# Overview of the Issues in Measurement

## Part I

**Psychological Constructs** are generally considered unobservable (*latent variables*). Conceptually, these constructs are presented /organized as Internalizing (e.g., major depressive disorders, panic disorders, and perception of discrimination), Externalizing (aggression—acting out and impulsivity), and Thought disorders.

**Measurement**: For psychology to be considered a **replicable science**, each subdiscipline must advance the understanding of constructs using instruments that meet basic measurement (psychometric) properties of **reliability** and **validity (i.e., empirical quality of an instrument)**.

**Instruments**: Although there are seemingly several **types** of instruments available for use by psychologists (mental health professionals), the most widely used is **self-report** (e.g., Beck Depression Inventory, Symptom Assessment, Aggression Questionnaire). Regardless, as with any instrument, there are:

**>**disadvantages (e.g., response tendency, the time commitment for administration and scoring) and advantages (cost, can be used with paraprofessionals) associated with the use of psychological instruments.

**>**specific **purpose**(s) for which instruments are adopted /used.

**>**obtained scores [*manifest variables that are expected to reflect the target construct*], are typically composed of elements of the target construct [*Ture* score] and *Error* [e]. The ***sources*** of these **errors** are areas of major concern in measurement. Accordingly, any **inferences** (*decisions*, statements by professionals) about the obtained scores should be focused on reducing error(s) in measuring the desirable construct.

>specific **statistical methods** that are appropriate for evaluating obtained scores.

**Development of Instruments (Category #1, as mentioned in our discussions)**: There are expected or **common** procedures adopted for developing and evaluating scores on most self-report instruments (i.e., based on the type and purpose). An excellent source (adapted here) I consulted is based on the seminal paper by Clark and Watson (2019) and my scholarly passion for scale development and validation.

Clark, L. A., & Watson, D. (2019). Constructing validity: New developments in creating objective measuring instruments. *Psychological Assessment*, *31*(12), 1412-1427.

[https://doi.org/10.1037/pas0000626](https://psycnet.apa.org/doi/10.1037/pas0000626" \t "_blank)

### The Target Construct--- *Qualitative Analysis I*

* identify the target construct, and provide specific justification [i.e., intended uses: clinical, research, policy, etc.] for measurement of the construct.
* identify detailed /potential **dimensions** [*if any*] or modalities of the construct [e.g., cognitive, affective, physiological, etc.].
* for each dimension, specify what is considered: *relevant* and *representative* (typically noted as the operational definition of the dimension of a construct).
* specify if the dimensions are drawn from a specific theoretical orientation, clinical observations, and empirical [e.g., meta-analytic studies].
* ensure that there are no viable or existing instruments (self-report) for measuring the construct.

### Preliminary Version of the Instrument—*Qualitative Analysis II*

* specify the types of content-specific items to be included in each potential dimension of the instrument (structured /objective vs. unstructured).
* specify the **sources** for securing or generating the potential pool of items.
* specify the instructions and timeframe for completing each item.
* specify the target population(s) for use of the instrument. Ensure the readability of the items (e.g., grade-level).
* specify the response options (scaling) for the instrument.

### Preliminary Version of the Instrument--- Quantitative Analysis I

* conduct the initial exploratory analysis, typically **Principal Components Analysis** (PCA) to **reduce** the initial item pool to a desirable pool.
* determine the number of dimensions that could empirically be supported using recommended criteria (e.g., parallel analysis).
* analyze the item descriptive (skewness and kurtosis).
* edit or revise items if the need is indicated.
  + note that these steps could be repeated to ensure at least 4-5 items are retained within a dimension.
* conduct and report estimates of internal consistency [as a population-based estimate] for each dimension.
* if the contents of the items within dimensions are **interpretable**, assign formal names to the dimensions as scales.
* specify the statistical package used for all the analyses [SPSS for Windows; JASP; Jamovi; BlueSky Statistics, etc.).

### Preliminary Validation of the Instrument--- Quantitative Analysis II

* conduct an Exploratory Factor Analysis (**EFA**) examining the items’ descriptive statistics information to determine the factor extraction method (normal vs. non-normal estimator).
* report **detailed information** [**Result**] from the EFA: extraction method, rotation method, pattern matrix, item-factor loadings /cross-loadings, explained variance, and criteria used to determine the number of dimensions /factors.
* report standard descriptive statistics (M, SD, range, etc., as normative); justify sample size.
* report estimates of internal consistency reliability (coefficient-omega; coefficient-alpha; coefficient-rho, etc.).
* ***Concurrent Validation [preliminary]:*** Extent to which scores on the Primary Instrument are:
  + Related to similar constructs [convergent validity] or dissimilar constructs [discriminant].
* attend to issues of (a) effect size and (b) confidence interval [vs. *p*-stats] when interpreting results.

## Part II: Validation Studies- Basic Considerations

**Options in the presentation of empirical evidence for an established instrument**: Modern Data Analytic Modeling-- **Quantitative**

* item-level confirmatory factor analysis (CFA).
* item-level combined EFA and CFA: exploratory structural equation modeling / structural equation modeling.
* measurement invariance modeling
* item response theory [uni- and multi-dimensional] models
* internal consistency reliability estimation :—coefficient rho, coefficient Omega, coefficient-marginal, etc.
* bifactor modeling
* network analyses (exploratory, Bayesian…)
* Bayesian modeling methods; machine learning