Frequently Used Terms in Statistics:

Validity – It measures what it’s supposed to measure.
- Validity is always more important than reliability when you are selecting an instrument! Look for higher validity regardless of reliability.
- Types of validity
  - Content validity – you ask a group of experts to review the instrument. This is the weakest type.
  - Criterion based validity – 2 kinds
    - Concurrent is taking two measurements at the same time. Ex: comparing scores on a math test with grades in a math class.
    - Predictive is determining scores in the future. Ex: the GRE
  - Construct validity is the highest form of validity. Every item on the test is either highly associated with a variable or not associated with a variable at all.

Reliability – it gets the same results each time it’s repeated.
- Ways to test for reliability
  - Test – retest. Run a correlation on scores between test time 1 and test time 2. Note: Make sure there’s enough time between the tests.
  - Parallel form – tests several forms of the same test. Also called alternate form.
  - Internal consistency

Control Techniques

- Randomization – Distributes extraneous/nuisance variables evenly to all groups.
- Elimination – Completely removes an extraneous variable.
- Constancy – Extraneous variable is reduced to its single form and distributed evenly among all groups.
- Balancing – Achieve group equality by distributing extraneous variables equally to all groups.
- Counterbalancing – Involves different treatment sequences.
- Variables
  - Numeric – Values are numbers.
    - Discrete – a numeric variable that has specific values or separate, indivisible categories. Ex: Number of children you have.
    - Continuous – a numeric variable that has an infinite number of values between any two whole values. Ex: Time and Weight
    - Ordinal – a numeric variable in which the values are ranks that can be ordered. Ex: Class standing, or your place on a waiting list.
  - Nominal – Values are non-numeric. Ex: Gender
Scales of Measurement

- **Ordinal Scale:**
  - Permits values to be rank-ordered.
  - Values are in terms of size or magnitude.

- **Interval Scale**
  - The values stand for approximately equal amounts of what is being measured.
  - Permits rank-ordering of events with the assumption of equal intervals between adjacent values.

- **Ratio Scale**
  - A scale that has an absolute zero point.
  - Provides the most amount of information.

- **Nominal Scale**
  - Values are assigned to categories.
  - Provides the least amount of information.

Non-Parametric Data

- **Nominal** – when the numbers name something. Ex: numbers on jerseys or addresses.
- **Ordinal** – when the numbers are in scaled order.

Parametric Data

- **Interval** – When the difference intervals between the numbers is always the same
- **Ratio** – Interval data that has a true zero.

A normal distribution is a bell-shaped frequency distribution that is both unimodal and symmetrical. Half the scores are above the mean and the other half are below the mean. The measures of central tendency (mean, median, and mode) all fall at the same place in the distribution.

- To find the critical value, $\sigma \times 1.96$. Add to the mean, then subtract from the mean.
- In a normal distribution, the mean is always zero, and the standard deviation is always one.
Skewed distributions:

- **Floor effect** – situation in which many scores gather toward the low end of a distribution. (Positively skewed distribution.)
- **Ceiling effect** – situation in which many scores gather toward the high end of a distribution. (Negatively skewed distribution.)

- **Kurtosis** – Peakedness of the curve
- In a positively skewed distribution, Mode < Median < Mean
- In a negatively skewed distribution, Mean < Median < Mode

Measures of central tendency

- **Mean** – Used for normal (symmetrical) distributions. This is the mathematical average. To calculate it, add up your scores, then divide by the total number of scores.
- **Median** – Used for skewed distributions. Arrange the scores in numerical order. Then count them, and go to the number in the middle. This is the median. If you have an even number of scores, find the two scores in the middle, add them together and divide by two to get the median.
- **Mode** – Only option for data that uses a nominal measure. In a data set, the mode is the value that occurs the most frequently. An easy way to remember this is that “mode” sounds an awful lot like “most.”

- **Variability** is the extent to which scores spread out around the mean in a distribution. The two measures of variability are range and standard deviation.

- **Range** is the largest score minus the smallest score in a data set.
  - Two kinds of range:
    - Exclusive is the highest score minus the lowest score.
    - Inclusive (works with integers) is the highest score minus the lowest score + one.
• Standard Deviation is the average distance a score varies from the mean of the distribution. It is often referred to as $\sigma$ or SD.
  - If there are no deviations, the SD will be zero.
  - The SD will always be positive, since it is based on squared scores.
  - Since the SD is an average deviation, it will be no larger than the largest deviation.
  - See the section on Standard Deviations to learn how to calculate it.