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The Dutch–Flemish PROMIS Physical Function item bank exhibited strong psychometric properties in patients with chronic pain

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Abstract

Objective: The objective of this study was to assess the psychometric properties of the Dutch–Flemish Patient-Reported Outcomes Measurement Information System (PROMIS) Physical Function item bank in Dutch patients with chronic pain.

Study Design and Setting: A bank of 121 items was administered to 1,247 Dutch patients with chronic pain. Unidimensionality was assessed by fitting a one-factor confirmatory factor analysis and evaluating resulting fit statistics. Items were calibrated with the graded response model and its fit was evaluated. Cross-cultural validity was assessed by testing items for differential item functioning (DIF) based on language (Dutch vs. English). Construct validity was evaluated by calculation correlations between scores on the Dutch–Flemish PROMIS Physical Function measure and scores on generic and disease-specific measures.

Results: Results supported the Dutch–Flemish PROMIS Physical Function item bank's unidimensionality (Comparative Fit Index = 0.976, Tucker Lewis Index = 0.976) and model fit. Item thresholds targeted a wide range of physical function construct (threshold-parameters range: −4.2 to 5.6). Cross-cultural validity was good as four items only showed DIF for language and their impact on item scores was minimal. Physical Function scores were strongly associated with scores on all other measures (all correlations ≤ -0.60 as expected).

Conclusion: The Dutch–Flemish PROMIS Physical Function item bank exhibited good psychometric properties. Development of a computer adaptive test based on the large bank is warranted.

Keywords: Physical functioning; Chronic pain; PROMIS; Dutch–Flemish PROMIS; Item response theory; Psychometrics

1. Introduction

Physical function refers to the ability to perform activities of daily living and instrumental activities of daily living [1]. Limitations in physical function are a big concern for elderly and patients with chronic diseases such as musculoskeletal disease and chronic pain [2–4]. Because physical function is prerequisite for independent

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What is new?

- Findings from this study in patients with chronic pain contribute to the evidence for the good psychometric properties of the Patient-Reported Outcomes Measurement Information System (PROMIS) Physical Function item bank.
- If applied as Short Form or computerized adaptive testing (CAT), the item bank has the potential to improve the measurement of physical function in a user-friendly and efficient way.
- Results from this study expand the evidence for the validity of the Dutch−Flemish PROMIS Physical Function item bank across populations.

living, it is commonly measured in clinical care and often is a core outcome of treatment [3]. A large number of patient-reported outcome measures (PROMs) are available to measure physical function in patient populations [5−9]. However, these PROMs can be burdensome for patients because of their length and because items are not targeted to respondents' individual levels of physical function. Existing measures vary in measurement quality and precision and may have limited measurement range (i.e., ceiling and floor effects). Furthermore, scores of different physical function measures are not comparable across different PROMs.

The National Institutes of Health Patient-Reported Outcomes Measurement Information System (PROMIS) initiative developed a new state-of-the-art generic assessment tool to measure patient-reported health across different populations. To optimize content validity, items adapted from existing PROMs and new items were combined into item banks [10−14]. An item bank is a set of items (questions) measuring a common construct such as physical function [15]. Responses to items in an item bank were calibrated with item response theory (IRT), which orders items along a measurement continuum, based on item difficulty (e.g., ''are you able to run a mile'' is a more difficult item than ''are you able to move across the room'') and discrimination [16]. Once calibrated to an IRT model, the item bank can be used to tailor measurement to individual persons through computerized adaptive testing (CAT) [11]. A CAT is a computer-administered measure in which successive items are selected by a computer algorithm based on responses to previous items [11,15,17]. After each item, the person's score and the associated standard error are estimated, and when a predefined precision (e.g., standard error <0.3 on the theta metric; <3 on the T-score metric) is achieved, the computer stops administering items and estimates the final score. Typically, this ''stopping criterion'' can be reached after administering 3 to 7 items. It can also be programmed that the computer stops administering items after a certain number of items are administered, also called fixed-length CAT. Because the administration of items is tailored to individuals, persons only respond to a minimal number of highly informative and relevant items. With CATs, higher measurement precision (less measurement error) can be achieved with less response burden.

PROMIS item banks and CATs have the potential to be implemented worldwide. The PROMIS Physical Function item bank has shown to have stronger content validity, better responsiveness, and other desirable psychometric properties compared with traditional physical function PROMs such as the SF-36 Health Survey Physical Functioning scale (SF-36 PF) and the Health Assessment Questionnaire−Disability index (HAQ-DI) [12−14,18−20]. Furthermore, PROMIS scores are expressed on a standardized T-score metric (T-score 50 represents the average score of the general US population, with a standard deviation of 10) that facilitates interpretability of scores [21,22].

The Dutch−Flemish PROMIS Group translated 17 adult PROMIS item banks (including the PROMIS Physical Function item bank) and nine pediatric PROMIS item banks into Dutch−Flemish [23,24]. The Dutch−Flemish PROMIS Physical Function item bank has been administered and tested in patients with rheumatoid arthritis, which is a relatively homogeneous patient group [25]. In line with the PROMIS goals to calibrate a translated item bank in multiple validation studies and in patients with multiple conditions, we conducted a second validation study with the Dutch−Flemish PROMIS Physical Function item bank in a more heterogeneous sample, to evaluate the generalizability of its properties across patient populations.

The objective of present study was to examine unidimensionality and calibrate the item parameters of the Dutch−Flemish PROMIS Physical Function item bank in Dutch chronic pain patients. Furthermore, the objective was to evaluate the cross-cultural validity of the Dutch−Flemish compared with the US PROMIS Physical Function item bank, and its reliability and construct validity. The ultimate aim was to obtain a valid, reliable, user-friendly, and efficient measurement tool for assessing physical function, available to care providers and researchers in both the Netherlands and Flanders (the Dutch-speaking part of Belgium).

2. Methods

2.1. Study participants

For this study, 2,808 patients from the Amsterdam Pain (AMS-PAIN) cohort were invited to participate. The AMS-PAIN cohort comprises chronic pain patients who have been registered since September 2010 in Reade, an outpatient secondary care center for rheumatology and rehabilitation in the Netherlands. To be eligible, patients had to have at least one chronic pain condition of the