# Psychology Research Process

- Logical Processes
- Induction
  - Observation/Association/Using Correlation
  - Trying to assess, through observation of a large group/sample, what is associated with what?
  - Examples: Naturalistic Observation, Surveys, Qualitative studies (e.g. focus groups)
  - Strengths: Helps build theories
  - Weaknesses:
    - 1) Don’t know when you’re wrong (statistics help…)
    - 2) Cannot show cause and effect

# Psychology Research Process

- Logical Processes
- Deduction
  - Using Premises (from theory) to test theory
  - Example:
    - Rape Blame study
    - Women are held responsible when drinking
    - Woman is drinking
    - All other things are held equal (controlled)
    - She will be held responsible (more than when not)
  - Derive Hypothesis
  - Test Hypothesis by setting up situation in which premises occur

# Psychology Research Process

- Logical Processes
- Deduction (continued)
  - What if hypothesis shown to be correct?
  - Support for theory (cause and effect)
    - However, problem of confounding variable
  - What if hypothesis found not correct?
    - 1. Maybe theory is wrong
    - 2. Maybe something you did not control for (hold constant) had a strong effect on results (caused much variability)
    - 3. Statistics help with #2; replication helps with #1

# Psychology Research Process

- Terms
  - **Theory**: An organized, systematic explanation of a phenomenon
  - **Hypothesis**: A more specific application of the theory
    - **Particular conditions → Particular outcomes**
    - **(Because….?)**

# Psychology Research Process

**Particular conditions → Particular outcomes**

**Particular conditions / Independent variable**

**Particular outcome / Dependent variable**

# Psychology Research Process

- Independent Variable:
  - A (hypothetical) cause that the experimenter manipulates
- Dependent Variable:
  - The (hypothetical) effect that the experimenter expects to see
  - Experiment we did in class on Wednesday
  - IV? DV?

# Psychology Research Process

Examples: **IV's**? **DV**s?

1) Effect of Alcohol Intoxication on Braking Distance When Driving
2) Effect of Ambient Room Temperature on Activity Levels of Mice
3) Do Specific Examples in Class Produce Better Learning in Psychology Classrooms?
4) Instituting a "No Smoking" Policy in a Restaurant: Does It Change the Clientele?

# Psychology Research Process

**Operational Definition**

"A definition that is specific enough to be used to actually perform an experiment" Pg 46

Must be measurable

Must have some validity

# Psychology Research Process

Examples: **Operational definitions**?

1) Effect of Alcohol Intoxication on Braking Distance When Driving
2) Effect of Ambient Room Temperature on Activity Levels of Mice
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# Psychology Research Process

Examples: **Hypotheses** probably being tested?

1) Effect of Alcohol Intoxication on Braking Distance When Driving
2) Effect of Ambient Room Temperature on Activity Levels of Mice
3) Do Specific Examples in Class Produce Better Learning in Psychology Classrooms?
4) Instituting a “No Smoking” Policy in a Restaurant: Does It Change the Clientele?

# Psychology Research Process

Between Groups Vs. Within Groups Designs

- Example: Braking Distance study
- 100 undergrads—random assignment
  - 50 sober; 50 intoxicated
- Distributions do not overlap—everybody who is intoxicated takes **<u>way</u>** longer to brake

Hypothesis supported.

# Psychology Research Process

## Between Groups Vs. Within Groups Designs

- Example: Braking Distance study
- 100 undergrads—random assignment
  - 50 sober; 50 intoxicated
- But what if:
- Distributions overlap because, even sober, braking distance times vary so much…
- Hmmm, what to do?

# Psychology Research Process

## Between Groups Vs. Within Groups Designs

- Example: Braking Distance study (cont.)
- I Know!!!
- How about a Within Groups Design??
- How would that work?
- But what might be the problems with it?

# Psychology Research Process

Review

- Induction vs. Deduction
- Theory
- Hypothesis
- Independent Variable
- Dependent Variable
- Confounding Variables
- Operational Definition
- Between Group vs. Within Group design

# Quick Review of Statistics

Purpose of Statistics in Research

Describe and Summarize the data

**Descriptive Statistics**

Test the hypothesis or hypotheses

**Inferential Statistics**

# Quick Review of Statistics (cont)

**Descriptive Statistics**:

- Measures of central tendency
  - Mean
  - Median
  - Mode
- Measures of variability
  - Range
  - Variance
  - Standard Deviation

# Quick Review of Statistics (cont)

**Descriptive Statistics** (cont):

- Measures of Association between two or more variables
- Pearson Product-Moment correlation - (symbolized as *r*).
  - Most common measure of association
  - Describes how strongly variables are related to one another.

