

Walking Index for Spinal Cord Injury II (WISCI II) Guide: Instructions for Use

Purpose

The WISCI/WISCI II scale was developed as a research tool in clinical trials to measure improvements in walking in persons with acute and chronic spinal cord injury. It is not intended to be used in a clinical setting.

NOTE: In a recent review of the literature (2012), it was found that clinicians have misused the WISCI II scale by documenting WISCI II levels on patients clinically, to show a more accurate snapshot of a patient's walking ability. The scale was not validated for this purpose. However, if clinicians choose to assign a WISCI II level to a patient in a clinical setting, they should clearly state whether the level is baseline/self-selected or maximum (see below).

Subject Selection

The following outline describes subjects for whom the scale is most commonly utilized:

1. Spinal cord injury subjects who are capable of standing and walking in parallel bars will be eligible for assessment. Only a reciprocal gait (without the use of mechanical device ie ARGO) is to be considered in scoring the WISCI II. Additional inclusion/exclusion criteria may be necessary.
 2. Most often ASIA Impairment Scale (AIS) grade A below T10 and AIS B, C, and D subjects qualify (Ditunno 2004). AIS A subjects with a higher injury level may be included in studies that use the WISCI II but typically they would function on initial assessment at the 0 level.
 3. Individuals with tetraplegia generally require motor strength in triceps of at least grade 3 or better to be able to support their body weight^{3,4}. (Ditunno 2004, Dobkin 2003). Individuals with tetraplegia and arm strength in triceps of less than grade 3 may not be easily classified by the WISCI II scale (Ditunno, 2005).
 4. The WISCI II has not been assessed for validity and reliability in subjects under age 18.
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Standardized Physical Environment and Distance

The WISCI II is a functional capacity scale, NOT a disability scale. It must be used in a standardized environment with standardized equipment and methods, which are observed and recorded by professionals that are trained in the use of the WISCI II. The following are necessary:

1. A flat, smooth, non-slippery surface of 10 meters length.
 2. Individuals walk at their own speed.
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Standardized Physical Assistance

1. Any physical contact with the subject, including "contact guarding" is considered physical assistance.
2. Supervision without actual touching should not be regarded as physical assistance.
3. For additional clarification, descriptors of specific levels of physical assistance are provided on the WISCI II scoring sheet.

Standardized Equipment

1. Walkers should be conventional, but if a rolling walker is used, it should be coded as a walker and identified in the descriptors. A rolling walker has commonly been used in the USA and several European centers.
 2. A platform walker is equivalent to a walker.
 3. ARGOs and other mechanical devices (e.g. use of treadmills) should be excluded.
 4. Crutches can be Lofstrand (Canadian) or axillary.
 5. "Braces" means one or two braces, either long or short, and should be identified in the descriptors. Other devices used for bracing such as ace wraps or splints should be coded as a brace and described under "other". Equivalents of short leg braces may include high top "sneakers"; alpine shoes, or other footwear that stabilizes the ankle.
 6. Whether long leg braces are locked or unlocked at the knees should be identified in the descriptors.
 7. Clothing should not cover braces to allow therapists and other professional staff to make a visual determination that the patient has a brace (Ditunno, 2005).
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Standardized Method

WISCI II testing is performed by physical therapists trained in the use of the WISCI II, and baseline and maximum levels are determined according to a specific protocol.

In the acute (hospital) setting, the initial (baseline) WISCI II level (i.e., the first one determined after injury onset) is determined by the therapist alone, since the patient is newly injured and must be instructed in achieving the maximum level that is safe in the hospital setting under the supervision of the therapist.

In follow-up assessments after the patient has been discharged to a community setting, the following steps are required to determine the maximum WISCI II level.

First, the therapist interviews the subject to determine the self-selected WISCI II level, which is defined as the level the subject is ambulating at in the community, or in the household if the subject is not a community ambulator. The therapist confirms that the participant can ambulate 10 meters at the reported level. This is the self-selected level, but may not be the maximum level.

To determine the maximum WISCI II level, the therapist advances the subject sequentially through WISCI II levels starting at the level one step above the self-selected level, until the subject fails a level or is deemed unsafe for the next level. If the therapist thinks the subject can ambulate three or more levels above the self-selected WISCI II level, then to avoid fatigue, the subject can skip to a higher level. However, if the subject fails to complete that level, the subject is tested at the first skipped level and advanced until failure. If the level tested requires a brace, an alternative method of ankle stabilization as described under standardized equipment is acceptable.

