/she should slow down the inside wheel while pushing on the outside one.
- The wheelchair user should make sure the inside axle is at least even with the corner before starting to turn.

Caregiver considerations:

- The caregiver should be careful to keep his/her feet, as well as the wheelchair, within the limits.
- The caregiver should not let the wheelchair user’s feet hit anything.

6.0 ACKNOWLEDGEMENTS

This work would not have been possible without the excellent papers, textbooks and training manuals that have been published by others. This literature is too extensive to cite here, but has been more specifically acknowledged in the reference sections of our papers published about the WSP (see web site).

The WSP was developed for research purposes at Dalhousie University and for clinical use in the Clinical Locomotor Function Laboratory of the Queen Elizabeth II Health Sciences Centre. We are grateful for the assistance of the patients, occupational therapists, physical therapists and physiatrists of the Queen Elizabeth II Health Sciences Centre.

A number of individuals have provided advice and assistance in the development of the Wheelchair Skills Program. Of special note are Janneke Swuste, Don MacLeod, Angela MacPhee, Anna Coolen, Jamie Bonaparte, Cher Smith, Krista Best, Judy Lugar, Debbie Dupuis, Kara Thompson, Jennifer Landry, Diane McKenzie, Corey Adams, Allison Newton, Anita Mountain, Deborah Thibault, Naomi Miffen, Casey Corkum, Kim Parker, Francois Routhier, Rebecca Walker and Amanda Machado.

Funding support has been received from the Medical Research Council of Canada, the Canadian Institutes of Health Research, the Dalhousie University Faculty of Medicine Summer Student Research Fund, the Nova Scotia Health Research Foundation, the Queen Elizabeth II Health Sciences Centre Research Fund and the University Internal Medicine Research Foundation.

Appendix 1

Wheelchair Skills Test -Questionnaire (WST-Q) (Version 3.2): Suggested Scripts

Note:

- The general instructions and evaluation criteria are specified earlier in this Manual.
- Record the scores and comments on the WST/WST-Q Data Collection Form.
- The italicized wording in quotations below is suggested wording for the interviewer to use. If the example settings are inappropriate for the person being interviewed (e.g., in a developing nation), more appropriate examples should be used.
- In addition to the suggested wording, additional clarifications and follow-up questions may be used to ensure that the test subject understands the question and that the interviewer understands the response.

Introduction and instructions to participant:

“I’m going to be asking you about a variety of wheelchair skills. These will range from some very basic skills, such as applying your brakes, to more difficult skills used when wheeling outside, such as going up and down ramps. If the question is about an activity that you are unable to do, I would prefer that you say so rather than to try to guess at the correct answer. Also, please let me know if you need any help from another person or caregiver. Please let me know if there are any questions that are not clear to you. Do you have any questions before we begin?”

If the interview is being conducted in-person, add:

“Please feel free to show me how you do any of the skills rather than explaining it.”

Brakes

Equipment: *“Does your wheelchair have brakes?”*

1,2) Apply: *“Can you apply the brakes? How? Would this be the same on both sides?”*

3,4) Release: *“Can you release the brakes? How? Would this be the same on both sides?”*

Armrests

Equipment: *“Does your wheelchair have armrests? Are they movable?”*

5,6) Move away: *“Can you move the armrests out of the way? How? Would this be the same on both sides?”*

7,8) Restore: *“Can you replace the armrests? How? Would this be the same on both sides?”*

Footrests

Equipment: *“Does your wheelchair have footrests? Are they movable?”*

9,10) Move away: “Can you move the footrests out of the way? How? Is this the same on both sides?”

11,12) Restore: “Can you replace the footrests? How? Is this the same on both sides?”

Rolling

13) Forwards: “Can you make your wheelchair go straight forward for 10m on a level surface? How?”

14) Street Crossing: “Can you push your wheelchair across a two-lane street, in the time it takes for a street light to change from green to red? How?”

15) Backwards: “Can you make your wheelchair go straight backward for 5m? How?”

Turns in Place

16,17) Turns in place: “If you were in a small space that was just large enough to fit your wheelchair, could you turn your wheelchair around so you were facing the opposite direction? How? Is this the same on both sides?”

Moving Turns

18,19) Forward: “When propelling your wheelchair forward, can you make your wheelchair turn around a corner? How? Is this the same on both sides?”

20,21) Backward: “When propelling your wheelchair backward, can you make your wheelchair turn around a corner? How? Is this the same on both sides?”