# Quick Review of Statistics (cont)

**Inferential Statistics**

Hypothesis testing (What does it all mean?)

Your hypothesis versus the null hypothesis

- *t*-test – to compare means of two groups
- *F*- test – to compare means of more than two groups. (Analysis of Variance)
- Chi-square – to compare frequencies (e.g., how many men versus how many women?)

# Quick Review of Statistics (cont)

**Inferential Statistics (continued)**

- Pearson's r-test – to investigate whether there is a linear relationship between two continuous variables.
- Regression – to use one predictor variable to predict a criterion variable.
- Multiple Regression – to use more than one predictor variable to predict a criterion variable.

# Quick Review of Statistics (cont)

**Inferential Statistics (continued)**

- Partial correlation – to partial out the effects of a third variable that is influencing the relationship between two variables.

- Semi-partial correlation – to partial out the effects of a variable that is influencing only one of the other variables.

# Data Analysis and Presentation

The statistical power of the study:

Your hypothesis says that (all other things being equal) if person hears conversation, participant will make more mistakes than if he/she does not hear conversation

Null hypothesis says (what?)

Your Finding: No difference, does not support your hypothesis— BUT does not prove the Null Hypothesis

# Data Analysis and Presentation

**Suppose instead**

1. You did not run the session long enough? (e.g. instead, participants had 500 math problems and heard conversation for 5 minutes—more chance to actually make mistakes) and/or
2. There was a between-group difference that was consistent but ***very small****, so you needed more participants to find it (to separate the "signal" from the "noise")

If you concluded that your hypothesis was wrong

# Data Analysis and Presentation

**Suppose instead**

1. You did not run the session long enough? (e.g. instead, participants had 500 math problems and heard conversation for 5 minutes—more chance to actually make mistakes) and/or
2. There was a between-group difference that was consistent but ***very small****, so you needed more participants to find it (to separate the "signal" from the "noise")

If you concluded that your hypothesis was wrong:

**THEN YOU HAVE COMMITTED A TYPE II ERROR**

# Data Analysis and Presentation

Remember from Statistics class

Type I Error is:

Thinking you disproved the Null Hypothesis because you hit that one chance in 20

Type II Error is:

Accepting the Null Hypothesis when, in fact, your hypothesis was correct

To avoid Type II Error:

Increase statistical power

# Data Analysis and Presentation

How would you increase statistical power?

1. Run more participants (computer programs help you decide this before you begin and/or
2. Use a better, perhaps more precise, operational definition of the dependent variable

As Power increases, the probability of Type II Error decreases

| **Type I vs Type II Errors** | | True State of Affairs | |
|---|---|---|---|
| | | Null is true | Null is false |
| Your decision | Reject the null | Type I error ($\alpha$) | Correct inference (power) |
| | Fail to reject the null | Correct inference | Type II error ($\beta$) |

# Descriptive Statistics: Variability

**Central Tendency**:

Mean, Median, Mode

**Variability**:

Amount of difference within a data set.

