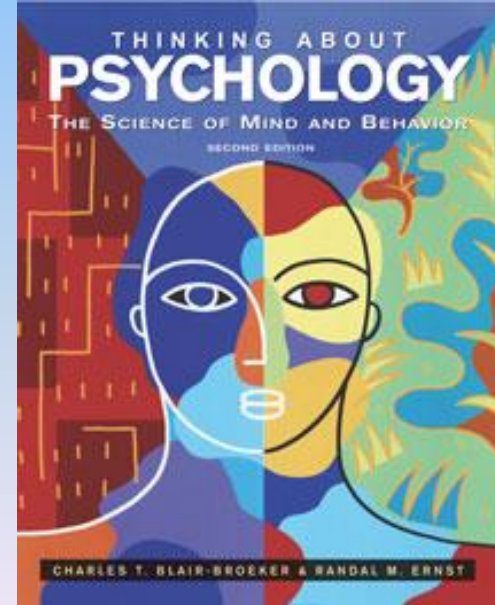


Thinking About Psychology: The Science of Mind and Behavior 2e

Charles T. Blair-Broeker
Randal M. Ernst



Methods Domain



Research and Statistics

Chapter



Module 5

Psychology's Statistics

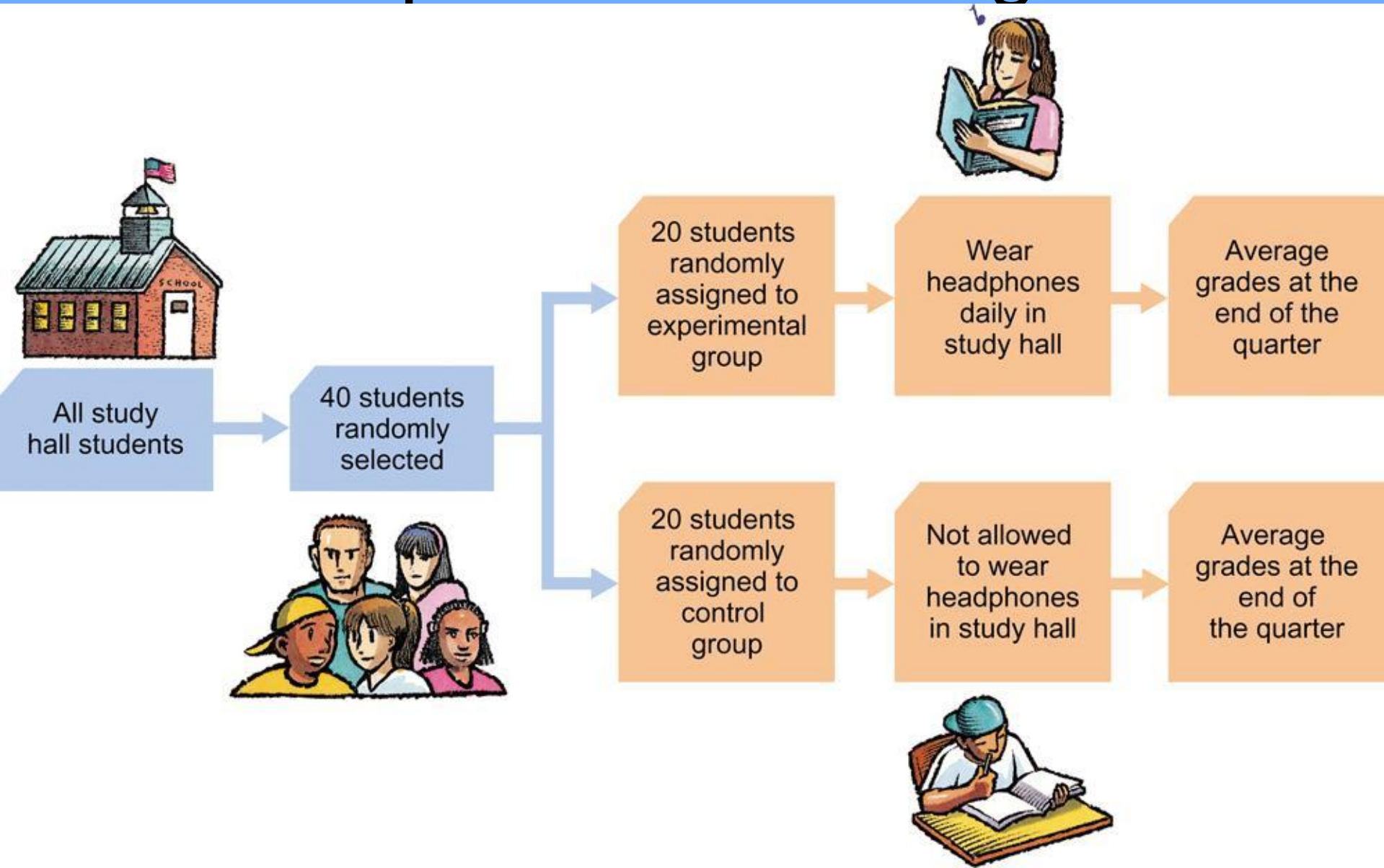
Statistics

- Are a means to make data more meaningful
- Provide a method of organizing information so that it can be understood

