Leeds Institute of Rheumatic and Musculoskeletal Medicine

UNIVERSITY OF LEEDS

Rasch Analysis of the Health Assessment Questionnaire Disability Index in Psoriatic Arthritis

Mwidimi Ndosi,[1] Ming-Ann Hsu,[2] Joseph C. Cappelleri,[2] Heather Jones,[3] Amit Chhabra,[4] Philip Helliwell[1]

[1]Leeds Institute of Rheumatic and Musculoskeletal Medicine, University of Leeds, Leeds, UK, [2]Pfizer Inc. Groton, CT, USA,
[3]Pfizer Inc. Collegeville, PA, USA, [4]Pfizer Inc. New York, NY, USA

Background

The cross-cultural validity of the Health Assessment Questionnaire Disability Index (HAQ-DI) in psoriatic arthritis (PSA) has not been well studied.

Objective

To assess the validity of the HAQ-DI in PSA and determine its invariance to different patient characteristics including culture.

Patients

We included patients diagnosed with PsA recruited into GRACE project,[1] carried out over 15 countries in Europe, N America, S America and Asia. The HAQ-DI data from baseline visit was used, including: age, gender, disease duration, disease type and the degree of skin involvement

Methods

Analysis

We undertook Rasch analysis[2] to determine the scale's validity, person separation index (PSI) reliability, unidimensionality, targeting and the invariance of the scale across patient subgroups based on culture, age, gender, disease duration, disease type and extent of skin involvement.

Given fit to the model and unidimensionality, we calibrated an interval-level scale to enable transformation of raw HAQ-DI scores into Rasch-transformed values which can be used in parametric analyses (given a normal distribution and adequate sample sizes) alongside other outcome measures.

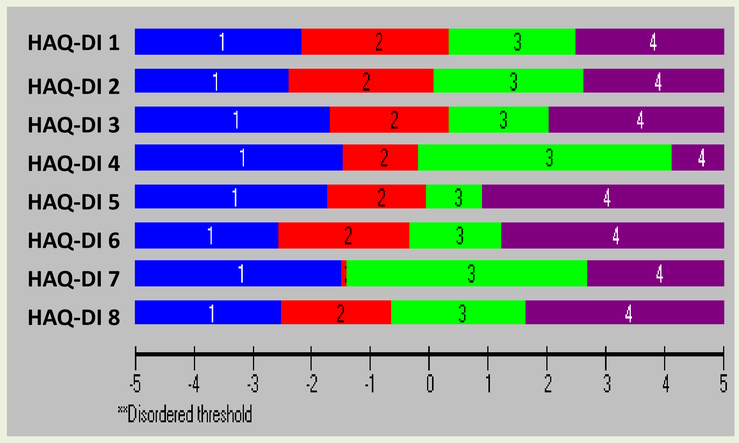
Results

Item Fit Statistics

Item	Loc	SE	Fit Res	X^2	P
HAQ-DI 1	0.227	0.087	-0.960	13.204	0.067
HAQ-DI 2	0.118	0.087	-0.165	8.080	0.326
HAQ-DI 3	0.236	0.084	2.339	7.320	0.396
HAQ-DI 4	0.826	0.087	0.250	12.825	0.076
HAQ-DI 5	-0.287	0.077	-0.816	10.203	0.177
HAQ-DI 6	-0.552	0.080	-2.154	11.425	0.121
HAQ-DI 7	-0.066	0.080	1.780	8.985	0.254
HAQ-DI 8	-0.503	0.081	-0.878	4.267	0.749

Loc = location
SE = Standard error
Fit Res = Standardised fit residuals
Non-significant p-value for X^2= fit to the model

Thresholds ordering



Summary measures of model fit

Region	Model Fit			Smith's Test[3]
	N	χ2 interaction (p)	PSI	Independent t-tests (95%CI)
UK	66	8.575 (0.379)	0.885	0.047 (0.001 to 0.094)
N America	83	5.299 (0.725)	0.860	0.015 (-0.022 to 0.052)
Europe (non-UK)	132	25.356 (0.064)	0.855	0.036 (0.003 to 0.070)
S America	45	6.086 (0.638)	0.765	0.051 (0.003 to 0.100)
Asia	27	8.027 (0.431)	0.818	0.029 (-0.044 to 0.101)
Perfect model fit		P-value > 0.05	>0.7	Lower bound 95%CI <0.05

