Psychometric Validation of the QOL-B Respiratory Domain in Adults with Newly Diagnosed or Recurrent *Mycobacterium avium* Complex (MAC) Lung Disease: The ARISE and ENCORE Studies

PCR140

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Supplemental Material

METHODS

- Model fit was evaluated using the C2-based RMSEA and corresponding 90% CI.
- Item and score properties evaluated included LD (Chen & Thissen's G^2), DIF (Wald-2 DIF Sweep procedure), and DTF (ETSSD [a Cohen's D analog for test score differences] and Test D-Max).
- The scoring algorithm was empirically supported by ECV, McDonald's omega, H, and FD statistics.

RESULTS

- Given the observed LD and persistent shortcomings in the MIRT model fit statistics (**Table 1**), item-parceling was explored.
- The parceled bifactor model had acceptable model fit and scoring statistics (RMSEA lower CI limit: 0.024; omega statistic ratio: 0.997) and LD concerns were resolved (**Table 1**).
- Item parameters were converted to IRFs to allow for easy visual interpretation of the item behavior (**Supplemental Figure 1**).
- During the DIF sweep procedure, Item 33 was found to have potential differential functioning across age groups. However, an exploration of DTF showed that the identified DIF had functionally no effect on the QOL-B-RD scores. Specifically, the DTF results indicated a very weak effect on scores for the age DIF associated with this item. Plotting the test scoring functions stratified on the age median-split demonstrated that the test scoring functions did not separate and nearly completely overlapped in their 95% confidence bands (**Supplemental Figure 2**).*
- Because the parceled bifactor model fit the data very closely, and the omega statistic ratio exceeds the threshold of 0.80 for supporting a unit-weighted score, a unidimensional unit-weighted score appears empirically justified for the QOL-B-RD within this context of use.

*The DIF results may change if assessed for a larger sample size.

Supplemental Table. Sample Characteristics

	Validation Analysis Sample (N=231)[a]
Age group, n (%)	
< 65 years	75 (32.61)
≥ 65 years	156 (67.83)
Sex, n (%)	
Female	186 (80.87)
Male	45 (19.57)
Race, n (%)	
American Indian or Alaska Native	0 (0.00)
Asian	55 (23.91)
Black or African American	1 (0.43)
Native Hawaiian or Other Pacific Islander	0 (0.00)
White	168 (73.04)
Other	0 (0.00)
Multiple	0 (0.00)
Not reported	6 (2.61)
Unknown	1 (0.43)
Ethnicity, n (%)	
Hispanic or Latino	11 (4.78)
Not Hispanic or Latino	214 (93.04)
Not reported	6 (2.61)
Weight at baseline, mean (min-max), kg	60.16 (36.0-139.0)
Height at baseline, mean (min-max), cm	164.79 (132.1-195.6)
BMI at baseline, mean (min-max), kg/m²	22.02 (13.6-42.0)
FEV1, mean (min-max), L	1.97 (0.55-4.22)

[a] This table presents the demographic characteristics for the validation analysis sample at baseline. While the baseline sample description is based on 231 patients, the cross-sectional validation analysis sample at baseline comprised 229 patients due to 2 patients not providing any item-level QOL-B-RD data.