Module 5: Psychology's Statistics

Frequency Distributions

Experimental Design



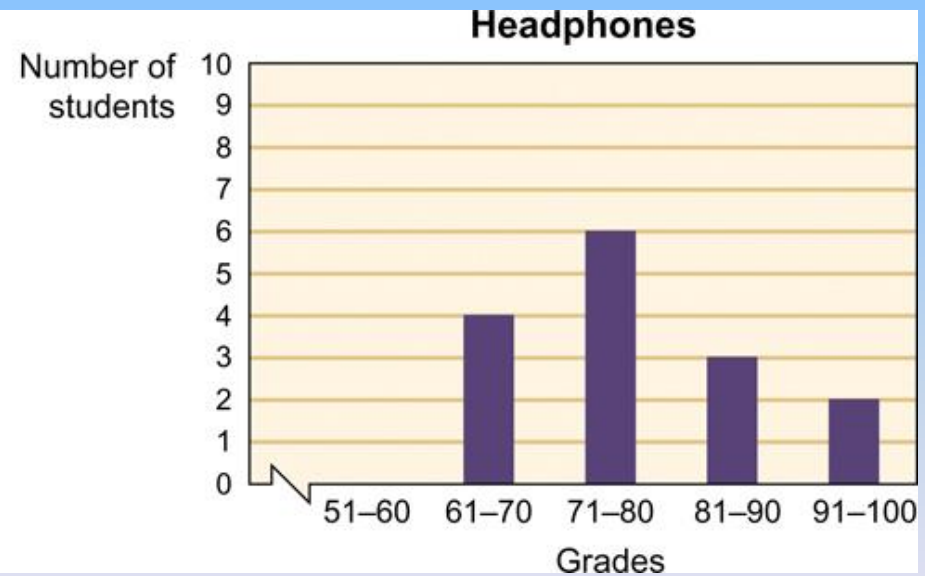
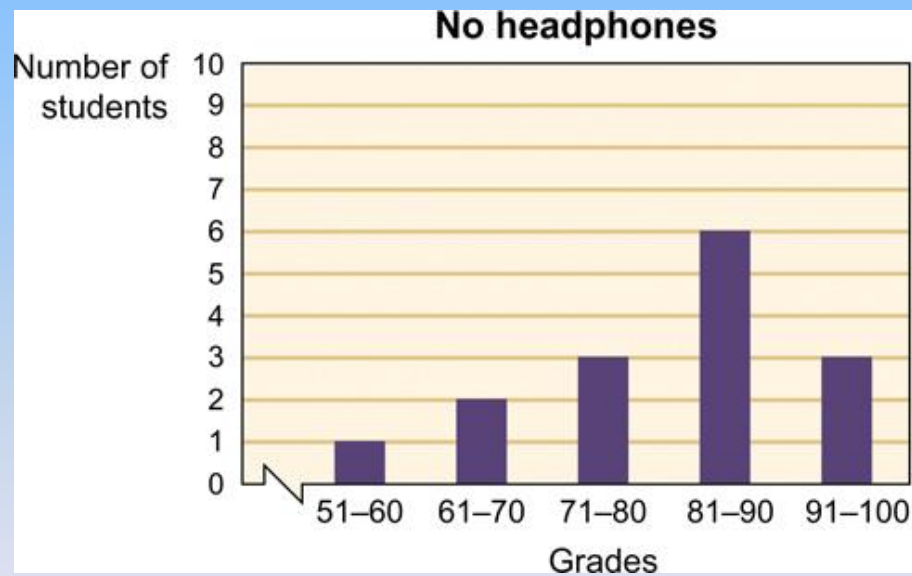
Frequency Distribution

- A list of scores placed in order from highest to lowest

Grades, in random order		Frequency distributions	
No headphones	Headphones	No headphones	Headphones
80	65	97	94
58	83	93	92
97	75	93	87
77	72	89	83
93	92	89	82
69	67	84	79
67	87	84	77
89	79	84	75
93	94	80	74
78	74	78	72
84	82	77	71
73	77	72	69
84	68	69	68
84	71	67	68
89	69	58	64

Bar Graphs

- Used to present data from frequency distributions



Module 5: Psychology's Statistics

Measures of Central Tendency

Measures of Central Tendency

- Statistical methods for finding the center of a distribution
- Three methods:
 - Mode
 - Mean
 - Median

Module 5: Psychology's Statistics

Measures of Central Tendency: Mode

Mode

- The score that occurs the most frequently in a distribution
- Most useful in circumstances where the data can be placed into distinct groups

Mode

	No headphones	Headphones
Mode (Most common)	84	68

Module 5: Psychology's Statistics

Measures of Central Tendency: Mean

Mean

- The arithmetic average of a distribution,
- Obtained by adding the scores and then dividing by the number of scores
- Usually the measure of central tendency of choice

Module 5: Psychology's Statistics

Measures of Central Tendency: Median

Mean

	No headphones	Headphones
Mode (Most common)	84	68
Mean (Average)	$\frac{1215}{15} = 81$	$\frac{1155}{15} = 77$