**Dispersion**:

Spread of the numbers that make up the data within a data set

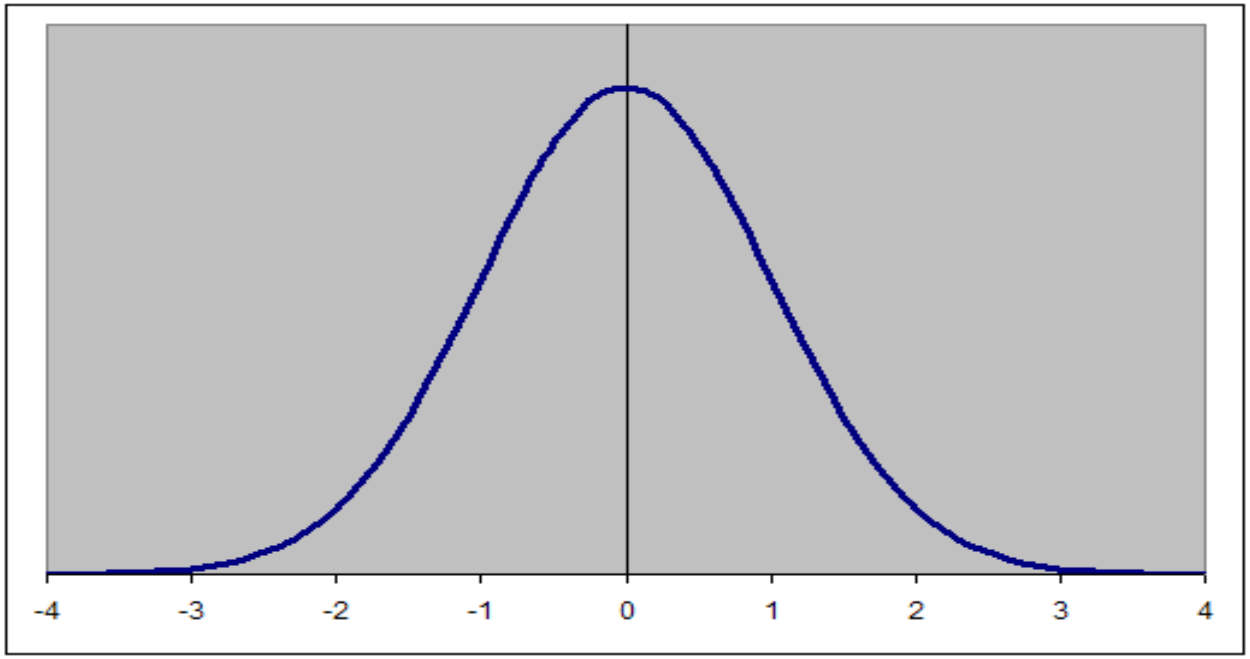
**Range**:

From the lowest number to the highest number in the distribution

# Descriptive Statistics: Variability

## Normal Distribution Curve

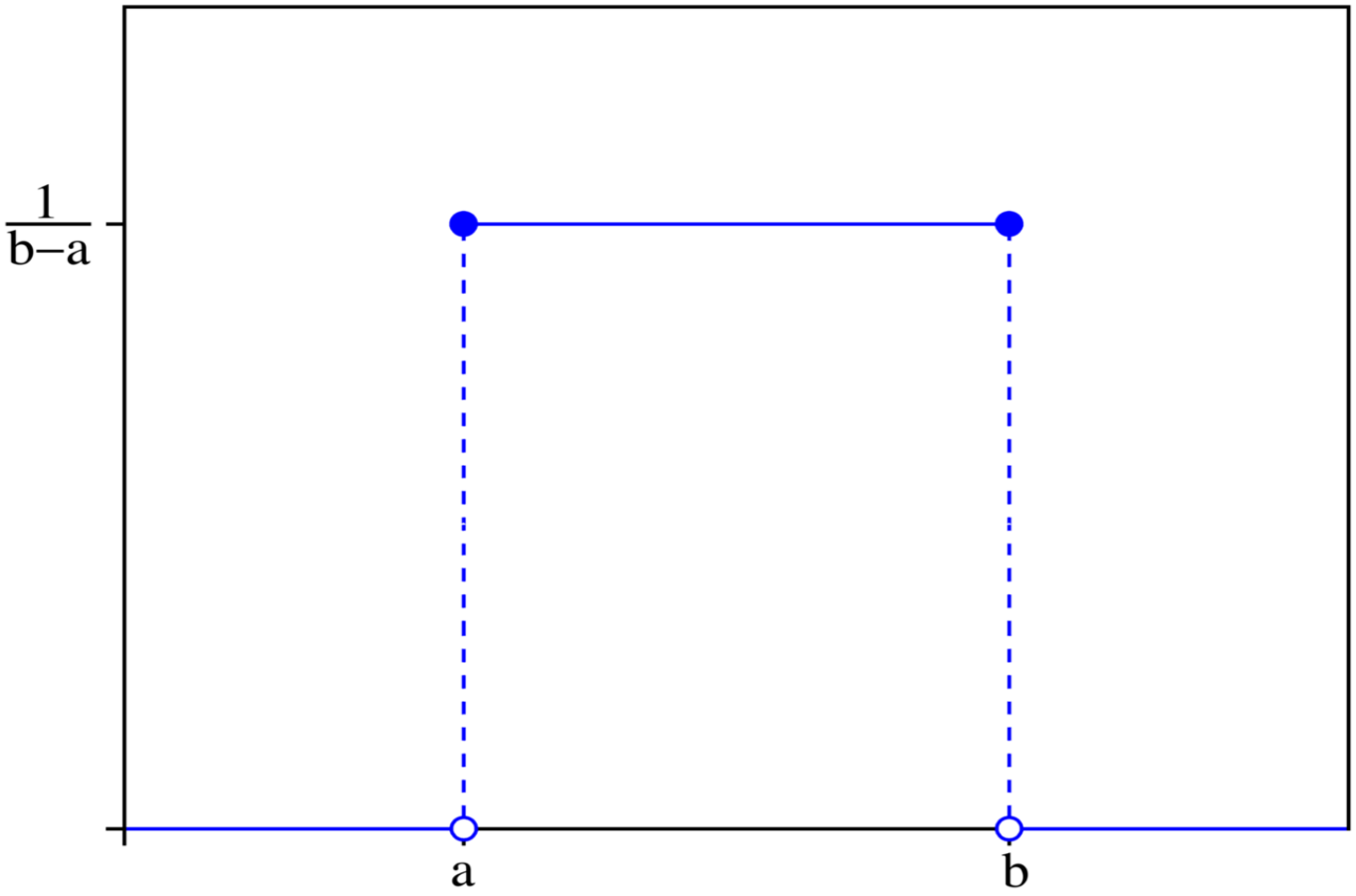
### Examples of Normal Distributions?



