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Definition of the construct to be measured is a prerequisite for the assessment of validity. The Neck Disability Index as an example

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Abstract

Objective: To determine the content, structural, and construct validity of the Dutch version of the Neck Disability Index (NDI).

Study Design and Setting: To assess content validity, 11 neck pain experts and 10 patients commented on the construct, comprehensiveness, and relevance of the NDI. Structural validity was assessed by item factor analysis (FA) and item response theory modeling using the generalized partial credit model. Differential item functioning (DIF) analysis for gender was examined. Pearson correlation coefficient with the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was calculated to assess construct validity.

Results: In addition to a suboptimal translation, we found a lack of consensus on the construct the NDI intends to measure. Experts and patients suggested that the NDI measures more than physical functioning. Unidimensionality of the NDI could not be confirmed. DIF analysis for gender showed DIF for the headache item. The goodness-of-fit statistics for FA with one factor were satisfactory when the item ''concentration'' was omitted. A correlation of 0.75 with the DASH was found supporting construct validity.

Conclusion: It is questionable whether in research the NDI should be the instrument of choice for use as a primary outcome measure. Definition of the construct to be measured is a prerequisite for the assessment of validity.

Keywords: Neck Disability Index; Construct; Content validity; Construct validity; Item response theory; Patient-reported outcome measure

1. Introduction

A recent systematic review on the measurement properties of disease-specific questionnaires in patients with neck pain indicated that the Neck Disability Index (NDI) is the most frequently evaluated questionnaire [1]. Researchers and clinicians often use the NDI to measure the level of disability and to study the effect of an intervention on patients with neck pain [2–5]. In developing the NDI, Vernon and Mior were inspired by Fairbank and Pynsent [6] who developed the Oswestry Disability Index (ODI) for measuring disability in patients with low back pain. The NDI was the first instrument designed to assess self-rated disability in patients with neck pain. Currently, there are more than 450 articles internationally that have cited the NDI. Numerous clinical guideline organizations, especially for whiplash management, have endorsed the NDI as the questionnaire of choice for patients with neck pain.

Vernon declared in an e-mail conversation (November 2011) that the construct of the NDI was ''self-rated disability,'' where disability was understood as the perceived effect of pain and impairment on the patient's performance and enjoyment of activities of daily living.

However, different opinions exist with regard to the meaning of the construct that the NDI aims to measure. Some researchers interpret the NDI as a measure of functional status [7,8], whereas others have a broader interpretation and see it as a measure of pain and disability [9]. As a result, confusion might arise as to what the NDI aims to measure and how scores should be interpreted.

The lack of consensus in the construct that the NDI aims to measure might hinder an assessment of the validity of the instrument as validity is defined as the extent to which an instrument measures what it purports to measure [10].

The aim of this article was to evaluate the quality of the translation of the most commonly used Dutch version of the

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What is new?

1. A clear definition of the construct to be measured is a prerequisite for the assessment of validity. It is unclear what the Neck Disability Index (NDI) aims to measure. It measures more than physical functioning, but for the measurement of a broader construct (e.g., disability), important items are missing. This also compromises other aspects of validity.
2. Analysis based on the consensus-based standards for the selection of health status measurement instruments for good content validity shows that the content validity of the NDI is poor. These identified conceptual problems might also apply to other questionnaires developed in the 80s and 90s.
3. In research, the NDI has long been considered the gold standard for measuring disability in patients with neck pain. Given current quality standards for patient-reported outcome instruments, questions could be raised whether the NDI should still be considered the first instrument of choice as a primary outcome measure in studies on patients with neck pain. We advocate the development of a new disease-specific instrument, starting from a clear definition of the construct to be measured and using more advanced psychometric techniques.

NDI (NDI-DV) and to determine its content, structural, and construct validity.

2. Methods

2.1. The NDI

The NDI is a patient-reported outcome (PRO) measure. It consists of 10 items. The 10 items have six response categories (range, 0−5; total score range, 0−50) [11] (Appendix A; available on the journal's website at www.jclinepi.com).

2.2. Translation

To check the Dutch translation of the NDI, the most commonly used NDI-DV [12] was translated back into English by two independently operating professional translators, blinded to the original English version. Discrepancies between the translated version, the versions translated back into English, and the original English version were discussed among five of the six authors and with the two professional translators to evaluate the quality of the translation.

2.3. Population

The NDI was completed by 338 patients with neck pain, who participated in a prospective cohort study with 97 chiropractors in Belgium and The Netherlands. Information on the characteristics of the patients included in our study can be found in Table 1. Inclusion criteria were the following: patients, age 18−65 years, who had neck pain with or without radiation into the arm as their main complaint, had not consulted a chiropractor for their neck complaint in the past 6 months and had a good understanding of the Dutch language. Exclusion criteria were red flags in the anamnesis or on clinical examination at the first visit. Patients completed a web-based version of the NDI at baseline, that is, maximum 2 days before the initial visit at the chiropractor and at 1, 3, 6, and 12 months of follow-up. Patients were treated for their neck pain by and at the discretion of a chiropractor, but other interventions and/or pain medication were allowed. The 6-month data were used to assess the validity of the NDI-DV.

2.4. Content validity

Based on the *CO*nsensus-based *S*tandards for the selection of health status *M*easurement *IN*struments (COSMIN Standards) [13], four requirements for good content validity were defined:

1. All items should refer to relevant aspects of the construct to be measured.
2. All items should be relevant for the study population (e.g., age, gender, disease characteristics, country, and setting).
3. All items should be relevant for the purpose of the measurement instrument (discriminative, evaluative, and/or predictive).
4. All items together should comprehensively reflect the construct to be measured.

To evaluate the first requirement, a literature search was performed in MEDLINE (1990−December 2011), EMBASE (1990−December 2011), and CINAHL (1990−December 2011) for relevant articles pertaining to the development of the NDI and the definition of disability. Second, contact was established with the developer of the original version of the NDI (Vernon) to have full clarity as to the exact description of the original construct of the NDI. Third, 11 clinicians and/or researchers with expertise in neck pain were invited to comment on the construct of the NDI to reach a consensus on what the NDI aims to measure. To evaluate the second requirement, 10 consecutive new patients presenting to a private chiropractic practice with neck pain as their main complaint were recruited and asked to comment on the relevance of the 10 NDI items. The patients were asked to rate the intensity of their current pain on a numeric rating scale (NRS) from 0 to 10. These 10 patients were