Equating UDS Neuropsychological Tests:

3.0>2.0, 3.0=2.0, 3.0<2.0?

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There are three kinds of statisticians. Those who can count and those who can't.

Gerald Van Belle, (with apologies to his original source)

Short Version - Conclusions

- Measure selection
- Study design
- Statistical and psychometric methods

Overview

- Test Equating: What does this mean?
- Content issues
- Study design issues
- Statistical / psychometric issues
- Implications for UDS transition

How/when are tests equivalent?

- Have same content
- Have same statistical properties
  - Mean
  - Variance
- Have same psychometric properties
  - Reliability
  - Validity

Equivalent Content in Equated Tests

- Equivalent tests should measure the same domain
- Trivial example
  - A test of object naming is never equivalent to a list learning test
- Less trivial example
  - A test of global cognition with episodic memory (or object naming) content is not the same as a test of global cognition without episodic memory (or object naming) content

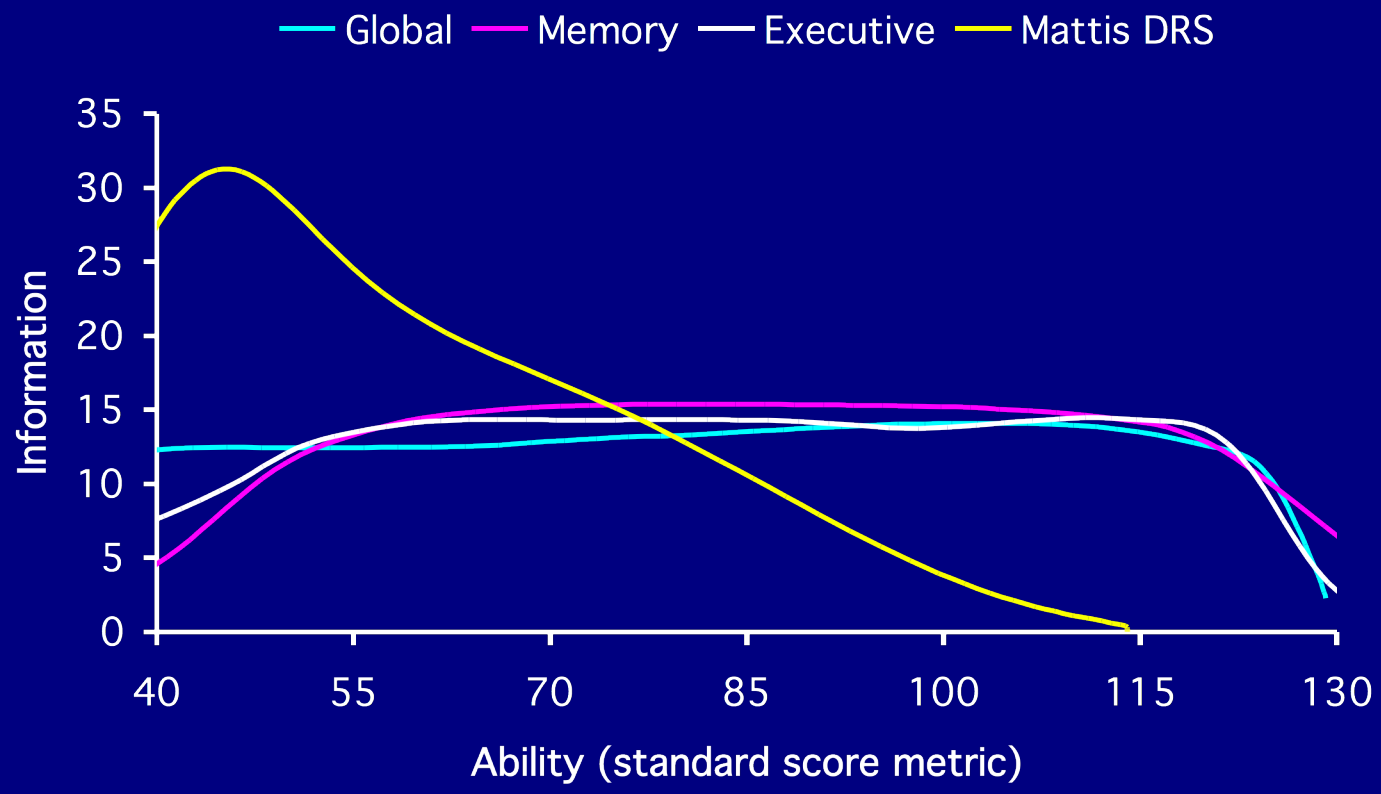
Equivalent Statistical Properties in Equated Tests

