

# Wheelchair Circuit (WC)

## Assessment Overview

### Assessment Area

**ICF Domain:**

Activity

**Subcategory:**

Mobility

### You Will Need

**Length:**

Approx. 30-45 min, 8-9 tasks (2 min of rest between each task).

**Equipment:**

- Adjustable mat
- Wheelchair Treadmill (with 3% and 6% grade)
- Heart Rate monitor
- Stopwatch
- 0.10 m platform on floor
- Wood doorstep height 0.4 m
- Open space
- 15 m corridor

**Scoring:**

Successful performance (Y/N), time (seconds), and/or physical strain (peak HR) are recorded.

Ability score (0-8 or 0-9): number of tasks completed adequately.

For 3 tasks, 0.5 may be awarded if it is partially completed.

For the 8-item version:

Performance time score: sum of the times taken during "figure-of-8-shape" and "15m-sprint"

Physical strain score: mean peak HR between 3% & 6% slope tasks, expressed in bpm or %HRR

### Summary

The Wheelchair Circuit (WC) is a performance-based measure that assesses manual wheelchair mobility (i.e., skill and performance).

The WC includes functional tasks developed specifically for people with SCI who use manual wheelchairs. Some tasks may be too difficult / not suitable if individuals have medical complications (cardiovascular and musculoskeletal diseases), or are older.

Tasks cover three aspects of mobility:

- 1) Tempo (figure-of-8 shape and sprint)
- 2) Technical skill (crossing a doorstep, mounting a platform, and transferring)
- 3) Physical capacity (wheelchair propulsion and ascending slopes).

The performance time and physical strain are useful to monitor progress once the individual achieves a maximal score on the ability score or if they have not demonstrated any change over repeated administrations.

### Availability

**Worksheet:** Can be found [here](#).

**Languages:** English

## Assessment Interpretability

### Minimal Clinically Important Difference

#### Minimal Detectable Change:

Performance Time (s):

|                    |      |
|--------------------|------|
| Figure-8:          | 4.1  |
| Crossing Doorstep: | 6.1  |
| Mounting Platform: | 6.2  |
| Sprint:            | 1.5  |
| Transfer:          | 33.8 |

Peak Heart Rate (bpm):

|                     |      |
|---------------------|------|
| Figure-8:           | 18.9 |
| Crossing Doorstep:  | 17.7 |
| Mounting Platform:  | 21.3 |
| Sprint:             | 20.9 |
| Walking:            | 12.2 |
| 3% Slope:           | 25.5 |
| 6% Slope:           | 18.5 |
| Wheelchair Driving: | 19.2 |
| Transfer:           | 25.7 |

(Kilkens et al. 2002; n=27; 18 males, 9 females; mean (SD) age: 34.7 (12.5) years: tetraplegia and paraplegia; complete and incomplete injury; final stage of clinical rehabilitation)

### Statistical Error

#### SEM:

Performance Time (s):

|                    |      |
|--------------------|------|
| Figure-8:          | 1.5  |
| Crossing Doorstep: | 2.2  |
| Mounting Platform: | 2.3  |
| Sprint:            | 0.6  |
| Transfer:          | 12.2 |

Peak Heart Rate (bpm):

|                     |     |
|---------------------|-----|
| Figure-8:           | 6.8 |
| Crossing Doorstep:  | 6.4 |
| Mounting Platform:  | 7.7 |
| Sprint:             | 7.5 |
| Walking:            | 4.4 |
| 3% Slope:           | 9.1 |
| 6% Slope:           | 6.7 |
| Wheelchair Driving: | 6.9 |
| Transfer:           | 9.2 |

(Kilkens et al. 2002; n=27; 18 males, 9 females; mean (SD) age: 34.7 (12.5) years: tetraplegia and paraplegia; complete and incomplete injury; final stage of clinical rehabilitation)

### Typical Values

|    | Ability score | Performance Time (s) | Physical strain (%HRR) |
|----|---------------|----------------------|------------------------|
| T1 | 4.9<br>(2.4)  | 30.6<br>(16.1)       | 43.8<br>(17.8)         |
|    | 5.7<br>(1.8)  | 28.7<br>(15.4)       | 41.3<br>(16.8)         |
|    | 2.7<br>(2.4)  | 40.0<br>(17.3)       | 56.0<br>(11.4)         |
|    | 5.0<br>(2.2)  | 34.1<br>(20.5)       | 44.2<br>(15.3)         |
|    | 4.8<br>(2.5)  | 28.3<br>(12.2)       | 43.5<br>(20.0)         |
| T3 | 6.2<br>(2.2)  | 22.0<br>(10.6)       | 35.4<br>(17.5)         |
|    | 6.7<br>(2.0)  | 19.4 (7.7)           | 31.0<br>(14.4)         |
|    | 5.1<br>(2.6)  | 29.5<br>(13.8)       | 53.2<br>(18.6)         |
|    | 6.7<br>(1.6)  | 23.2<br>(11.6)       | 38.1<br>(18.1)         |
|    | 6.0<br>(2.5)  | 21.3 (1.0)           | 33.6<br>(17.3)         |

T1 – Admission; T3 – Discharge

(Kilkens et al. 2004; 8-task version; n=74, 51 males; mean (SD) age: 40.5 (14.5) years; majority of participants had paraplegia)

## Measurement Properties

### Validity – Moderate

#### Moderate correlation with Functional Independence Measure (FIM) – Mobility:

Ability Score:  $r = 0.517$  (Admission),  $0.519$  (Discharge)

Performance Time Score:  $r = -0.466$  (At admission),  $-0.396$  (At discharge)

(Between admission and discharge; Kilkens et al. 2004, 8-task version; n=74, 51 males; mean (SD) age: 40.5 (14.5) years; majority of participants had paraplegia)

Number of studies reporting validity data: 1

### Reliability – Moderate to High

#### High Inter-rater Reliability:

ICC = 0.97 (Overall task feasibility / ability), 0.76-0.98 (Task feasibility / ability for individual items), 0.82-0.99 (Peak HRs)

#### Moderate to High Intra-rater Reliability:

ICC = 0.98 (Overall task feasibility / ability), 0.71-0.99 (Performance times), 0.68-0.96 (Peak HRs)

(Kilkens et al. 2002; n=27; 18 males, 9 females; mean (SD) age: 34.7 (12.5) years: tetraplegia and paraplegia; complete and incomplete injury; final stage of clinical rehabilitation)

Number of studies reporting reliability data: 1

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## Responsiveness

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**Floor/Ceiling Effect:**

Not established in SCI

**Effect Size:**

Standardized Response Mean:

0.6 (WC Ability score)

0.9 (Performance Time score)

0.80 (Physical Strain score)

(Between admission and discharge; Kilkens et al. 2004, 8-task version; n=74, 51 males; mean (SD) age: 40.5 (14.5) years; majority of participants had paraplegia)

**Number of studies reporting  
responsiveness data: 1**