Median

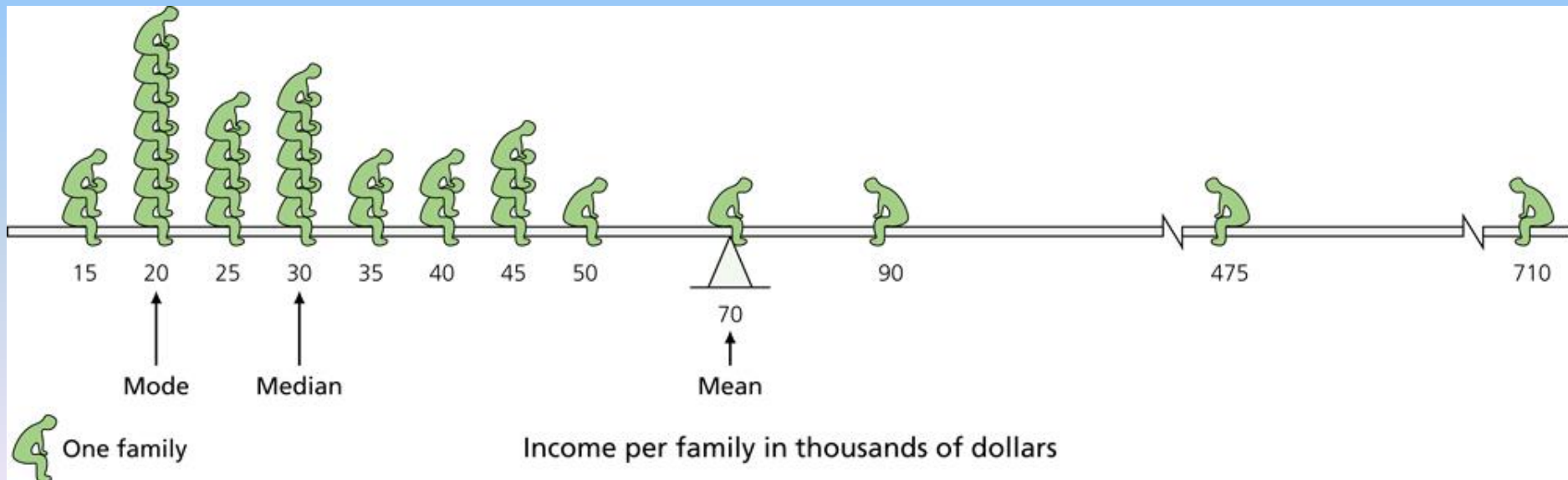
- The middle score in a ranked distribution
- One half of the scores are above the median, one half of the scores are below it.

Median

	No headphones	Headphones
Mode (Most common)	84	68
Mean (Average)	$\frac{1215}{15} = 81$	$\frac{1155}{15} = 77$
Median (Middle score)	84	75

Skewed

- Distorted
- In a skewed distribution the scores are not evenly distributed around the mean.



Module 5: Psychology's Statistics

Measures of Variation

Module 5: Psychology's Statistics

Measures of Variation: Range

Range

- The difference between the highest and the lowest scores in a distribution

Module 5: Psychology's Statistics

Measures of Variation: Standard Deviation

Standard Deviation

- A computed measure of how much scores vary around the mean score of a distribution
- The higher the standard deviation, the more the more spread out the scores are

Standard Deviation Calculation

- Calculate the mean of the data.
- Determine how far each score deviates from the mean.
- Square the deviation and average them.
- Take the square root of the average of the squared deviation scores.

Standard Deviation Calculation

1. Calculate the mean

36 yards

38 yards

41 yards

45 yards

$$\text{Mean} = \frac{160}{4} = 40 \text{ yards}$$

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2. Determine deviation from the mean (40 yards)

-4 yards

-2 yards

+1 yard

+5 yards

Standard Deviation Calculation

1. Calculate the mean

36 yards
38 yards
41 yards
45 yards

$$\text{Mean} = \frac{160}{4} = 40 \text{ yards}$$

2. Determine deviation from the mean (40 yards)

-4 yards
-2 yards
+1 yard
+5 yards

3. Square the deviations

16 yards²
4 yards²
1 yard²
25 yards²

$$46 \text{ yards}^2 = \text{Sum of (deviations)}^2$$

Standard Deviation Calculation

1. Calculate the mean

36 yards
38 yards
41 yards
45 yards

$$\text{Mean} = \frac{160}{4} = 40 \text{ yards}$$

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-4 yards
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+1 yard
+5 yards

3. Square the deviations

16 yards²
4 yards²
1 yard²
25 yards²

$$46 \text{ yards}^2 = \text{Sum of (deviations)}^2$$

4. Take the square root of the mean of column 3

$$\text{Standard deviation} = \sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of punts}}} = \sqrt{\frac{46 \text{ yards}^2}{4}} = 3.4 \text{ yards}$$