PSI = Patient Separation Index Reliability (internal consistency equivalent to Chronbach's alpha)
Asia includes Australia, Korea and New Zealand
The sample sizes in S America and Asia were too small to reliably determine model fit

Patient characteristics

Total of 503 patients with PsA (diagnosed by a physician)

- Male = 287, female = 217
- Mean age = 50.8 years, SD = 13.1
- Psoriatic arthritis duration, mean = 9.8 years, SD = 9.9
- Psoriasis duration, mean = 18.4 years, SD = 13.7

Interval-level scale calibration

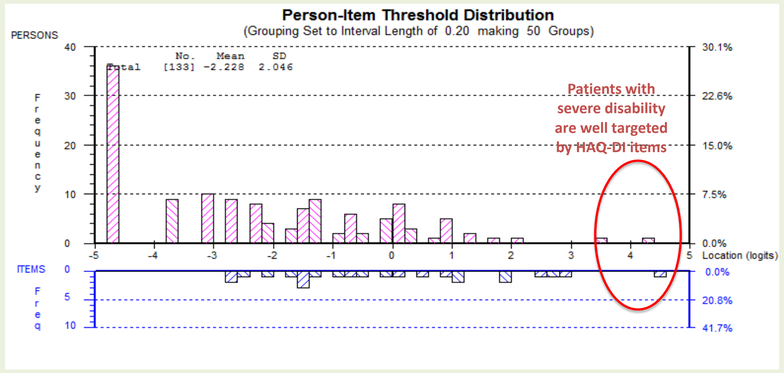
Raw score	Person location (on logit scale)	Rasch-transformed values
0	-4.558	0.0
1	-3.699	2.1
2	-3.080	3.6
3	-2.635	4.7
4	-2.275	5.6
5	-1.963	6.4
6	-1.680	7.0
7	-1.415	7.7
8	-1.160	8.3
9	-0.909	8.9
10	-0.658	9.5
11	-0.406	10.2
12	-0.151	10.8
13	0.109	11.4
14	0.376	12.1
15	0.652	12.8
16	0.943	13.5
17	1.253	14.2
18	1.587	15.0
19	1.953	15.9
20	2.361	16.9
21	2.831	18.1
22	3.404	19.5
23	4.184	21.4
24	5.246	24.0

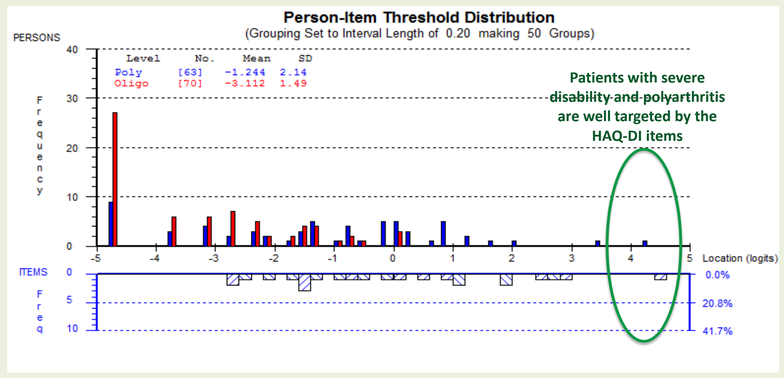
The Rasch-transformed values need to be divided by 8 to get a total HAQ score which ranges from 0 to 3.

Invariance

- The HAQ-DI was invariant to all subgroups of patients in the N America dataset
- In the pooled dataset, the HAQ-DI displayed differential item functioning (DIF) by type of arthritis, where those with oligoarthritis were more likely to have lower scores on the dressing & grooming item than those with polyarthritis.

Targeting





Conclusion

In Europe and N America, HAQ-DI is a cross-culturally valid and reliable measure of disability in PsA. Rasch-transformed values can be used with confidence alongside other outcome measures in parametric analyses.

References

1. Helliwell PS, FitzGerald O, Fransen J, et al. The development of candidate composite disease activity and responder indices for psoriatic arthritis (GRACE project). Annals of the Rheumatic Diseases. 2013;72(6):986-91.
2. Rasch G. Probabilistic models for some intelligence and attainment tests. Chicago: University of Chicago; 1960.
3. Smith Jr E. Detecting and evaluating the impact of multidimensionality using item fit statistics and principal component analysis of residuals. Journal of Applied Measurement. 2002; **3**(2): 205-231.

This study was funded by Pfizer