# Descriptive Statistics: Variability

## Uniform Distribution (No variability)

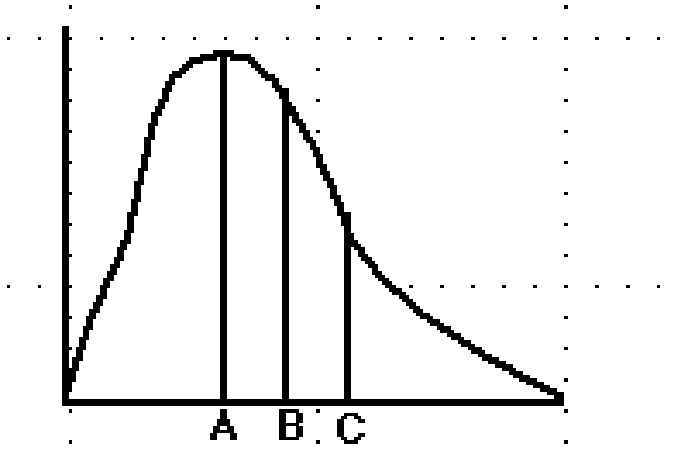
## Examples of Uniform Distributions?



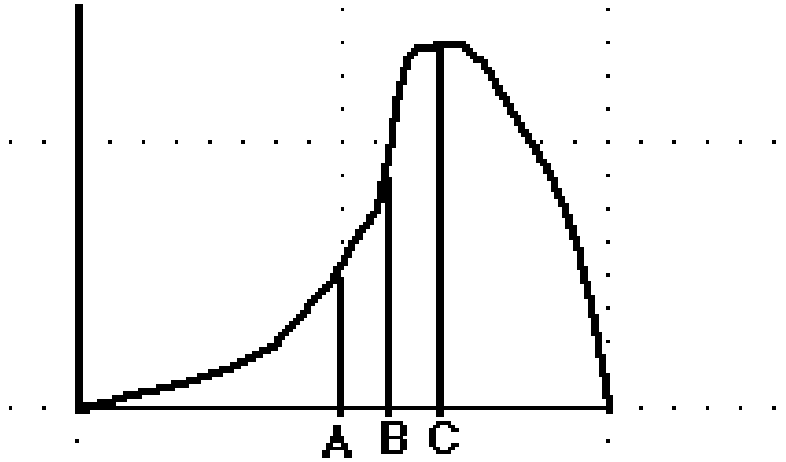
# Descriptive Statistics: Variability

## Skewed Distributions

## Examples of Skewed Distributions?




Positively Skewed Distribution

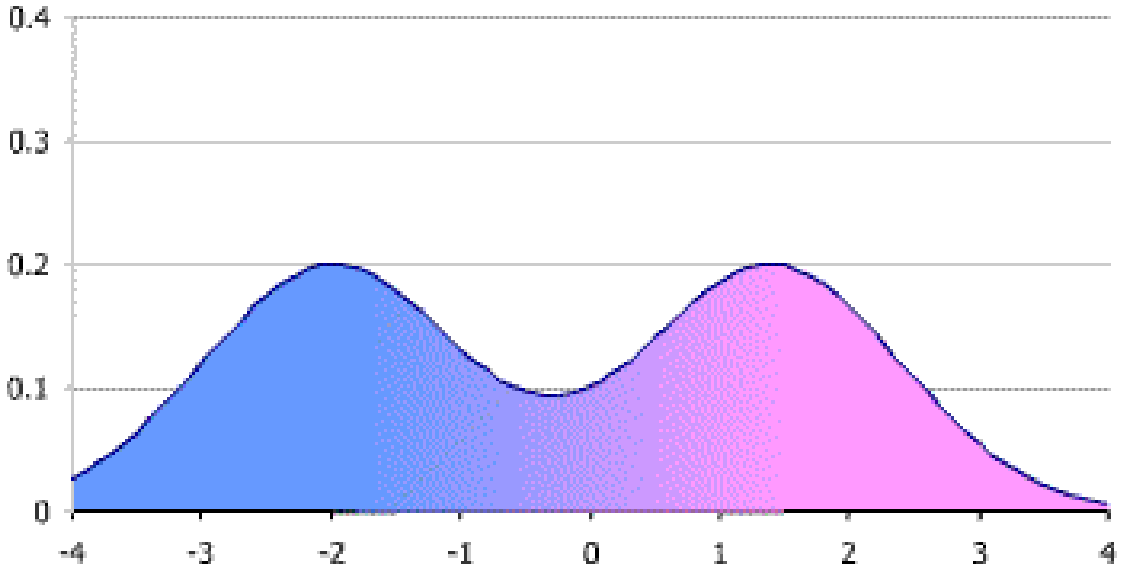



Negatively Skewed Distribution

# Descriptive Statistics: Variability

## Bimodal Distribution

## Examples of Bimodal Distributions?



# Descriptive Statistics: Variability

Variance:

