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Evaluation of the WHOQOL-Bref in Six Countries: A Cross-Cultural Evaluation using Rasch Item Response Theory (IRT) Analysis

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Objective

Further compare the WHOQOL-Bref across six countries aiming at:

- evaluating the extent to which the item characteristics remain stable at each site
- examining whether the multiple aspects of the instrument form hierarchical and unidimensional indices that are reproducible across cultures

Methods

- Data taken from the Longitudinal Investigation of Depression Outcomes (LIDO)
- Primary care patients aged 18-75 in six countries
- Patients screened for depressive symptoms
- Highly symptomatic patients (CES-D ≥ 16) asked to participate in baseline assessment
- The following analysis utilizes this baseline data

Sample



• Be'er Sheva, Israel (n=378)



• Barcelona, Spain (n=472)



• Melbourne, Australia (n=437)



• Porto Alegre, Brazil (n=390)



• Seattle, Washington, USA (n=366)



• St. Petersburg, Russian Federation (n=310)

Sample Demographics

| | Age (mean (SD)) | Gender (% female) | Marital (% married) | Education (mean yrs) | Income* (USD) (median/month) |
|-----------------------|--------------------|----------------------|------------------------|-------------------------|---------------------------------|
| Be'er Sheva | 41.4 (14.3) | 62 | 67 | 11.9 (2.7) | 842 |
| Barcelona | 41.5 (15.2) | 71 | 56 | 10.7 (3.4) | 564 |
| Melbourne | 39.4 (14.3) | 65 | 26 | 12.5 (3.8) | 491 |
| Porto Alegre | 39.9 (13.6) | 75 | 53 | 9.3 (3.4) | 178 |
| Seattle | 41.8 (15.0) | 67 | 48 | 13.3 (2.3) | 1700 |
| St. Petersburg | 47.0 (16.2) | 72 | 45 | 11.8 (3.5) | 35 |

* What is your total personal income from all sources?

Survey

The WHOQOL-Bref:

- is a generic quality of life measure
- stemmed from the WHOQOL-100 work
- was developed simultaneously in many cultures and languages

Survey

The WHOQOL-Bref:

- consists of 26 questions
- has 4 independent subscales
 - Physical (7 items)
 - Psychological (6 items)
 - Social Relationships (3 items)
 - Environment (8 items)

Analysis

Rasch Item Response Theory provides:

- a method for obtaining objective, fundamental, linear measures from stochastic observations of ordered category responses.
- Provides estimates of item locations (calibrations) along a common measurement continuum expressed in log-odd units (logits) with standard errors.

Analysis - continued

We will also look at:

- information-weighted fit statistics (infit), more sensitive to unexpected behavior affecting responses to items near the person's ability level.
 - MNSQ (mean-square) statistic with expectation 1.00
(<0.75 indicating redundancy and >1.25 indicating responses that do not conform to the response patterning of most other items)
 - ZEMP – empirically restandardized fit statistic rescaled for easier interpretation
(<-2.00 indicating redundancy, >2.00 indicating responses that do not conform to the response patterning of most other items)

WQ-Bref – Physical

WQ03: To what extent do you feel that physical pain prevents you from doing what you need to do?

WQ04: How much do you need any medical treatment to function in your daily life?

WQ10: Do you have enough energy for everyday life?

WQ15: How well are you able to get around?

WQ16: How satisfied are you with your sleep?

WQ17: How satisfied are you with your ability to perform your daily living activities?

WQ18: How satisfied are you with your capacity for work?