- Equivalent tests should have the same distributions
  - in equivalent samples
- Minimally, means and variances should be the same
- Distribution shape must also be the same

Equivalent Psychometric Properties in Equated Tests

- Minimally, classical test theory reliability should be the same
  - Internal consistency reliability
  - Test-retest reliability
- Reliability at different points of the ability continuum must also be the same
  - Psychometric matching
  - IRT

TICs from an Existing Global Cognition Scale and Re-Calibrated Existing Cognitive Tests



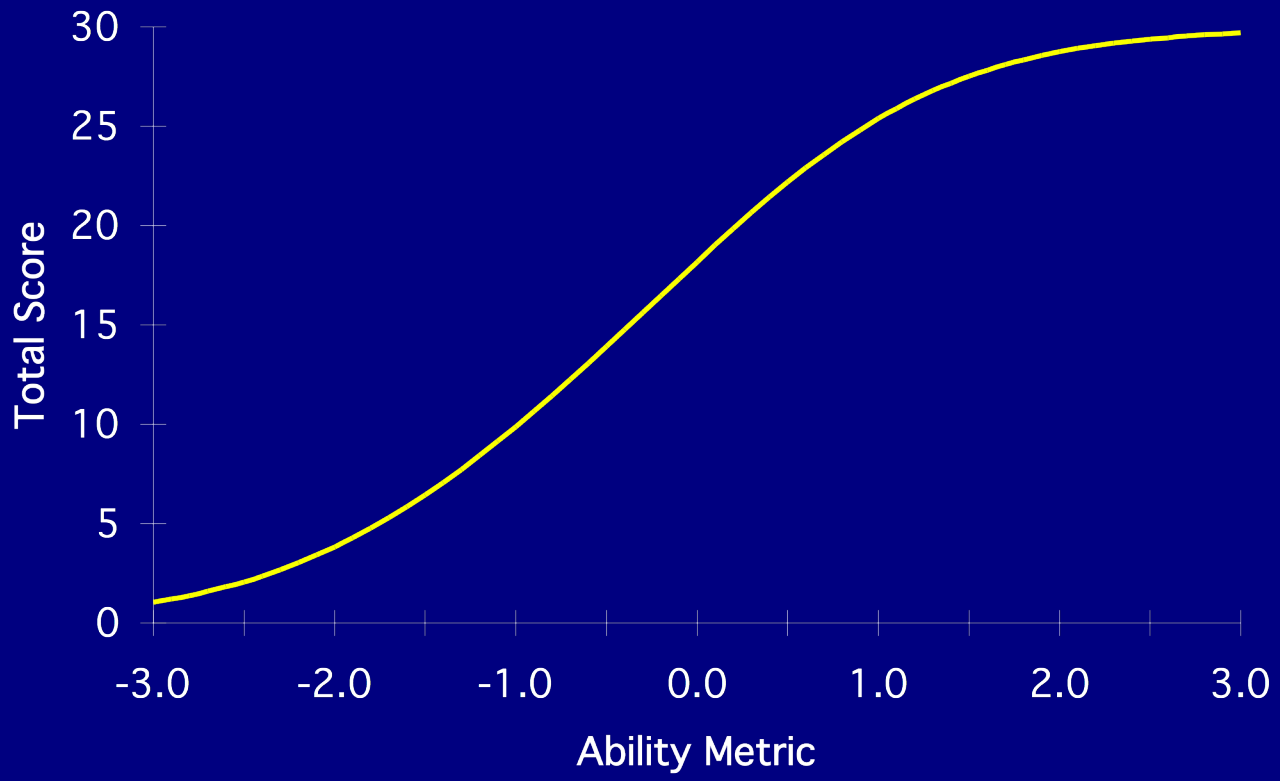
Mungas et al., Neuropsychology, 2003

Psychometric Properties of Equated Tests

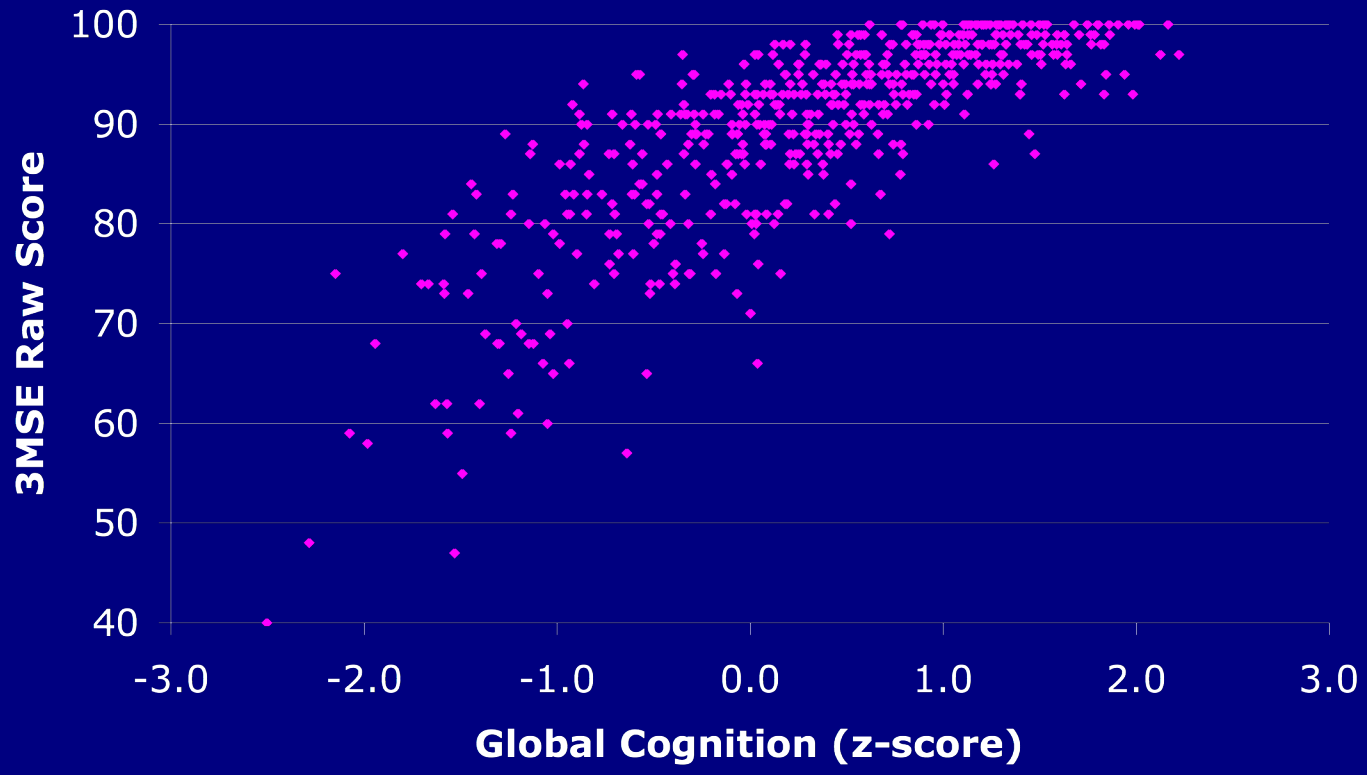
- Linear measurement is a nice property
  - Especially for longitudinal studies