- Measure of how all the scores in a set of data deviate (differ) from the mean
- (Formula and step by step calculation on page 94)

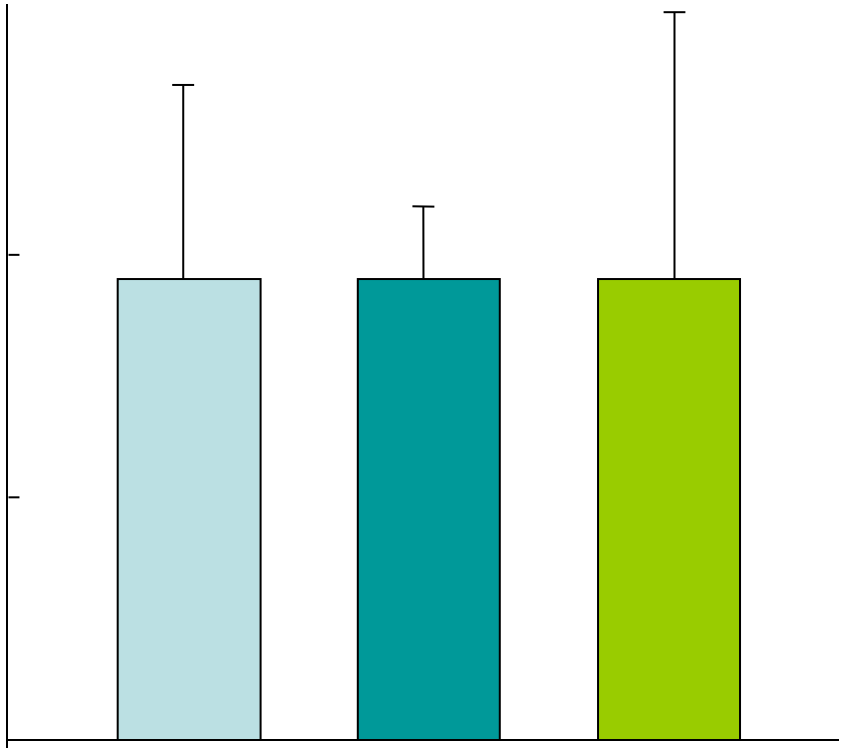
Standard deviation:

- Square root of the variance. (see pg 93)

Standard Error of the Mean (SE):

- Standard deviation divided by the square root of n (corrects for sample size)

# Graphing the Mean and Variance



# Z-scores

Method of standardizing (helping to shape like a normal curve)

Formula

(Score – Mean) / standard deviation

Examples of this type of presentation:

MMPI test scores

WAIS Scores