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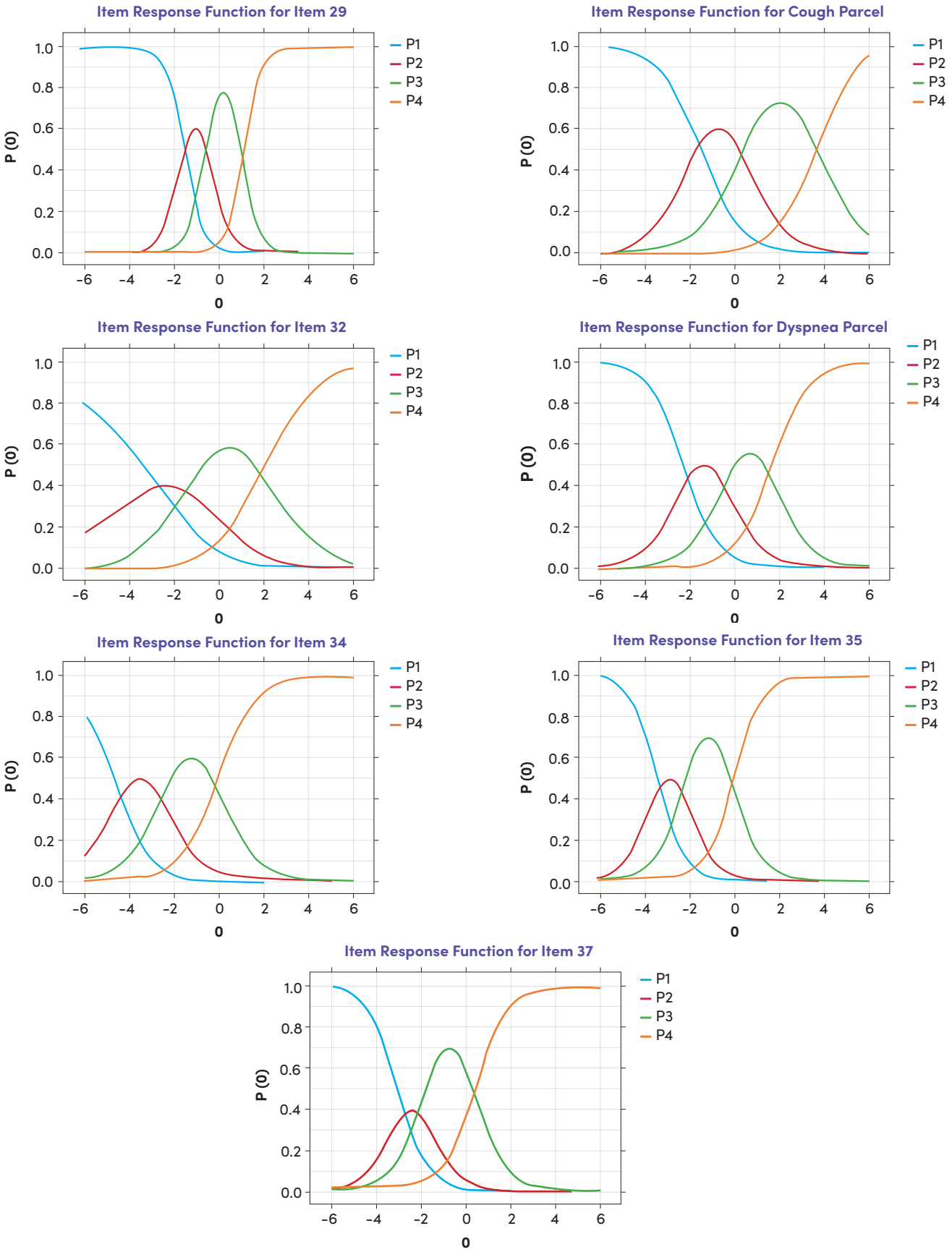
Supplemental Figure 1. Modern Psychometric Methods: IRFs for Parceled QOL-B-RD