Module 5: Psychology's Statistics

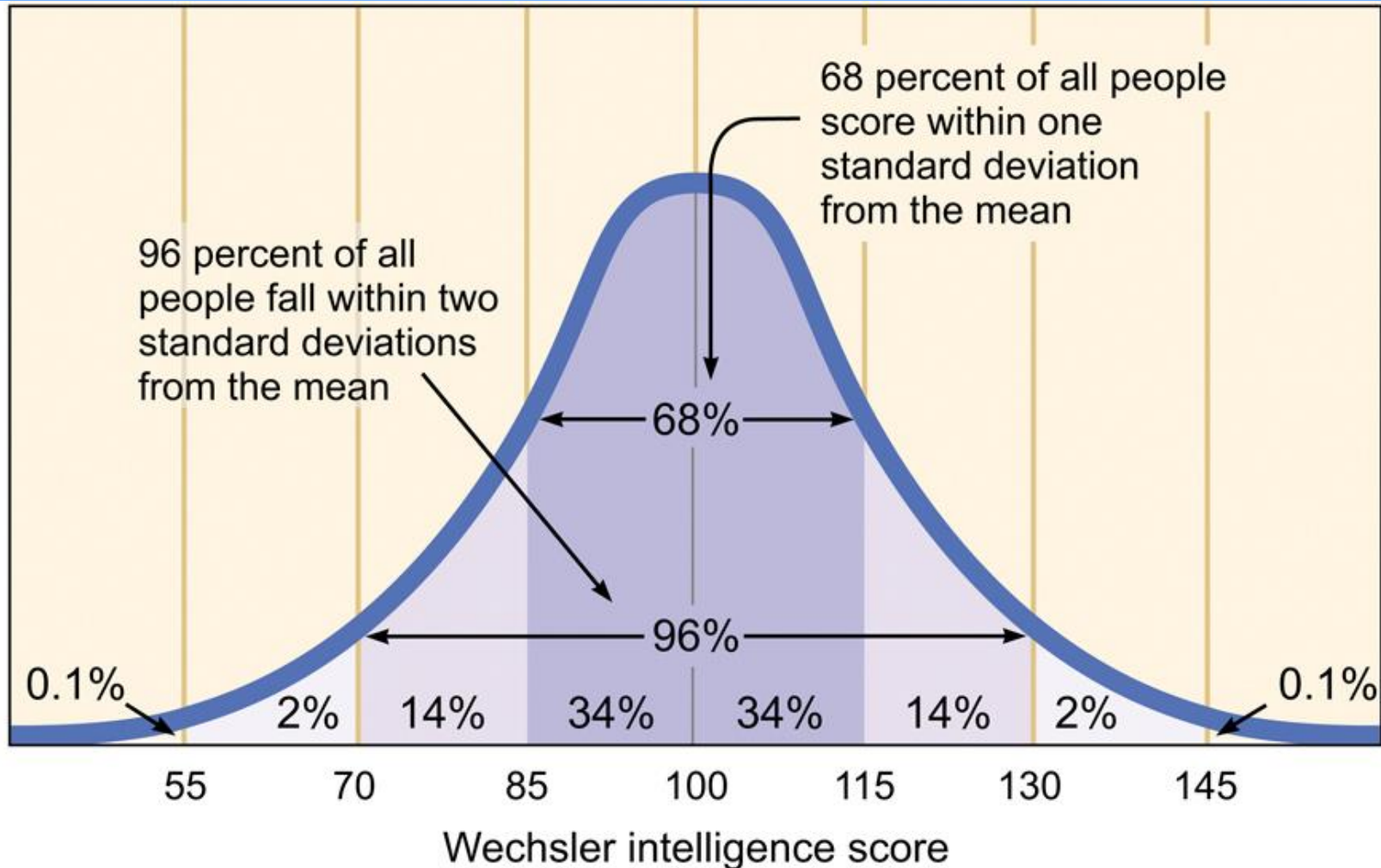
Normal Distribution

Normal Distribution

- The symmetrical, bell-shaped curve that describes the distribution of many physical and psychological variables
- Most scores fall near the mean, with fewer and fewer scores at the extreme.
- The mean, median, and mode are all the same (the highest point of the curve) in a normal distribution.

Normal Distribution

Number of students



Module 5: Psychology's Statistics

Comparative Statistics

Percentage

- A comparative statistic that compares a score to a perfect score, assuming the perfect score is 100

Percentile Rank

- A comparative statistic that compares a score to other scores, in an imaginary group of 100 individuals
- The percentile rank indicates how many of the hundred scores are at or below a particular score.

Calculating Percentage Scores and Percentile Ranks

Assume Jack gets 160 points on a 200-point test. His score is good enough to top 27 students out of his class of 36 students.

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Meaning: If the test had been 100 points, Jack would have had 80 right.

80
right

20
wrong

100 points

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Assume Jack gets 160 points on a 200-point test. His score is good enough to top 27 students out of his class of 36 students.

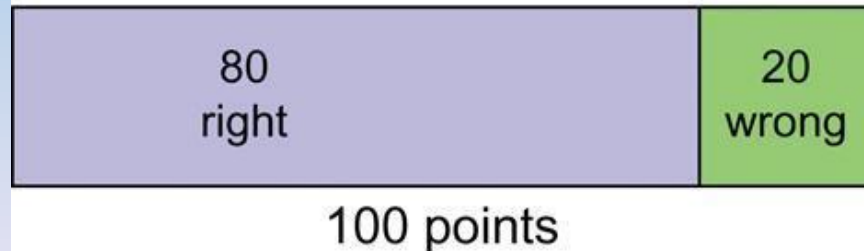
Percentage

$$\frac{160 \text{ correct}}{200 \text{ possible}} \times 100 = 80\%$$

Percentile rank

$$\frac{27 \text{ students beaten}}{36 \text{ total students}} \times 100 = 75\text{th percentile}$$

Meaning: If the test had been 100 points, Jack would have had 80 right.



Calculating Percentage Scores and Percentile Ranks

Assume Jack gets 160 points on a 200-point test. His score is good enough to top 27 students out of his class of 36 students.

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Meaning: If the test had been 100 points, Jack would have had 80 right.

80
right

20
wrong

100 points

Percentile rank

$$\frac{27 \text{ students beaten}}{36 \text{ total students}} \times 100 = 75\text{th percentile}$$

Meaning: If 100 students had taken the test, Jack would have scored higher than 75 of them.