Physical: Average Item Calibrations – Logit (Std Error)

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|--------------|--------------|--------------|--------------|--------------|---------------|
| WQ03 | -0.01 (0.06) | -0.34 (0.06) | -0.72 (0.06) | -0.29 (0.07) | -0.50 (0.06) | 0.09 (0.08) |
| WQ04 | -0.37 (0.06) | -0.56 (0.06) | -0.83 (0.06) | -0.52 (0.07) | -0.77 (0.07) | 0.46 (0.08) |
| WQ10 | 0.04 (0.06) | 0.00 (0.06) | 0.39 (0.07) | 0.31 (0.08) | 0.40 (0.07) | 0.05 (0.08) |
| WQ15 | -0.55 (0.07) | -0.70 (0.07) | -0.93 (0.06) | -0.84 (0.08) | -1.42 (0.07) | -1.48 (0.08) |
| WQ16 | 0.59 (0.06) | 0.80 (0.06) | 0.99 (0.07) | 0.52 (0.08) | 0.98 (0.08) | 0.16 (0.08) |
| WQ17 | 0.19 (0.06) | 0.37 (0.06) | 0.43 (0.06) | 0.50 (0.08) | 0.58 (0.07) | 0.28 (0.07) |
| WQ18 | 0.11 (0.06) | 0.42 (0.06) | 0.66 (0.06) | 0.32 (0.07) | 0.73 (0.06) | 0.42 (0.07) |

Physical: Item difficulty order across site

| Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-----------|-----------|--------------|---------|---------------|
| WQ16 | WQ16 | WQ16 | WQ16 | WQ16 | WQ04 |
| WQ17 | WQ18 | WQ18 | WQ17 | WQ18 | WQ18 |
| WQ18 | WQ17 | WQ17 | WQ18 | WQ17 | WQ17 |
| WQ10 | WQ10 | WQ10 | WQ10 | WQ10 | WQ16 |
| WQ03 | WQ03 | WQ03 | WQ04 | WQ03 | WQ03 |
| WQ04 | WQ04 | WQ04 | WQ03 | WQ04 | WQ10 |
| WQ15 | WQ15 | WQ15 | WQ15 | WQ15 | WQ15 |

Physical: Infit Statistics – Mean Squares and ZEMP

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-------------|-----------|-----------|--------------|-----------|---------------|
| WQ03 | 1.14 0.7 | 1.22 1.1 | 1.05 0.3 | 1.11 0.5 | 0.98 -0.1 | 1.02 0.1 |
| WQ04 | 1.03 0.1 | 1.22 1.1 | 1.01 0.1 | 1.11 0.5 | 1.34 1.4 | 0.99 -0.1 |
| WQ10 | 0.91 -0.5 | 0.82 -1.0 | 1.00 0.0 | 0.89 -0.6 | 0.97 -0.1 | 0.88 -0.7 |
| WQ15 | 1.16 0.7 | 0.99 -0.1 | 0.95 -0.3 | 0.98 -0.1 | 0.90 -0.4 | 1.14 0.8 |
| WQ16 | 1.24 1.2 | 1.15 0.8 | 1.31 1.7 | 1.39 1.7 | 1.29 1.2 | 1.34 1.8 |
| WQ17 | 0.67 -1.9 | 0.74 -1.5 | 0.71 -2.0 | 0.72 -1.5 | 0.67 -1.7 | 0.83 -1.1 |
| WQ18 | 0.84 -0.9 | 0.85 -0.8 | 0.92 -0.5 | 0.81 -1.0 | 0.83 -0.8 | 0.83 -1.1 |

Physical: Cronbach's alpha

| | Nº. of extreme cases | alpha |
|-----------------------|----------------------|-------------|
| Be'er Sheva | 4 (1%) | 0.82 |
| Barcelona | 0 | 0.78 |
| Melbourne | 0 | 0.85 |
| Porto Alegre | 0 | 0.84 |
| Seattle | 0 | 0.82 |
| St. Petersburg | 0 | 0.84 |

WQ-Bref – Psychological

WQ05: How much do you enjoy life?

WQ06: To what extent do you feel your life to be meaningful?

WQ07: How well are you able to concentrate?

WQ11: Are you able to accept your bodily appearance?

WQ19: How satisfied are you with your abilities?

