

## Appraisal

## Clinimetrics: The Neurological Fatigue Index for Multiple Sclerosis

### Summary

**Description:** Fatigue is common in multiple sclerosis (MS). However, a broadly accepted definition of fatigue is lacking and, with that, the determination of its many dimensions.<sup>1</sup> Usually, fatigue in MS is quantified by means of self-report questionnaires assessing the perceived level or impact of fatigue.

The Neurological Fatigue Index MS (NFI-MS)<sup>a</sup> is a self-report questionnaire that was specifically developed to measure fatigue severity and factors influencing fatigue in patients with MS. Using Rasch analysis, the initial 57 potential items were reduced to 23 items in the final questionnaire.<sup>2</sup> The 23 items are subdivided over four different unidimensional subscales: physical (eight items), cognitive (four items), relief by diurnal sleep or rest (six items) and abnormal nocturnal sleep and sleepiness (five items). Participants rate their agreement with each item on a 4-point Likert scale: 0 = 'strongly disagree', 1 = 'disagree', 2 = 'agree' and 3 = 'strongly agree'. For each of the subscales, a total score can be calculated, with higher scores corresponding to more fatigue. In addition, a summary NFI-MS score can be calculated (range summary score 0 to 30) and contains 10 items (seven and three items from the subscales physical and cognitive, respectively). There is a single-sentence instruction asking respondents to consider their experience over the previous 2 weeks.

Assessment of the psychometric properties of the NFI-MS has been performed for the English<sup>2</sup> and Dutch<sup>3</sup> versions. Sufficient test-retest reliability (ICC 0.75 to 0.83) and small measurement errors

(SEM<sub>agreement</sub> as % of scale range 8.3 to 9.2) were found on all subscales of the Dutch version.<sup>3</sup> Moreover, using the Bland and Altman method, a negligible systematic difference (−0.07; limits of agreement −6.91/6.77) for the summary scale of the NFI-MS was found.<sup>3</sup> For the English version,<sup>2</sup> test-retest reliability was good (Spearman  $\rho$  0.79 to 0.86). In addition, there were no significant differences in the median scores for two time points separated by 2 to 4 weeks ( $p > 0.05$ ).<sup>3</sup>

Construct validity of the Dutch NFI-MS<sup>3</sup> was confirmed by high correlations with commonly used self-report fatigue questionnaires Fatigue Severity Scale (FSS)<sup>4</sup> and Modified Fatigue Impact Scale (MFIS)<sup>5</sup> and moderate correlations between non-similar constructs (eg, NFI-MS physical and MFIS cognitive<sup>5</sup> ( $r = 0.30$  to  $0.59$ )). Construct validity of the English version<sup>2</sup> was confirmed by moderate correlations ( $r = 0.4$  to  $0.7$ ) between the NFI-MS and comparative measures in the MFIS physical subscale,<sup>5</sup> MFIS cognitive subscale,<sup>5</sup> FSS-5<sup>6</sup> and a Visual Analogue Scale score ('lively and alert' (0, left) to 'absolutely no energy to do anything at all' (10, right)).

The minimum clinically important difference (MCID) was determined for the English version. Using the interval level NFI-MS scores, the largest MCID equated to 2.49 points on the Summary scale, 2.36 points on the Physical scale, 0.84 points on the Cognitive scale, 0.97 on the Diurnal Sleep scale and 1.95 on the Nocturnal Sleep scale.<sup>7</sup> The NFI-MS thus has desirably smaller MCIDs and is therefore responsive.

### Commentary

The NFI-MS is a valid, reliable and responsive self-reported measurement of fatigue. The 5- to 10-minute completion time is very acceptable, improving the clinical utility of the NFI-MS. In addition, on-line administration allows for automatic calculation of sub scores, increasing feasibility if the clinician or patient has limited time to conduct the assessment.

Limitations: The absence of a widely accepted definition of fatigue poses significant challenges for adequately assessing criterion validity of fatigue questionnaires.<sup>8</sup> The clinician or researcher has to consider that each self-report fatigue questionnaire is characterised by its own underlying construct, measurement properties and practical feasibility. Most importantly, clinicians who use self-report questionnaires to monitor changes in fatigue perception should be aware of the methodological properties and limitations of these instruments. Outcome measures that are used to evaluate treatment effects in clinical practice should be able to reliably identify clinically relevant changes at an individual level. This suggests that the demands with regard to reliability and responsiveness are high, in comparison with

outcome measures that are used for research purposes at a group level.

**Provenance:** Invited. Not peer reviewed.

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### References

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<sup>a</sup> The NFI-MS is free for use in Public Health and non-for-profit agencies, and can be obtained from the University of Leeds by a simple registration (<http://www.leeds.ac.uk/medicine/rehabmed/psychometric/Scales1.htm>).