Below Jack's
Score

Above
Jack's
Score

100 students

Module 5: Psychology's Statistics

Correlation Coefficient

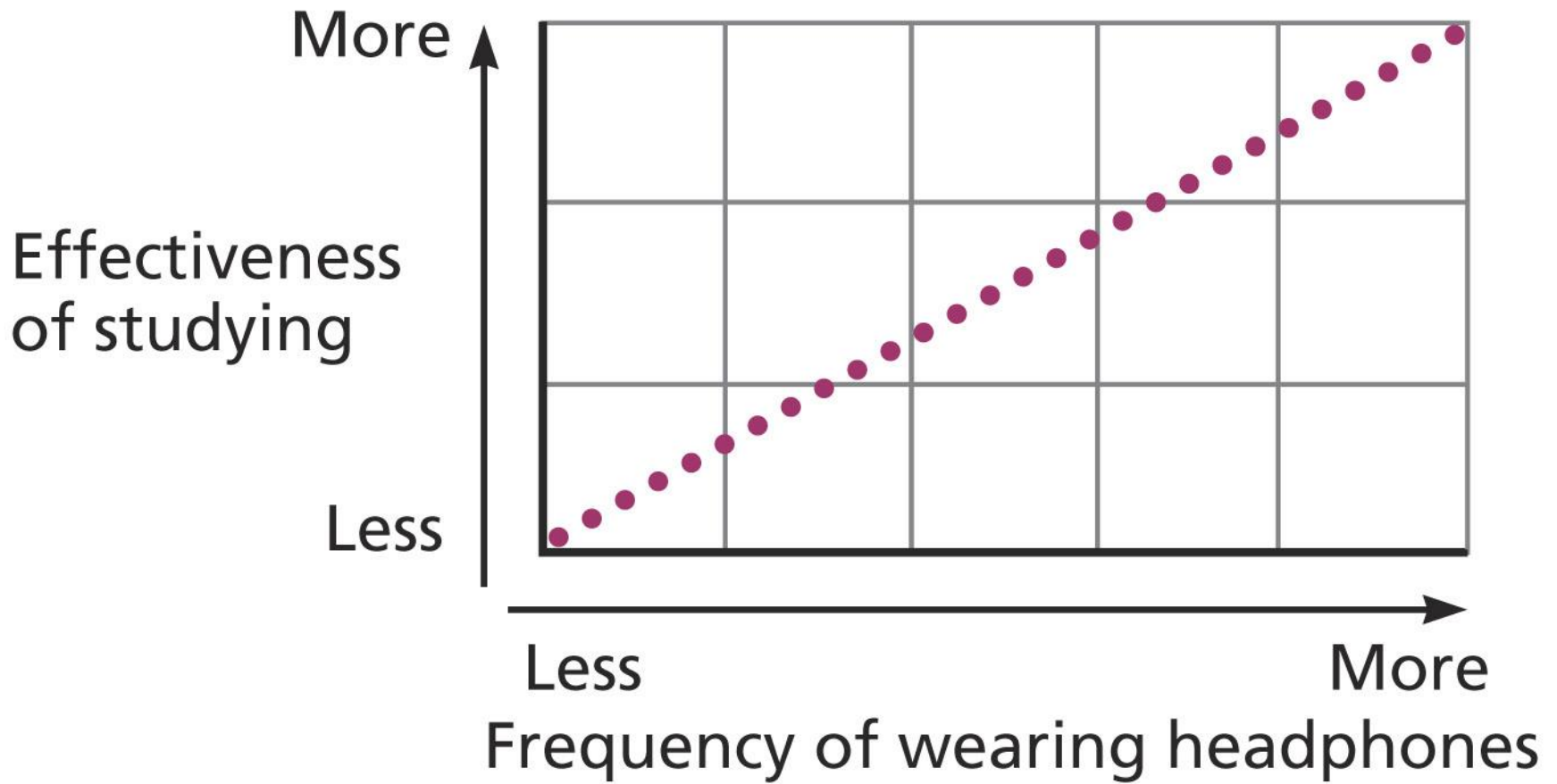
Correlation Coefficient

- A statistical measure of the strength of the relationship between two variables
- Extent to which two things vary together

Positive Correlation

- As the value of one variable increases (or decreases), the value of the other variable increases (or decreases).
- A perfect positive correlation is $+1.0$.
- The closer the correlation is to $+1.0$ the stronger the relationship.