WQ26: How often do you have negative feelings, such as blue mood, despair, anxiety, depression?

Psychological: Average Item Calibrations – Logit (SE)

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|--------------|--------------|--------------|--------------|--------------|---------------|
| WQ05 | 0.32 (0.06) | 0.50 (0.08) | -0.12 (0.07) | 0.73 (0.08) | -0.31 (0.09) | 0.80 (0.08) |
| WQ06 | 0.02 (0.07) | -0.43 (0.07) | -0.30 (0.07) | -0.55 (0.08) | -0.32 (0.08) | -0.23 (0.07) |
| WQ07 | -0.18 (0.07) | 0.37 (0.08) | -0.21 (0.08) | 0.07 (0.08) | -0.01 (0.10) | -1.05 (0.09) |
| WQ11 | -0.08 (0.06) | -0.88 (0.08) | -0.42 (0.08) | -0.56 (0.07) | -0.25 (0.08) | -0.47 (0.08) |
| WQ19 | -0.22 (0.06) | 0.13 (0.07) | 0.41 (0.07) | 0.10 (0.07) | 0.40 (0.08) | 0.48 (0.07) |
| WQ26 | 0.13 (0.08) | 0.30 (0.07) | 0.64 (0.08) | 0.22 (0.08) | 0.49 (0.09) | 0.48 (0.08) |

Psychological: Item difficulty order across site

| Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-----------|-----------|--------------|---------|---------------|
| WQ05 | WQ05 | WQ26 | WQ05 | WQ26 | WQ05 |
| WQ26 | WQ07 | WQ19 | WQ26 | WQ19 | WQ26 |
| WQ06 | WQ26 | WQ05 | WQ19 | WQ07 | WQ19 |
| WQ11 | WQ19 | WQ07 | WQ07 | WQ11 | WQ06 |
| WQ07 | WQ06 | WQ06 | WQ06 | WQ05 | WQ11 |
| WQ19 | WQ11 | WQ11 | WQ11 | WQ06 | WQ07 |

Psychological: Infit Statistics – Mean Squares and ZEMP

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-----------------|-----------------|-----------------|--------------|-----------|---------------|
| WQ05 | 0.70 -1.5 | 0.88 -0.7 | 0.78 -1.1 | 0.91 -0.8 | 0.89 -0.7 | 0.78 -1.5 |
| WQ06 | 1.36 1.4 | 0.91 -0.5 | 0.80 -1.0 | 0.84 -1.3 | 0.91 -0.6 | 0.94 -0.4 |
| WQ07 | 0.98 -0.1 | 1.10 0.5 | 1.11 0.5 | 1.08 0.7 | 1.13 0.7 | 1.21 1.3 |
| WQ11 | 1.13 0.5 | 1.38 1.9 | 1.43 1.7 | 1.13 1.0 | 1.25 1.4 | 1.20 1.2 |
| WQ19 | 0.77 -1.1 | 0.82 -1.1 | 0.85 -0.7 | 0.87 -1.1 | 0.76 -1.6 | 0.91 -0.6 |
| WQ26 | 1.07 0.3 | 0.93 -0.4 | 1.03 0.2 | 1.14 1.0 | 0.98 -0.2 | 0.97 -0.2 |

Psychological : Cronbach's alpha

| | Nº. of extreme cases | alpha |
|-----------------------|----------------------|-------------|
| Be'er Sheva | 2 (0.5%) | 0.80 |
| Barcelona | 0 | 0.84 |
| Melbourne | 0 | 0.83 |
| Porto Alegre | 2 (0.5%) | 0.79 |
| Seattle | 0 | 0.86 |
| St. Petersburg | 0 | 0.76 |

WQ-Bref – Social Relationships

WQ20: How satisfied are you with your personal relationships?

WQ21: How satisfied are you with your sex life?

WQ22: How satisfied are you with the support you get from your friends?