Scoring

In scoring the WISCI II, first check the descriptors that apply to the current walking performance, and then assign the level of walking performance (see pgs. 7-8). For example, a subject who walks with a rolling walker and assistance of one person and no braces would be

scored at a WISCI II Level 8. In selecting a level, one should choose the level at which the patient is safe as judged by the therapist, with patient's comfort level described. If devices other than those stated in the standard definitions are used, they should be documented in the comment section. If there is a discrepancy between two observers (that is, one judges the patient to be safe, the other unsafe; there never should be disagreement as to whether the patient is or is not using particular equipment; the patient's comfort level is not of relevance in assigning scores, unless insofar it informs on safety), the higher level should be chosen.

Time to Administer

The time needed to administer the WISCI II may vary from 5 minutes in the acute phase to 15 minutes in a follow-up assessment. The duration of the assessment depends on the subject's self-selected WISCI II level in the follow-up or chronic phase. For example, a subject who's self-selected WISCI II is 19 may only take 5 minutes because he/she only needs to be tested at 1 more level to reach his/her maximum WISCI II level. Similarly, a subject whose self-selected WISCI II is at the lower end of the scale may not be able to progress to a higher level and the self-selected WISCI II and maximum WISCI II levels are the same. Testing time for these two scenarios would be minimal. However, those subjects who can progress through multiple WISCI II levels beyond their self-selected level or require donning of additional equipment (such as braces), may take longer.

Additional Notes

In clinical trials initiated in the acute phase, the increase in score is calculated by subtracting the baseline level at the beginning of the trial from the maximum level at the end of the trial.

In performing the WISCI II, individuals walk at their own speed and the 10 meters should not be timed, unless the walking speed and the WISCI II assessments are combined (Scivoletto 2011).

The WISCI II's ranking of walking levels reflecting impairment should not be dichotomized into dependent and independent levels of physical assistance, in an attempt to more closely mirror a disability scale.

Descriptors may have value in reflecting cultural differences when planning a trial.

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****Additional manuscripts not listed in publication (Appendix 1 pgs 7-8)**

Research Face Validity

Twenty-four spinal cord injury (SCI) experts in walking function from eight counties established and agreed on hierarchical ranking of 20 items. (Ditunno et al., 2000)

Results - Kendall coefficient of concordance for the pilot data was significant (W=0.843, P< 0.001) indicating agreement among the experts in rank ordering of original items.

**Concurrent/
Predictive/
Construct Validity**

First use of WISCI II in a clinical trial of Body-Weight Supported Treadmill Training versus overground mobility training. Prospective study of 146 subjects with incomplete SCI (C4 to L3) confirmed concurrent validity of the WISCI by correlating with all measures at 3, 6, and 12 months. (FIM, 50-foot walking speed, 6-minute walk, LEMS, Berg Balance, FIM Locomotor Score). Correlation of LEMS change scores supports predictive validity (Ditunno et al., 2007). Results - Correlations with WISCI at 6 months were significant with BBS ($r = .90$), LEMS ($r = .85$), LFIM ($r = .89$), FIM ($r = .77$), 50FW-S ($r = .85$), and 6MW-D ($r = .79$); similar correlations occurred at 3 and 12 months. Correlations of change scores from baseline WISCI were significant for change scores from baseline of LEMS/BBS/LFIM. Correlation of baseline LEMS and WISCI at 12 months were most significant ($r = .73$). The R^2 of baseline LEMS explained 57% of variability of WISCI levels at 3 months.

**Content/Construct
Validity**

Prospective study of 170 subjects in four countries confirmed that progression through the levels followed a monotonic pattern in more than 80% of subjects and the relationship of walking capacity (WISCI) to impairment (LEMS) was 91% ($p < 0.001$) at final assessment, supporting content and construct validity. (Ditunno et al., 2008).