Sideways Maneuvering

22,23) “Imagine you are sitting in your wheelchair with a window about a foot away on one side. Could you move your wheelchair so it was right up beside the window? How? Would this be the same if you were moving toward the other side?”

Reaching

24) Ground: “Imagine you are sitting in your wheelchair and you have dropped something on the ground, (e.g., a paperback book). Can you reach to the floor to pick it up? How?”

25) High object: “Now imagine you are sitting in your wheelchair and you need to reach up for something overhead (e.g., an elevator button or a plate on the lower shelf of a kitchen cupboard). Can you do that? How?”

Transfers

26) Out of wheelchair: “Can you transfer from your wheelchair to another surface (e.g., a bed or seat)? How?”

27) Into wheelchair: “Can you transfer back into the wheelchair? How?”

Fold/Unfold Wheelchair

Equipment: “Does your wheelchair fold up?”

28) Fold: “Can you fold your wheelchair? How?”

29) Unfold: “Can you unfold your wheelchair? How?”

Doors

30) Open away: “Imagine a door that swings open away from you. Can you open such a door, go through it and then close it behind you? How?”

31) Open towards: “Imagine a door that swings open towards you. Can you open such a door, go through it and then close it behind you? How?”

Obstacles

32) 2cm high: “Can you push your wheelchair over a 2cm-high obstacle (e.g., a door threshold)? How?”

33) 13cm high: “Can you push your wheelchair over a 13cm-high obstacle (e.g., a tree branch or railroad track)? How?”

Cross Slope

34,35) “Imagine you are going across a slope (e.g., a hill or driveway) and you notice that your wheelchair starts to turn downhill. Can you manage your wheelchair so it keeps going straight? How? Is this the same for slopes on either side?”

Increased Rolling Resistance

36) Carpet: “Can you push your wheelchair on a soft surface (like a thick carpet)? How?”

37) Gravel: “Can you push your wheelchair on gravel? How?”

Pot-Holes

38) 15cm across: “Imagine you are propelling your wheelchair and you are confronted with a small pothole, the width of your wheelchair, about 5cm deep and about the size of a paperback book (i.e., 15cm) across. Can you push your wheelchair over such a pot-hole? How?”

39) 30cm across: “Now imagine that the pot-hole is even larger – approximately twice the size across of the previous one (i.e., 30cm). Can you push your wheelchair over such a pot-hole? How?”

Inclines

40) 5° ascent: “Can you get your wheelchair up a moderately steep (5°) incline (e.g., a wheelchair

ramp)? How?”

41) 5° descent: “Can you get your wheelchair down a moderately steep (5°) incline (e.g., a wheelchair ramp)? How?”

42) 7.5° wheelie forward descent: “Can you get your wheelchair down a steep (7.5°) incline, using a wheelie in the forward direction? How?”

Level Changes

43) 5cm ascent: “Can you get your wheelchair up over a small level change (e.g., a 5cm curb)? How?”

44) 5cm descent: “Can you get your wheelchair down a small level change (e.g., a 5cm curb)? How?”

45) 15cm ascent: “Can you get your wheelchair up over a large level change (e.g., a 15cm curb)? How?”

46) 15cm descent: “Can you get your wheelchair down a large level change (e.g., a 15cm curb)? How?”

47) 15cm wheelie forward descent: “Can you get your wheelchair down a large level change (e.g., a 15cm curb) using a wheelie in the forward direction? How?”

Wheelies on level terrain, no-hands rest

48) “Do you know what a wheelie is? Can you tip the wheelchair back into a wheelie position and then place your hands in your lap? How?”

Wheelies on level terrain, stationary

49) “Can you do a wheelie and hold the position for at least 10 seconds? How?”

Wheelies on level terrain, rolling forwards and backwards

50) Forward: “Can you propel your wheelchair forwards 5m (e.g., across a room) while in a wheelie position? How?”

51) Back: “Can you propel your wheelchair backwards 5m (e.g., across a room) while in a wheelie position? How?”

Wheelies on level terrain, turns in place

52,53) *“While maintaining a wheelie position can you turn in a tight circle so you are facing the opposite direction, i.e., do a 180-degree turn? How? Would this be the same to the left and right?”*

Wheelies on level terrain, moving turns

54,55) Forward: *“Can you turn a corner while moving forward in the wheelie position? How? Would this be the same to the left or right?”*

56,57) Backward: *“Can you turn a corner while moving backwards in the wheelie position? How? Would this be the same to the left or right?”*