Measurement in Research

Selecting a measure - Reliability
- Temporal stability (test-retest reliability)
- Alternate forms reliability
- Internal consistency
- Inter-rater reliability

Selecting a Measure - Validity
- Construct validity
  - Does the measure reflect the construct of interest?
- In measurement, construct validity divided into:
  - Translation Validity
    - Is the operationalization a good reflection of the construct?
  - Criterion-related Validity
    - Does the construct "behave" in a theory-consistent manner?
Translation Validity

- Face Validity
  - Extent to which items appear to measure the construct of interest (non-psychometric)
- Content Validity
  - Relation of items to underlying content domain

Criterion-Related Validity:

- Predictive Validity
  - Ability of measure to predict something it should
- Convergent Validity
  - Does the measure “converge with” theoretically similar constructs?
- Discriminant Validity
  - Does the measure “diverge from” theoretically dissimilar constructs?

The nomological network...

- Learning more about a construct involves elaborating the nomological net
- Laws within the nomological net relate:
  - Observable properties to each other
  - Theoretical constructs to each other
  - Theoretical constructs to observables
- At least some laws must involve observables
Construct validity will vary with:

- Sample characteristics
- Facets of the construct
- Assessment context
- Goals of the assessment
- Type of validation

Sensitivity of measurement

- A measure is sensitive to the degree that it captures level of variability of interest
- Factors relevant to sensitivity:
  - Range of responses
  - Content
  - Pervious evidence of sensitivity

Clinical utility of measurement

- To what degree does a measure add information to clinical assessment?
- Treatment validity
- Incremental validity
- Sensitivity to change
- Cost-effectiveness
- User-friendliness
Clinical predictive value

- **Sensitivity**
  - probability that a person with the condition will be classified as having the condition.
- **Specificity**
  - probability that a person without the condition will be classified as being without the condition.
- **Predictive value**
  - proportion of positive test results that are truly positive.

Clinical Predictive Value

<table>
<thead>
<tr>
<th>Result</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disorder</td>
</tr>
<tr>
<td>Positive</td>
<td>True positive</td>
</tr>
<tr>
<td>Negative</td>
<td>False negative</td>
</tr>
</tbody>
</table>

- Sensitivity = (true positives divided by (true positives + false negatives)) multiplied by 100 (to make it a percentage)
- Specificity = (true negatives divided by (true negatives + false positives)) multiplied by 100 (to make it a percentage)

Using new measures

- When possible, use previously validated measures
- Other times, may vary content or context of usage
Steps to construct a new measure

Specify the construct(s) to be measured
- Specify the domain of the target construct
  - What will be included?
  - What will be excluded?
- Facets and dimensions of the construct
  - What factors of the construct will be covered
  - What dimensions (e.g., rate, duration, magnitude)
  - Mode (thoughts and behavior)
  - Temporal dimensions
  - Situations

Steps to construct a new measure

- Specify the intended functions of the instrument
  - brief screening, treatment outcome, diagnosis
- Select assessment method to match targeted construct and function of assessment

Steps to construct a new measure

- Generate items through
  - Expert Discussion
  - Clinical experience
  - Relevant theories
  - Relevant empirical literature
  - Other assessment instruments
  - Population sampling
What is a good item?

- Use simple language at appropriate reading level
- Avoid slang
- Avoid items that everyone would endorse in either the positive or negative direction.
- Avoid complex items, or multi-part items.

Constructing a New Measure

- Match items to facets and dimensions
  - Create a table of facets and place items under each facet heading
  - Generate multiple items for each facet
  - Insure proportional representation of items across facets
- Examine each item
- Establish quantitative parameters of instrument

Constructing a New Measure

- Develop participant instructions
- Have multiple experts review the instrument
- Have the target population review the instrument
- Have experts and target population re-review the instrument following adjustments
Constructing a New Measure

- Pilot test the instrument
- Psychometric Evaluation
  - construct/content validation stage

Methods of measure construction

- Rational-deductive approach
- Empirical method
  - Strictly empirical methods for selecting items and validating the instrument.
  - Problems: Can be sample specific
  - Not theory driven
- Internal consistency method
  - Perform an internal consistency analysis
  - delete items with low item-total correlations

Methods of measure construction

- Item response theory (IRT)
  - Test responses reflect an underlying trait
  - Relationship between the responses and the trait are reflected by the item characteristic curve (ICC)
  - ICC provides the probability for directional response for each item for each level of the trait
Overview in selecting a measure

- Think carefully about the construct and which aspects you want to measure
- Review relevant literature and psychometric properties of validated scales
- If nothing works, consider altering a scale for new content, purpose
- Scale construction = lots of work!

Initial steps in psychometric evaluation

- Examine item distribution
  - highly skewed items = not good
  - Items with wide response ranges = good
- Examine item distribution
- Internal consistency
  - How closely inter-related are the items
- Structural analysis
  - How many factors underlie the measure