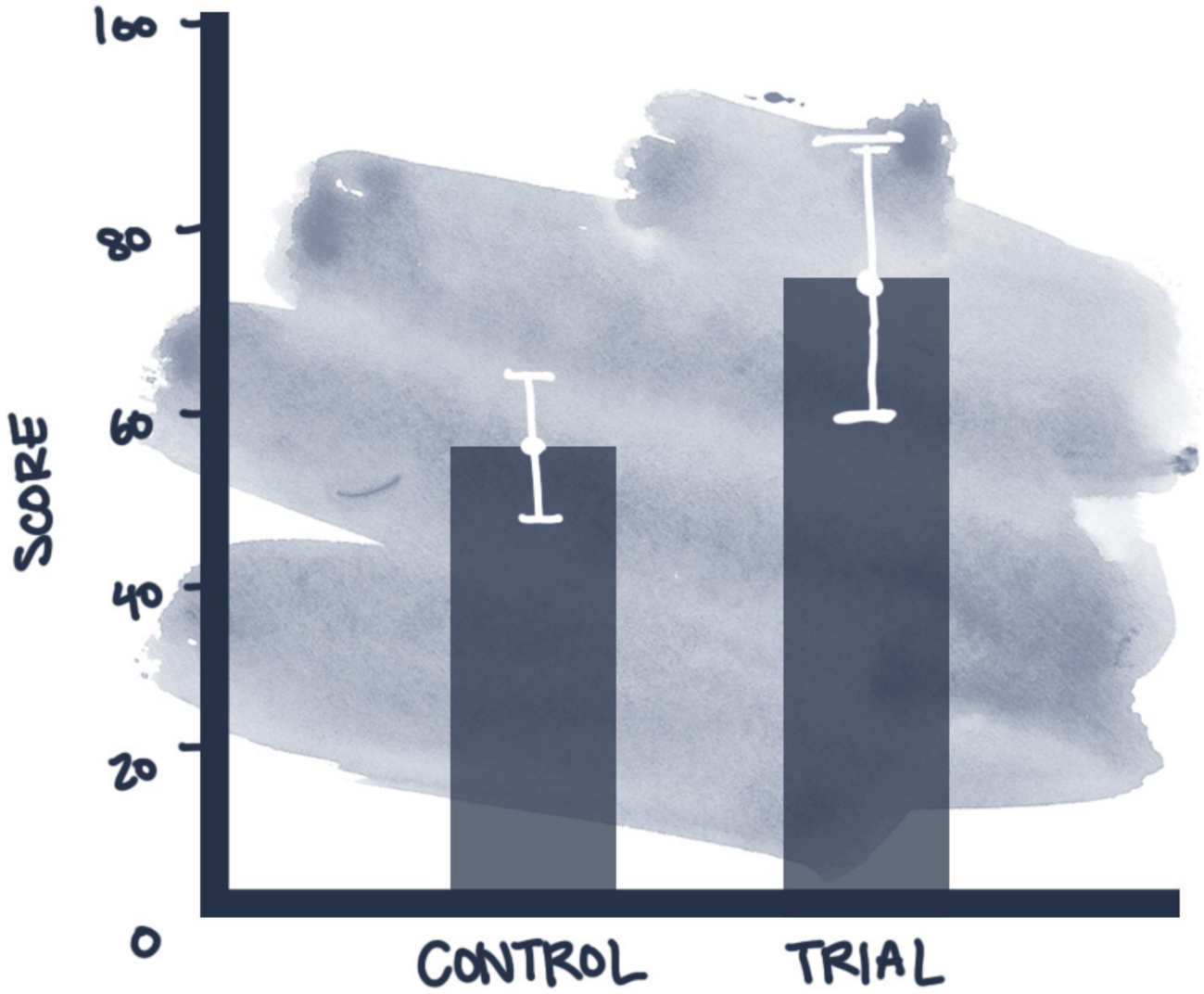
Statistical Reasoning: Describing Data Part 2



steven j. barnes

Learning Goals

- Understand the problems with considering measures of central tendency on their own.
- Be able to calculate the range, variance, and standard deviation given a data set.
- Understand the meaning of a correlation coefficient and a coefficient of determination.

