



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
 - Previous 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

| Result | Outcome | |
|----------|----------------|----------------|
| | Disorder | No Disorder |
| Positive | True positive | False positive |
| Negative | False negative | True negative |

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