Social: Average Item Calibrations – Logit (SE)

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|------|--------------|--------------|--------------|--------------|--------------|---------------|
| WQ20 | -0.34 (0.07) | -0.26 (0.07) | 0.06 (0.06) | -0.28 (0.08) | 0.16 (0.07) | 0.19 (0.08) |
| WQ21 | 0.52 (0.08) | 0.75 (0.07) | 0.51 (0.06) | 0.49 (0.08) | 0.49 (0.07) | 0.16 (0.07) |
| WQ22 | -0.19 (0.07) | -0.49 (0.07) | -0.58 (0.07) | -0.21 (0.08) | -0.65 (0.08) | -0.35 (0.08) |

Social: Item difficulty order across site

| Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-----------|-----------|--------------|---------|---------------|
| WQ21 | WQ21 | WQ21 | WQ21 | WQ21 | WQ20 |
| WQ22 | WQ20 | WQ20 | WQ22 | WQ20 | WQ21 |
| WQ20 | WQ22 | WQ22 | WQ20 | WQ22 | WQ22 |

Social: Infit Statistics – Mean Squares and ZEMP

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|------|-------------|-----------|-----------|--------------|-----------|---------------|
| WQ20 | 0.82 -1.4 | 0.86 -1.4 | 0.71 -1.4 | 0.84 -1.0 | 0.75 -1.5 | 0.92 -1.3 |
| WQ21 | 1.14 1.0 | 1.00 0.0 | 1.04 0.2 | 1.22 1.3 | 1.02 0.1 | 0.98 -0.2 |
| WQ22 | 1.03 0.2 | 1.10 0.9 | 1.24 1.0 | 0.91 -0.6 | 1.18 0.9 | 1.07 1.1 |

Social : Cronbach's alpha

| | N ^o . of extreme cases | alpha |
|-----------------------|-----------------------------------|-------------|
| Be'er Sheva | 28 (7.4%) | 0.70 |
| Barcelona | 10 (2.1%) | 0.72 |
| Melbourne | 14 (3.2%) | 0.70 |
| Porto Alegre | 5 (1.3%) | 0.71 |
| Seattle | 8 (2.2%) | 0.75 |
| St. Petersburg | 10 (3.2%) | 0.68 |

WQ-Bref – Environment

WQ08: How safe do you feel in your daily life?

WQ09: How healthy is your physical environment?

WQ12: Have you enough money to meet your needs?

WQ13: How available to you is the information that you need in your day-to-day life?

WQ14: To what extent do you have the opportunity for leisure activities?

WQ23: How satisfied are you with the conditions of your living place?

WQ24: How satisfied are you with your access to health services?

WQ25: How satisfied are you with your mode of transportation?

Environment: Average Item Calibrations – Logit (SE)

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|--------------|--------------|--------------|--------------|--------------|---------------|
| WQ08 | 0.01 (0.06) | 0.46 (0.07) | 0.03 (0.06) | 0.17 (0.07) | 0.02 (0.08) | -0.14 (0.07) |
| WQ09 | -0.15 (0.06) | 0.19 (0.07) | 0.20 (0.06) | 0.00 (0.07) | 0.02 (0.08) | -0.13 (0.07) |
| WQ12 | 0.66 (0.06) | 0.12 (0.06) | 0.68 (0.05) | 1.18 (0.08) | 0.74 (0.06) | 1.34 (0.07) |
| WQ13 | -0.39 (0.07) | -0.46 (0.07) | -0.40 (0.06) | -0.50 (0.07) | -0.47 (0.07) | -1.11 (0.08) |
| WQ14 | 0.65 (0.06) | 0.54 (0.06) | 0.62 (0.06) | 0.68 (0.07) | 0.66 (0.07) | 0.52 (0.06) |
| WQ23 | -0.01 (0.05) | -0.46 (0.06) | -0.06 (0.05) | -0.54 (0.06) | 0.07 (0.06) | -0.21 (0.06) |
| WQ24 | -0.40 (0.07) | -0.32 (0.06) | -0.77 (0.07) | -0.68 (0.06) | -0.47 (0.07) | -0.25 (0.06) |
| WQ25 | -0.36 (0.06) | -0.06 (0.06) | -0.30 (0.06) | -0.31 (0.06) | -0.57 (0.07) | -0.02 (0.06) |