Test Characteristic Curve

Mini-Mental State Examination



Relationship of 3MSE to Global Cognitive Ability



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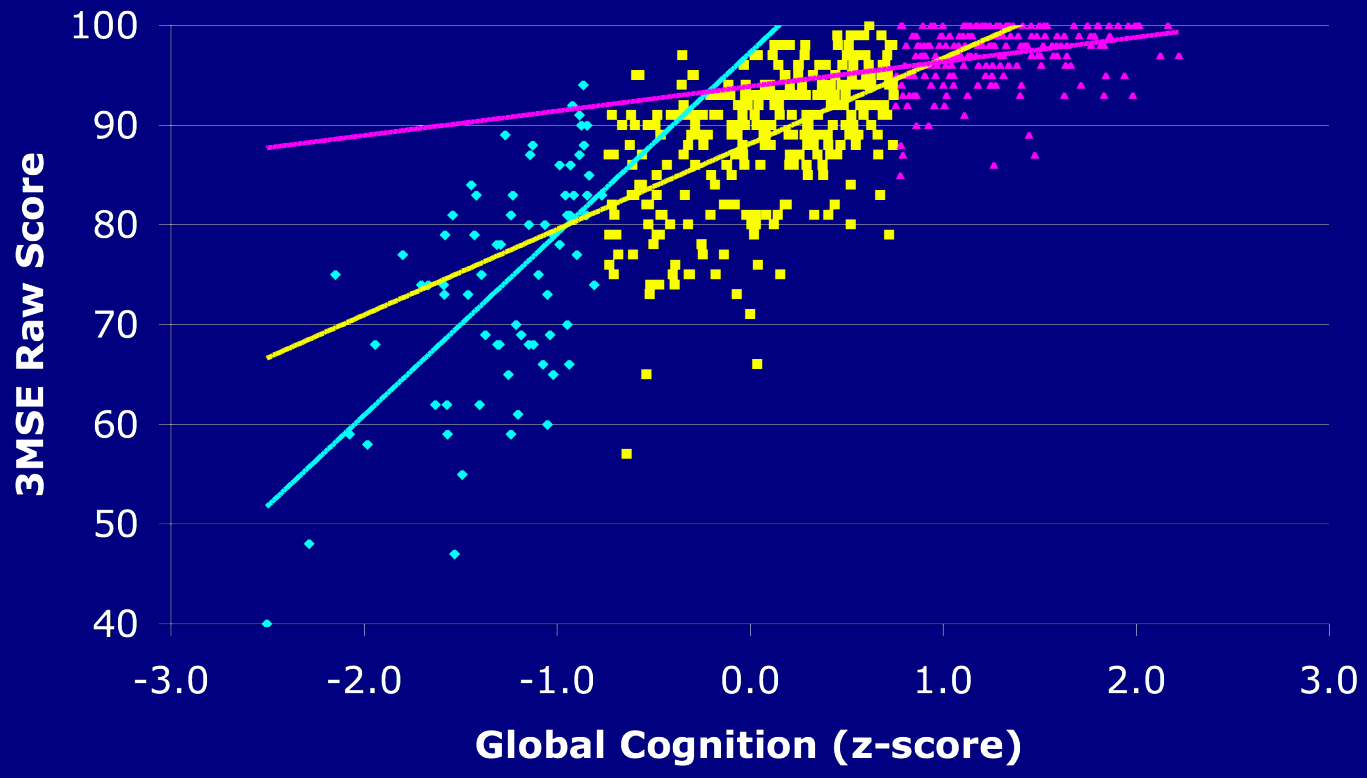

Designs for Test Equating

- Common item equating
  - Anchor items that are common to tests being equated
  - Sample overlap not necessary
- Common sample equating
  - Both tests administered to same sample
  - Item overlap not necessary
  - Sample should cover range of variability of target population
    - Distributions need not be identical

Statistical/Psychometric Approaches

- Item response theory (IRT)
  - Require item level data
- Non-IRT
  - Can be used with scale level scores

Statistical/Psychometric Approaches

- Test based
  - Cross-walk between tests used to create recoded test scores
  - Recoded scores entered into analysis
- Model based
  - Original test scores entered into analysis
  - Linking of scores occurs within analytic model

Issues for UDS

- Content
  - Close correspondence for some measures (Digit Span, Story Recall)
  - Apparent differences for MMSE and MOCA
- Psychometric characteristics
  - Empirical question
  - Design/selection suggests that this may be greater concern for MMSE - MOCA

Study Design Issues UDS

- Common sample equating most applicable
  - Sample size depends on method used for equating
  - Can have different samples for different test pairs
    - Common sample needed for to be equated pairs
    - Different samples could be used for different pairs
- Sample composition should roughly match target population (UDS enrollees)
- Order of test administration is important concern
  - Especially for Story Recall measures

Study Design Issues UDS

- Practice effects
  - Content learned over repeated administrations
    - Especially relevant to memory tasks
  - Familiarity with task
  - Sample with previous exposure to UDS tests is problematic
    - Familiarity with UDS 2.0, naive to UDS 3.0

Challenges for Equating UDS Tests

- Measure selection
- Study design
- Statistical and psychometric methods