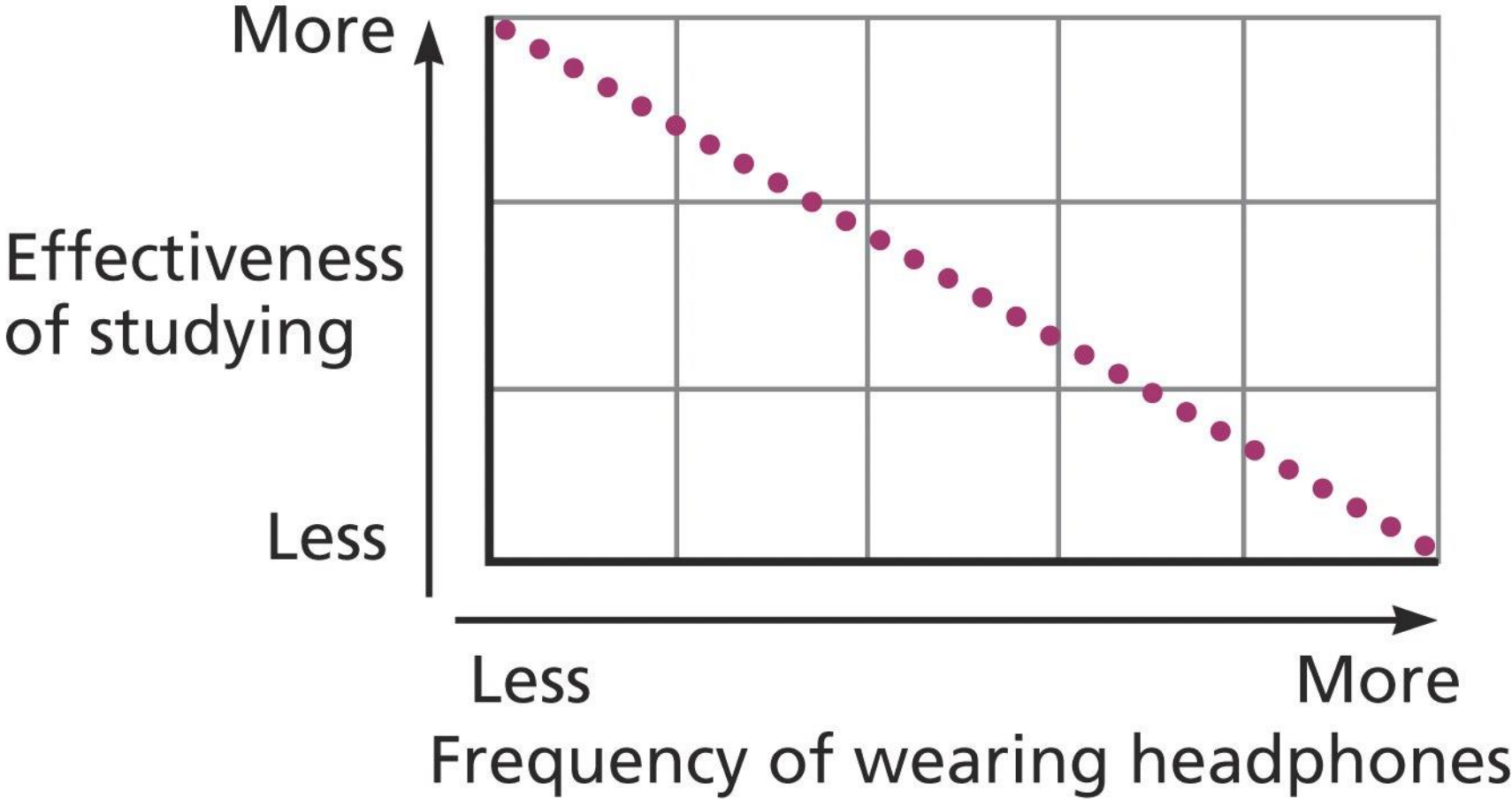
Perfect positive correlation



Negative Correlation

- As the value of one variable increases, the value of the other variable decreases.
- A perfect negative correlation is -1.0.
- The closer the correlation is to -1.0 the stronger the relationship.

