Neuromuscular Recovery Scale (NRS)

Assessment Overview

Assessment Area

ICF Domain:
Activity
Subcategory:
Mobility

You Will Need

Length:
30-50 minutes
Items:
1) Sit
2) Reverse sit-up
3) Sit-up
4) Trunk extension
5) Sit to stand
6) Stand
7) Walk
8) Stand retraining
9) Stand adaptability
10) Step retraining
11) Step adaptability

Equipment:
- Treadmill
- Body-weight supported system
- Four personnel

Scoring:
Each of the items represents a hierarchy of performance capacity from the lowest level (scored 1A) to a high level of capacity (scored 4). The examiner then calculates the overall phase based on the combined phase scores of each of the individual items. The continuum of scores proceeds from unable to complete the task to achieving full recovery by executing the tasks as done preinjury.

Summary

The Neuromuscular Recovery Scale (NRS) was developed by physical therapists and scientists within the Christopher and Dana Reeve Foundation NeuroRecovery Network (NRN).

The aim is to measure the quality of movement in a safe environment (a body weight support system and a treadmill are used) without compensatory movement patterns (Behrman et al. 2015). The reference for comparison is typical preinjury movement patterns during task performance.

The NRS includes 11 items and classifies motor function into 4 phases, with higher phases indicating a greater return of movement. Up to 3 subphases (a-c) per phase (phase 4 has no subphases) capture incremental changes within each task.

Phases:
1) Phase 1 represents the greatest impairment relative to normal movement patterns, with most people being nonambulatory and sitting being the goal.
2) In phase 2, people begin to stand and weight support independently with associated proper kinematics.
3) At phase 3, walking begins with several steps to continuous stepping.
4) Phase 4 reflects normal locomotor performance with marked adaptability to varying conditions and return to recreational activities (e.g., running).

Availability

Worksheet: Can be found in the appendix of the following articles:
- https://pubmed.ncbi.nlm.nih.gov/25912666/
- https://pubmed.ncbi.nlm.nih.gov/25883038/

Check http://neurorecoverylearning.org/ for further information, courses, and the cost of equipment.

Assessment Interpretability

Minimal Clinically Important Difference

Not established in SCI

Statistical Error

Standard Error of Measurement:
Not established in SCI

Minimal Detectable Change:
Not established in SCI

Typical Values

Mean (SD) Scores:
Not established in SCI

Measurement Properties

Validity – **Not rated**

The Principal Components Analysis (PCA) revealed that the Rasch measurement dimension explained 76.9% of the variance. Ten of 11 items and 91% of the patients fit the Rasch model, with 9 of 11 items showing high discrimination. Sixty-nine percent of the ratings met criteria.

(Velozo et al. 2015; n=188; 141 males, 41 females; mean age 39.3 years, complete and incomplete SCI (ASIA A-D); injury level: 132 cervical, 53 thoracic, 3 lumbar; mean time since injury 1.2 years)

Number of studies reporting validity data: 1

Reliability – **High**

High Test-retest Reliability:
$\rho = 0.99$

(Behrman et al. 2015; n=69; 56 males, 12 females; mean age 36 years; complete and incomplete SCI (ASIA A-D); injury level: 46 cervical, 23 thoracic; mean time since injury 3.3 years)

High Inter-rater Reliability:
ICC = 0.96

(Behrman et al. 2019; Pediatric NRS; n=32; 17 males, 15 females; mean age 6 years, incomplete and complete SCI (ASIA A-D); injury level: 12 tetraplegia, 12 paraplegia)

W = 0.91 – 0.98

(Basso et al. 2015; n=10; 7 males, 3 females; mean age 43 years; complete and incomplete SCI (ASIA A-D); level of injury: 8 cervical, 2 thoracic; mean time since injury 26 months)

Number of studies reporting reliability data: 3

Responsiveness

Floor/Ceiling Effect:
Does not have floor or ceiling effects

(Velozo et al. 2015; n=188; 141 males, 41 females; mean age 39.3 years, complete and incomplete SCI (ASIA A-D); injury level: 132 cervical, 53 thoracic, 3 lumbar; mean time since injury 1.2 years)

Effect Size:
None

Number of studies reporting responsiveness data: 2
Adjusted response mean = 1.05; CI = 0.75-1.35)

The scale was also significantly responsive for the different SCI subgroups; it was higher for individuals classified as AIS C or D (ARM = 1.53 [1.13, 1.96]) compared with individuals classified as AIS A or B (ARM = 0.64 [0.22, 1.05]).

(Tester et al. 2016; n = 72, 57 males, 15 females, mean age 36 years, mean time since injury = 0.7 years)