Results - Eighty-five percent of motor complete (66/78) and 10% (7/72) of motor incomplete participants showed no progression (73/150). Of the remaining participants (77/150) who improved, 81% (62/77) showed MDI. However, the deviation from MDI occurred only at one timepoint in 10/15 participants. LEMS correlated with WISCI at initial and final assessment (0.47 and 0.91 $P < 0.001$). Parallel bar use differed between the US and Europe possibly due to patterns of care. Use of braces also differed.

**Convergent
Validity/
Reproducibility**

Prospective study of 76 subjects with chronic SCI confirmed convergent validity by correlating WISCI II levels to LEMS and walking speed. Reproducibility was assessed with the intraclass correlation coefficient (ICC) and the smallest real difference (SRD). (Burns et al., 2011)

Results - Convergent validity of the self-selected and maximum WISCI II with LEMS was moderate for paraplegia ($r = 0.479$ and $r = 0.533$) and strong for tetraplegia ($r = 0.852$ and $r = 0.816$). Tetraplegia, but not paraplegia, demonstrated convergent validity of walking speed at the self-selected and maximum WISCI levels with LEMS ($r = 0.752$ and $r = 0.813$). WISCI reproducibility was excellent (Intraclass correlation (ICC) for self-selected level 0.995). The resulting significant real differences (SRDs) of 0.785 (self-selected) and 0.597 (maximum), suggests that a change of one WISCI level can be interpreted as real (meaningful) in a chronic patient.

**Inter/Intra-rater
Reliability**

Study of 26 subjects with chronic SCI from the United States and Italy tested by two blinded raters on two separate days to determine self-selected and maximum WISCI II levels and the time to complete a 10-m walk confirmed inter/intra-rater reliability (Marino et al., 2010). Results - Inter-rater and intra-rater reliability were 1.00 for self-selected WISCI. The intra-rater reliability for maximal level WISCI was 1.0; inter-rater reliability was .98. The progression from self-selected to maximal WISCI level also showed high agreement between and within raters, with no communication between therapists.

Walking Index for Spinal Cord Injury (WISCI II) Descriptors

Physical limitation for walking secondary to impairment is defined at the person level and indicates the ability of a person to walk after spinal cord injury. The development of this assessment index required a rank ordering along a dimension of impairment, from the level of most severe impairment (0) to least severe impairment (20) based on the use of devices, braces and physical assistance of one or more persons. The order of the levels suggests each successive level is a less impaired level than the former. The ranking of severity is based on the severity of the impairment and not on functional independence in the environment. The following definitions standardize the terms used in each item:

| | |
|-----------------------------|---|
| Physical assistance: | ‘Physical assistance of two persons’ is moderate to maximum assistance. ‘Physical assistance of one person’ is minimal to moderate assistance. ‘Contact guarding’ is minimal assistance |
| Braces: | ‘Braces’ means one or two braces, either short or long leg. (Splinting of lower extremities for standing is considered long leg bracing). ‘No braces’ means no braces on either leg. |
| Walker: | ‘Walker’ is a conventional rigid walker without wheels. |
| Crutches: | ‘Crutches’ can be Lofstrand (Canadian) or axillary. |
| Cane: | ‘Cane’ is a conventional straight cane. |

Level Description

- 0 Unable to stand and/or participate in assisted walking.
- 1 Ambulates in parallel bars, with braces and physical assistance of two persons, but less than 10 meters.
- 2 Ambulates in parallel bars, with braces and physical assistance of two persons, 10 meters.
- 3 Ambulates in parallel bars, with braces and physical assistance of one person, 10 meters.
- 4 Ambulates in parallel bars, no braces and physical assistance of one person, 10 meters.
- 5 Ambulates in parallel bars, with no braces and no physical assistance, 10 meters.
- 6 Ambulates with walker, with braces and physical assistance of one person, 10 meters.
- 7 Ambulates with two crutches, with braces and physical assistance of one person, 10 meters.
- 8 Ambulates with walker, no braces and physical assistance of one person, 10 meters.
- 9 Ambulates with walker, with braces and no physical assistance, 10 meters.
- 10 Ambulates with one cane/crutch, with braces and physical assistance of one person, 10 meters.
- 11 Ambulates with two crutches, no braces and physical assistance of one person, 10 meters.
- 12 Ambulates with two crutches, with braces and no physical assistance, 10 meters.
- 13 Ambulates with walker, no braces and no physical assistance, 10 meters.
- 14 Ambulates with one cane/crutch, no braces and physical assistance of one person, 10 meters.
- 15 Ambulates with one cane/crutch, with braces and no physical assistance, 10 meters.
- 16 Ambulates with two crutches, no braces and no physical assistance, 10 meters.
- 17 Ambulates with no devices, no braces and physical assistance of one person, 10 meters.
- 18 Ambulates with no devices, with braces and no physical assistance, 10 meters.
- 19 Ambulates with one cane/crutch, no braces and no physical assistance, 10 meters.
- 20 Ambulates with no devices, no braces and no physical assistance, 10 meters.