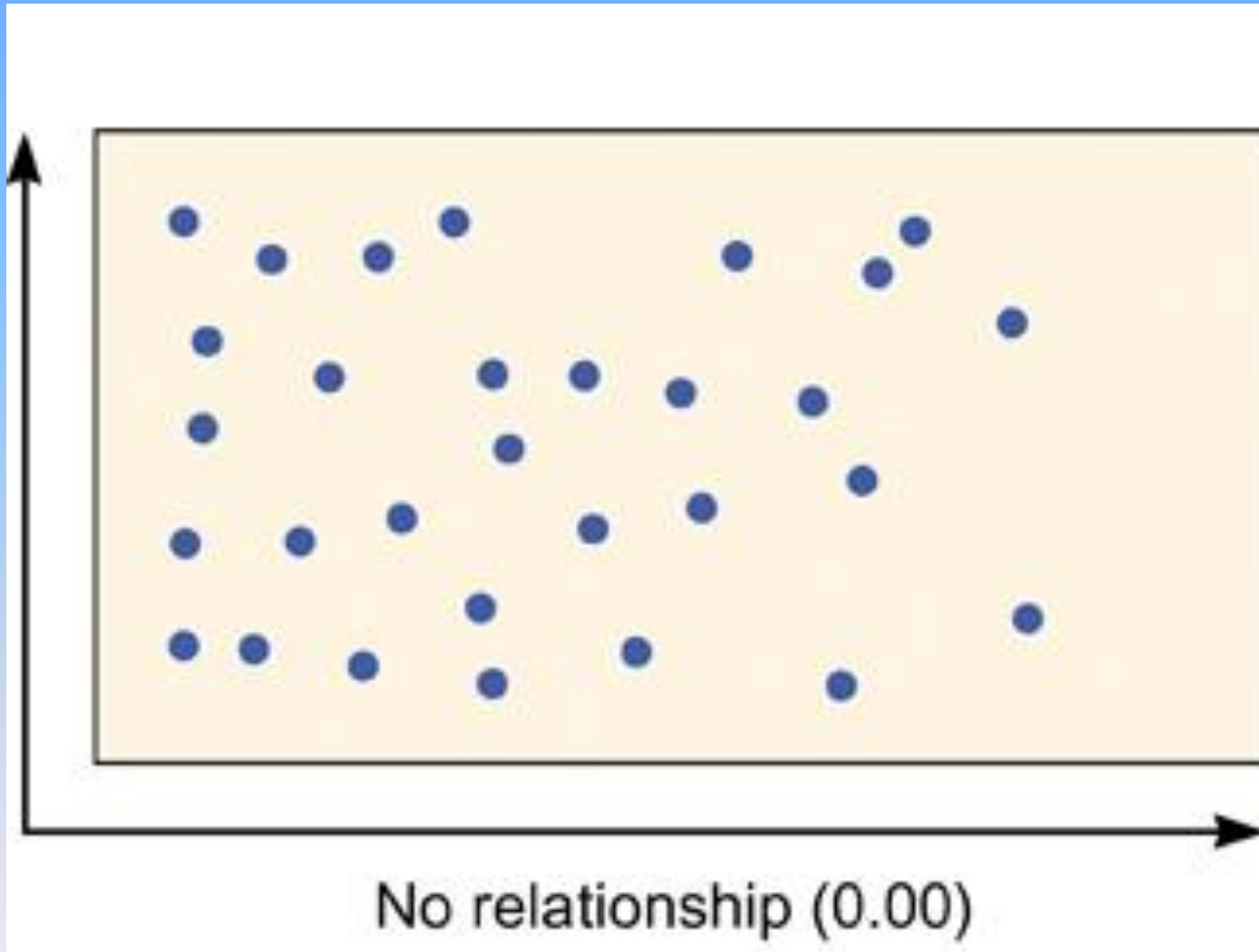
Perfect negative correlation



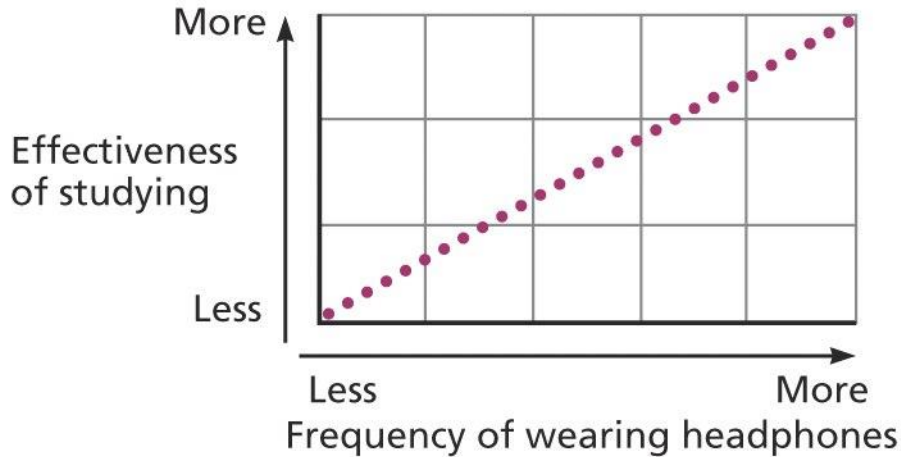
Zero Correlation

- There is no relationship whatsoever between the two variables.

