Measurement Issues
(Bordens & Abbott Chap. 5)

III. MEASUREMENT ISSSUES
    A. Operationalization

- Proposal Assignment 2 is about operationally defining all the variables in your selected research study
- **Operational Definition**: The definition of a variable in terms of operations needed to produce or measure that variable.

Concept or Term   **Violent TV watching**

               Operationalization

Measurement   **Checklist of Shows**

III. MEASUREMENT ISSSUES
    B. Measurement Validity

- The operational definition of terms marks the first decision which you have make about the your research.
- It is also the first issue which can be questioned in any research paper you read.
  - The two questions that can be posed about operational definitions are measurement *validity* and *reliability*.

III. MEASUREMENT ISSSUES
    B. Measurement Validity

- **Measurement Validity**: A measurement is valid when it is measuring what it claims to be measuring (truthfulness).

Concept or Term

             Truthfulness?

Measurement

III. MEASUREMENT ISSSUES
   B. Measurement Validity

- Establishing the validity of a measure takes multiple studies examining different aspects of the measure.
    1. **Criterion-Related (or Concurrent) Validity**: Does the measure correlate with an established measure of the phenomenon of interest?
    2. **Predictive Validity**: Does the measure predict future behavior?
    3. **Face Validity**: Does the measure look like one that does what it is supposed to do?
    4. **Construct Validity**: Do the results from the measure fit with theoretical expectations?

III. MEASUREMENT ISSSUES
    C. Measurement Reliability

- **Measurement Reliability**: A measurement is reliable when it is consistent across experimenters and/or time.

Concept or Term

Consistency?   Truthfulness?
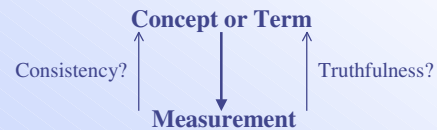
Measurement

III. MEASUREMENT ISSSUES
    C. Measurement Reliability

- Reliability is about the whether the measurement device produces similar results when repeated measurements are made under identical conditions.
    - A reliable measurement is consistent over multiple observers (measures of **inter-rater reliability**)
    - A reliable measurement is consistent over time. (measures of **internal consistency, test-retest reliability**, or s**plit-half reliability**)

III. MEASUREMENT ISSSUES
    C. Measurement Reliability

- Measures can be reliable but invalid:
    - The "Draw-A-Person" test is supposed to be a measure of IQ
- Measures can not be unreliable but valid**.**
    - How can an unreliable measure ever have validity?
        - Throw away a ruler that gives you a different score on each measurement of the same object.
- One critical issue in reading a research paper is the status of the measurement devices
    - Is there evidence that it they are reliable and valid?

III. MEASUREMENT ISSSUES
    D. Measurement Scales

- Once variables are operationalized, their scaling properties can be identified
- **Measurement Scales**: The type of information yielded by a measurement operation. The mathematical properties of the information yielded by the measurement device
  - There are 4 types of measurement scales (NOIR)
    - **N**ominal
    - **O**rdinal
    - **I**nterval
    - **R**atio

III. MEASUREMENT ISSSUES
    D. Measurement Scales

- **Nominal**: Information about whether two values are the same or different (X is different from Y but the same as Z):
- Judgments of: **Same/Different**.
- Sex, Blue/Not Blue Eye Color, Higher/Lower Achievers.

III. MEASUREMENT ISSSUES
    D. Measurement Scales

- **Ordinal**: Information about whether two values are different and the direction of difference (better, higher, greater, etc.)
  - e.g.: X is greater than y, but less than z:
- Judgments of**: Same/Different**; **Greater than/Less than**.
- Stages, Ranks, Multiple Categorical types

III. MEASUREMENT ISSSUES
    D. Measurement Scales

- **Interval**: Information about the units that mark the distance between two values. (The difference between X and Y is 6 units, exactly the same as the difference between Y and Z)
- Judgments of: **Same/Different, Greater than/Less Than, Differences are the same/Differences are different**
- Temperature, IQ.

III. MEASUREMENT ISSSUES
   D. Measurement Scales

- **Ratio**: Information about the precise relation between two values by their distance from a fix zero-point. (X is exactly twice as much as y)
- Judgments of: **Same/Different, Greater than/Less Than, Differences are the same/Differences are different, Quantification of the difference.**
- Weight, Length, Time.

III. MEASUREMENT ISSSUES
   D. Measurement Scales

- The best scale to use depends on…
  - How much information is needed.
  - Statistical tests to be used.
    - Tests like ANOVA or T-Tests must use interval or ratio scales but Chi-Square might best be used on nominal and ordinal scales.
  - Ecological validity of the assessment.
    - Which scale corresponds to the real life situations of movie judgments: Nominal, Ordinal, Interval or Ratio?
  - Psychological reality of the scale.
    - Preferences for justification statements: Ordinal (rank order), Interval (rating).

III. MEASUREMENT ISSSUES
   E. Anticipating and Fixing Problems

- Even with a very good operational definition of a variable, measurement issues may pose a problem, reflecting inappropriate distinctions
  - **Insensitivity**: Insensitive measurement devices produce range effects which reflect the fact that the limits of the measurement device are encountered too frequently.
    - Floor effects: Too many scores are are the lower limit
    - Ceiling effects: Too many scores are at the upper limit.
  - **Oversensitivity**: An overly sensitive measuring device produce outliers.

III. MEASUREMENT ISSSUES
   E. Anticipating and Fixing Problems

- Even with a very good operational definition of a variable, the process of measuring may pose problems.
- **Reactivity:** The effect on measurement of the act of measuring.
  - **Demand characteristics**: Inadvertent cues to the purpose of the study.
    - Effect of guns on aggression is studied by placing a gun in the research room in one condition. The unusual sight of a gun in a research room will cause participants to think about the the purpose of the research.

III. MEASUREMENT ISSSUES
   E. Anticipating and Fixing Problems

- **Attitude of subjects**: Participants' predispositions towards the research
  - Cooperative: Try to please; Negative: Participant is difficult or refuses to understand or play by the rules; Defensive: Participant presents self in the best possible light -- tries to smell like a rose.
- **Experimenter bias**: Experimenters' behaviors that influence participants' specific responses.
  - Nodding to correct answers by not to incorrect ones.
- **Expectancy effects:** Experimenters' attitudes about the capabilities of participants affects their performance (Rosenthal)

III. MEASUREMENT ISSSUES
   E. Anticipating and Fixing Problems

- Reducing measurement problems
  - **Pilot studies**
    - Allows the researcher to check procedures and results
  - **Manipulation checks**
    - Interviews and other techniques to assess whether participants experience what they were supposed to.
  - **Reduce Bias**
    - Single Blind: Experimenter ignorant of the conditions
    - Double Blind: Experimenter and participant ignorant of the conditions.
  - **Automate procedures to reduce expectancy.**