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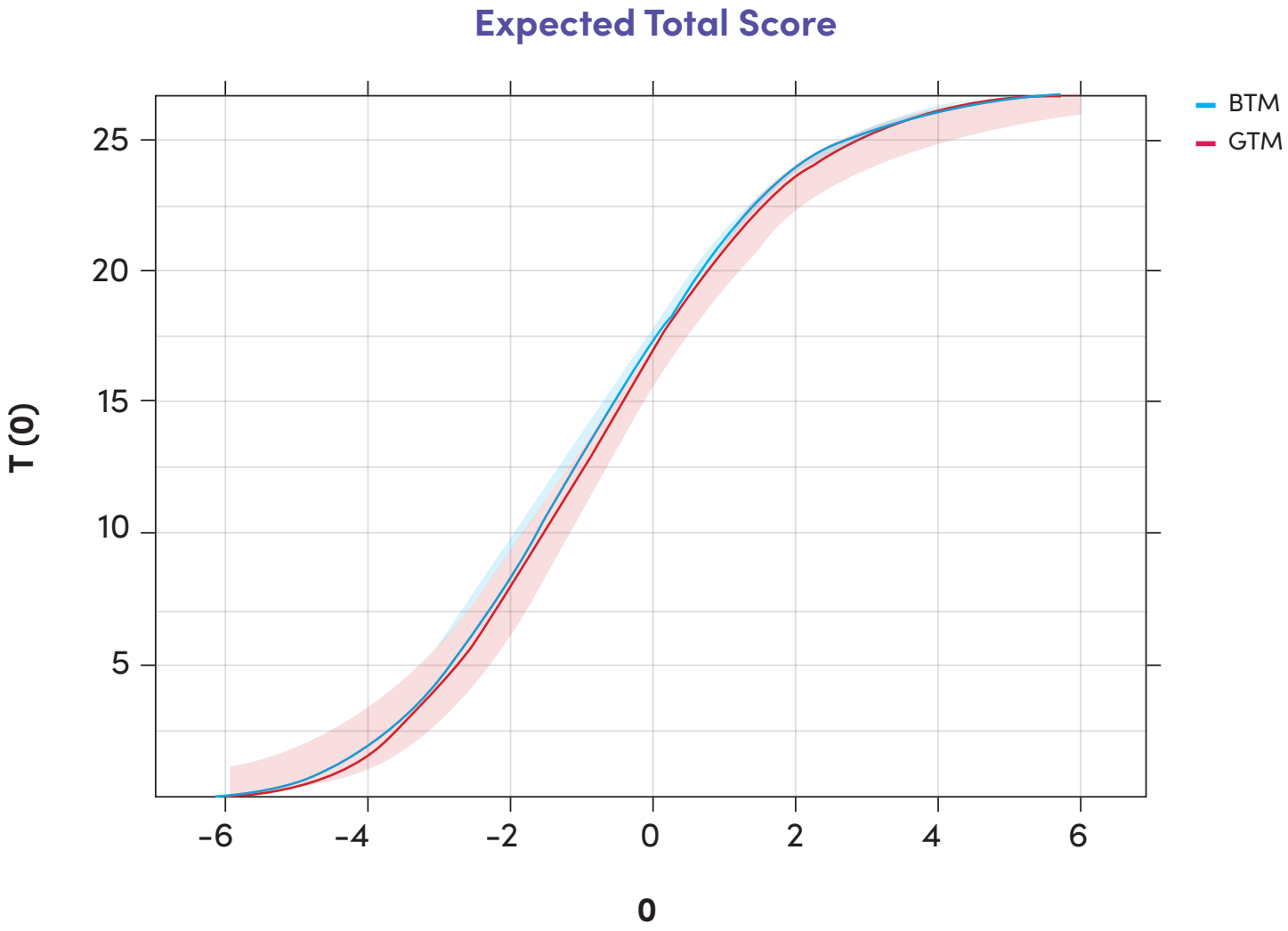
Supplemental Figure 2. Modern Psychometric Methods: QOL-B-RD Test Scoring Function Stratified on Age Median-Split



ABBREVIATIONS:

BMI, body mass index; BTM, below the median age; CI, confidence interval; DIF, differential item functioning; DTF, differential test functioning; ECV, explained common variance; ETSSD, expected test score standardized difference; FD, factor determinacy; FEV1, forced expiratory volume in 1 second; GTM, above the median age; IRF, item response function; LD, local dependence; MIRT, multidimensional item response theory; QOL-B-RD, Quality of Life-Bronchiectasis-Respiratory Domain; RMSEA, root mean squared error of approximation; Test D-Max, maximum expected test score difference.