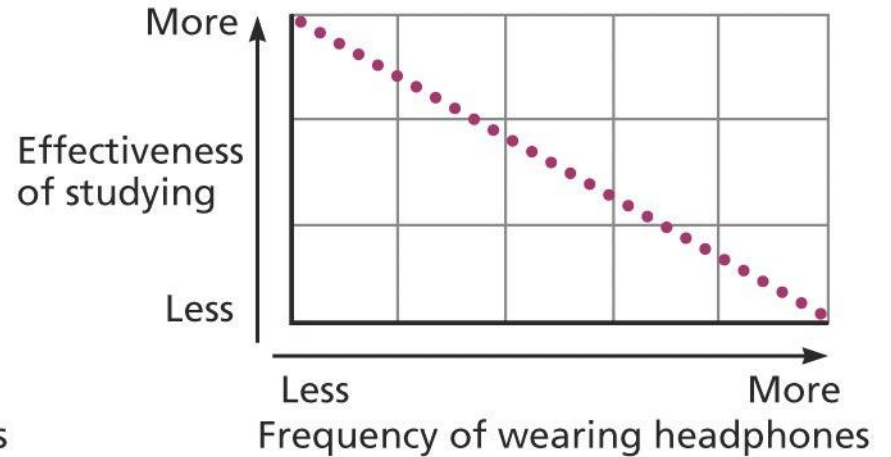
Zero Correlation



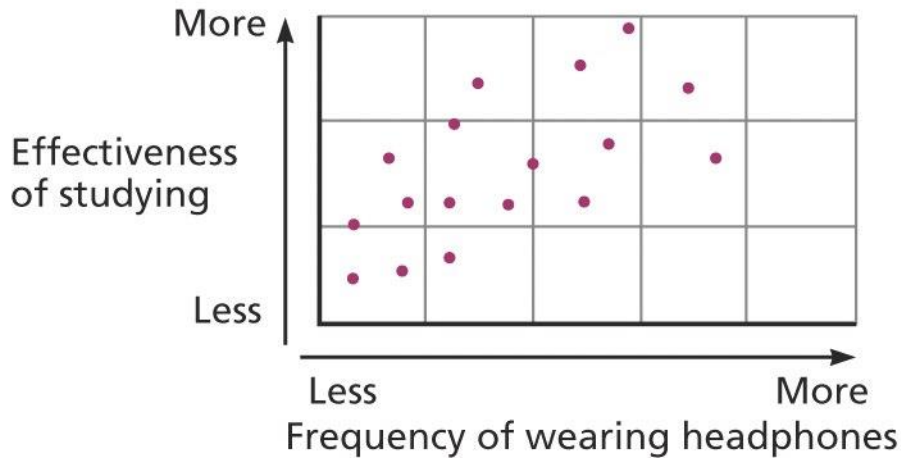
Perfect positive correlation



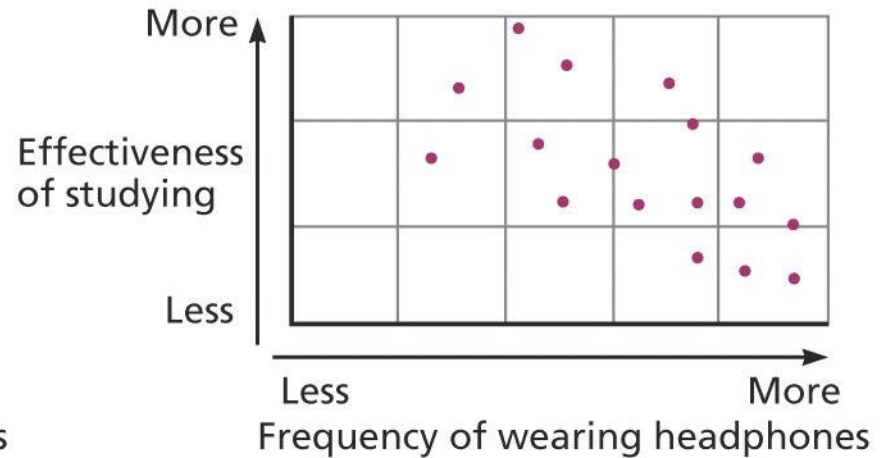
Perfect negative correlation



Moderate positive correlation



Moderate negative correlation



Module 5: Psychology's Statistics

Statistical Inference

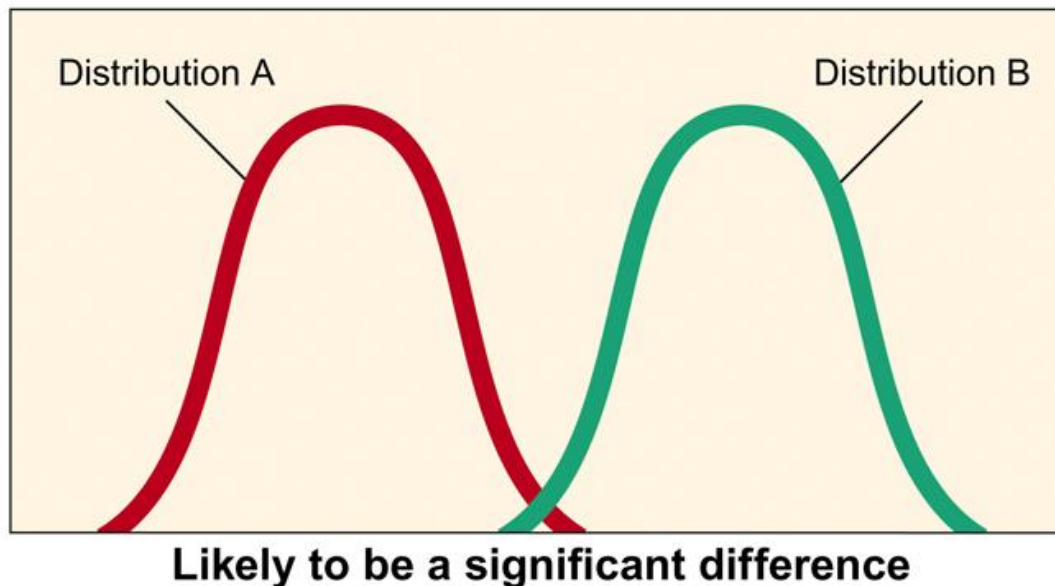
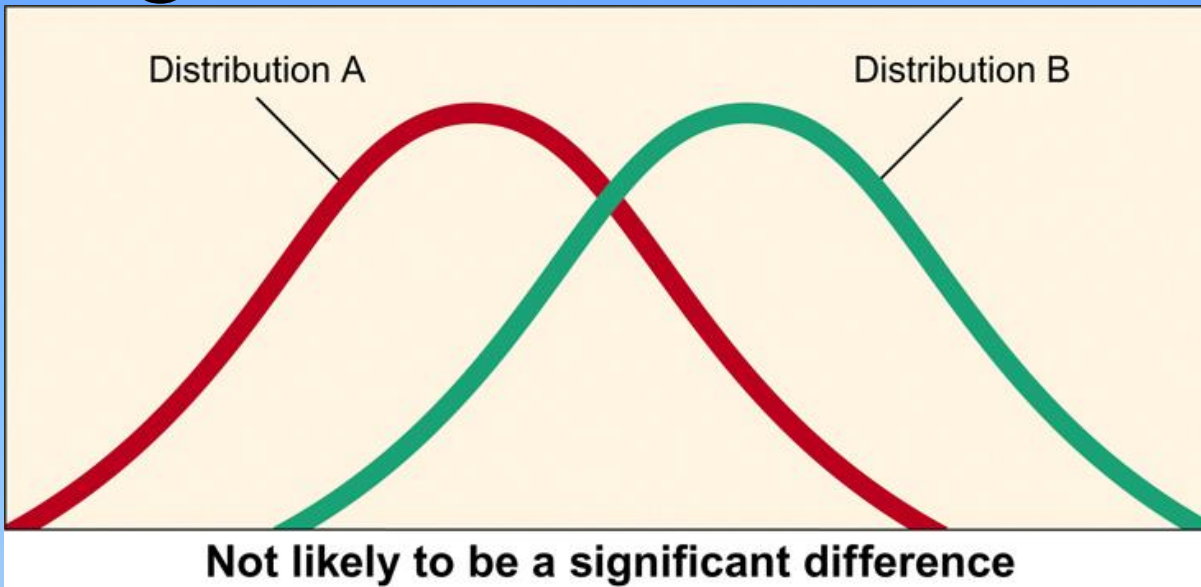
Inferential Statistics

- Statistics that can be used to make a decision or reach a conclusion about data

Statistical Significance

- A statistical statement of how likely it is that a result occurred by chance alone

Significance Difference



The End