Scoring Sheet for the Walking Index for Spinal Cord Injury II (WISCI II)

Name _____

Date _____

Check descriptors that apply to current walking performance, and then assign the highest level of walking performance. (In scoring a level, one should choose the level at which the patient is safe as judged by the therapist, with patient's comfort level described. If devices other than those stated in the standard definitions are used, they should be documented as descriptors. If there is a discrepancy between two observers, the higher level should be chosen.)

Descriptors: Make ONE selection only in each section

| Devices | Comments | Braces | Comments |
|---|----------|--|----------|
| D1 Parallel bars < 10 meters | | B1 Long Leg Braces - Uses 2 - Locked at knee | |
| D2 Parallel bars 10+ meters | | B2 Long Leg Braces - Uses 1 - Locked at knee | |
| D3 Walker - Standard | | B3 Short Leg Braces - Uses 2 - Unlocked | |
| D4 Walker - rolling platform | | B4 Short Leg Braces - Uses 1 - Unlocked | |
| D5 Walker - other > describe >>> | | B5 Alpine boots | |
| D6 Crutches - Uses 2 | | B6 Ace bandages | |
| D7 Crutches - Uses 1 | | B7 High tops | |
| D8 Canes- Quad - Uses 2 | | B8 Other braces / bracing methods > describe > | |
| D9 Canes- Quad - Uses 1 | | B9 No braces | |
| D10 No devices | | | |
| Assistance | Comments | Patient reported comfort level | Comments |
| A1 Max assist x 2 people* | | C1 Very comfortable | |
| A2 Min/Mod assist x 2 people* | | C2 Slightly comfortable | |
| A3 Min/Mod assist x 1 person [†] | | C3 Neither comfortable nor uncomfortable | |
| A4 No assistance | | C4 Slightly uncomfortable | |
| Patient safety comments | | | |

*Applies only to WISCI II levels 1 and 2; [†]Applies to WISCI II levels 3,4,6,7,8,10,11,14,17

WISCI Levels

| Level | Devices | Braces | Assistance | Distance |
|-------|-----------------|-----------|---------------|---------------------|
| 0 | | | | Unable |
| 1 | Parallel bars | Braces | 2 persons | Less than 10 meters |
| 2 | Parallel bars | Braces | 2 persons | 10 meters |
| 3 | Parallel bars | Braces | 1 person | 10 meters |
| 4 | Parallel bars | No braces | 1 person | 10 meters |
| 5 | Parallel bars | Braces | No assistance | 10 meters |
| 6 | Walker | Braces | 1 person | 10 meters |
| 7 | Two crutches | Braces | 1 person | 10 meters |
| 8 | Walker | No braces | 1 person | 10 meters |
| 9 | Walker | Braces | No assistance | 10 meters |
| 10 | One cane/crutch | Braces | 1 person | 10 meters |
| 11 | Two crutches | No braces | 1 person | 10 meters |
| 12 | Two crutches | Braces | No assistance | 10 meters |
| 13 | Walker | No braces | No assistance | 10 meters |
| 14 | One cane/crutch | No braces | 1 person | 10 meters |
| 15 | One cane/crutch | Braces | No assistance | 10 meters |
| 16 | Two crutches | No braces | No assistance | 10 meters |
| 17 | No devices | No braces | 1 person | 10 meters |
| 18 | No devices | Braces | No assistance | 10 meters |
| 19 | One cane/crutch | No braces | No assistance | 10 meters |
| 20 | No devices | No braces | No assistance | 10 meters |

Baseline/Self-Selected Level assigned _____

Maximum WISCI Level assigned _____