Environment: Item difficulty order across site

| Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-----------|-----------|--------------|---------|---------------|
| WQ12 | WQ14 | WQ12 | WQ12 | WQ12 | WQ12 |
| WQ14 | WQ8 | WQ14 | WQ14 | WQ14 | WQ14 |
| WQ8 | WQ9 | WQ9 | WQ8 | WQ23 | WQ25 |
| WQ23 | WQ12 | WQ8 | WQ9 | WQ8 | WQ9 |
| WQ9 | WQ25 | WQ23 | WQ25 | WQ9 | WQ8 |
| WQ25 | WQ24 | WQ25 | WQ13 | WQ13 | WQ23 |
| WQ13 | WQ23 | WQ13 | WQ23 | WQ24 | WQ24 |
| WQ24 | WQ13 | WQ24 | WQ24 | WQ25 | WQ13 |

Environment: Infit Statistics – Mean Squares and ZEMP

| | Be'er Sheva | Barcelona | Melbourne | Porto Alegre | Seattle | St Petersburg |
|-------------|-------------|-----------|-----------|--------------|------------------|---------------|
| WQ08 | 1.06 0.5 | 1.01 0.2 | 0.93 -0.7 | 0.97 -0.7 | 1.02 0.4 | 1.06 0.8 |
| WQ09 | 1.06 0.5 | 0.96 -0.7 | 0.95 -0.5 | 1.08 1.4 | 0.99 -0.1 | 0.99 -0.1 |
| WQ12 | 0.83 -1.7 | 0.96 -0.7 | 0.89 -1.2 | 1.04 0.8 | 0.99 -0.1 | 0.89 -1.4 |
| WQ13 | 0.90 -0.9 | 0.98 -0.4 | 0.90 -1.0 | 0.94 -1.2 | 0.88 -2.2 | 1.02 0.2 |
| WQ14 | 1.21 1.9 | 1.09 1.7 | 1.10 1.0 | 0.95 -0.9 | 1.04 0.6 | 0.91 -1.2 |
| WQ23 | 0.93 -0.6 | 0.93 -1.2 | 0.95 -0.6 | 0.96 -0.9 | 1.07 1.3 | 1.05 0.7 |
| WQ24 | 1.04 0.3 | 0.97 -0.5 | 1.18 1.4 | 0.99 -0.2 | 1.07 1.1 | 0.95 -0.7 |
| WQ25 | 0.99 -0.1 | 1.09 1.5 | 1.13 1.2 | 1.07 1.3 | 0.98 -0.3 | 1.13 1.8 |

Environment : Cronbach's alpha

| | N°. of extreme cases | alpha |
|-----------------------|----------------------|-------------|
| Be'er Sheva | 2 (0.5%) | 0.77 |
| Barcelona | 0 | 0.75 |
| Melbourne | 0 | 0.81 |
| Porto Alegre | 0 | 0.70 |
| Seattle | 0 | 0.82 |
| St. Petersburg | 1 (0.3%) | 0.71 |

Conclusions

The combined results of the Rasch IRT analyses support the WHOQOL-Bref subscales as:

- **stable and reproducible across these countries**
(with average item-calibration estimates incorporating suitable ranges of logit values with good item spacing)
- **hierarchical and unidimensional indices**
(with acceptable goodness-of-fit statistics. Very few infit values were outside recommended ranges.)

Moving Forward

Further analysis:

- Take a closer look at the Physical subscale (particularly with the “sleep satisfaction” item).
- Reproducibility – test whether item order and item calibrations along the continuum remain relatively constant across different groups of patients and different time points.