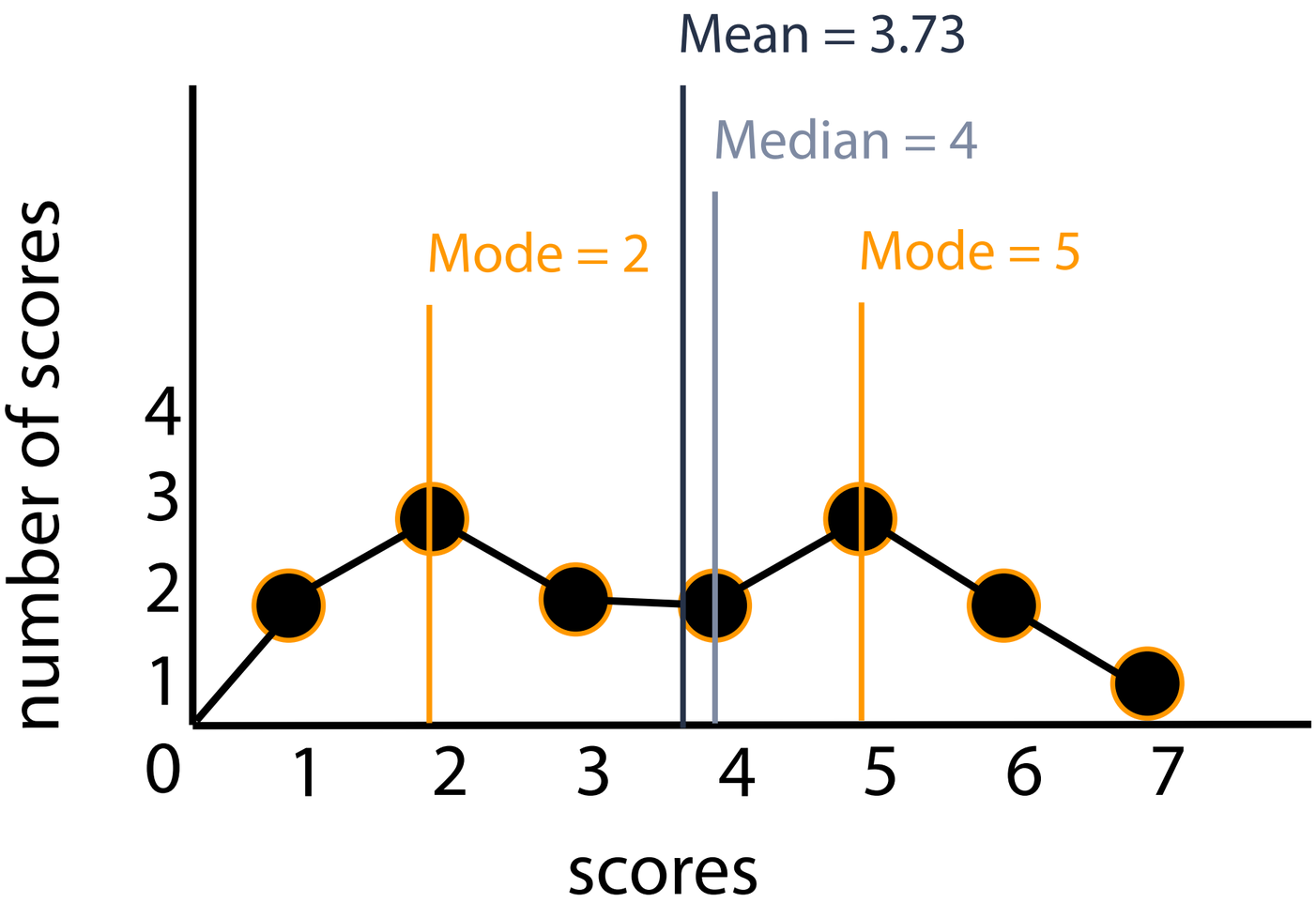
Psychological research makes use of a variety of statistical methods. They can be broken down into 2 groups:

1. Descriptive Statistics: Statistics that are used to help organize/summarize data.

2. Inferential Statistics: Statistics that allow a researcher to make inferences about the characteristics of a population, based on the characteristics of a representative sample taken from that population.

Statistical Methods

Measures of Central Tendency



Descriptive Statistics

Measures of Central Tendency

There is a general problem with measures of central tendency when considered on their own.

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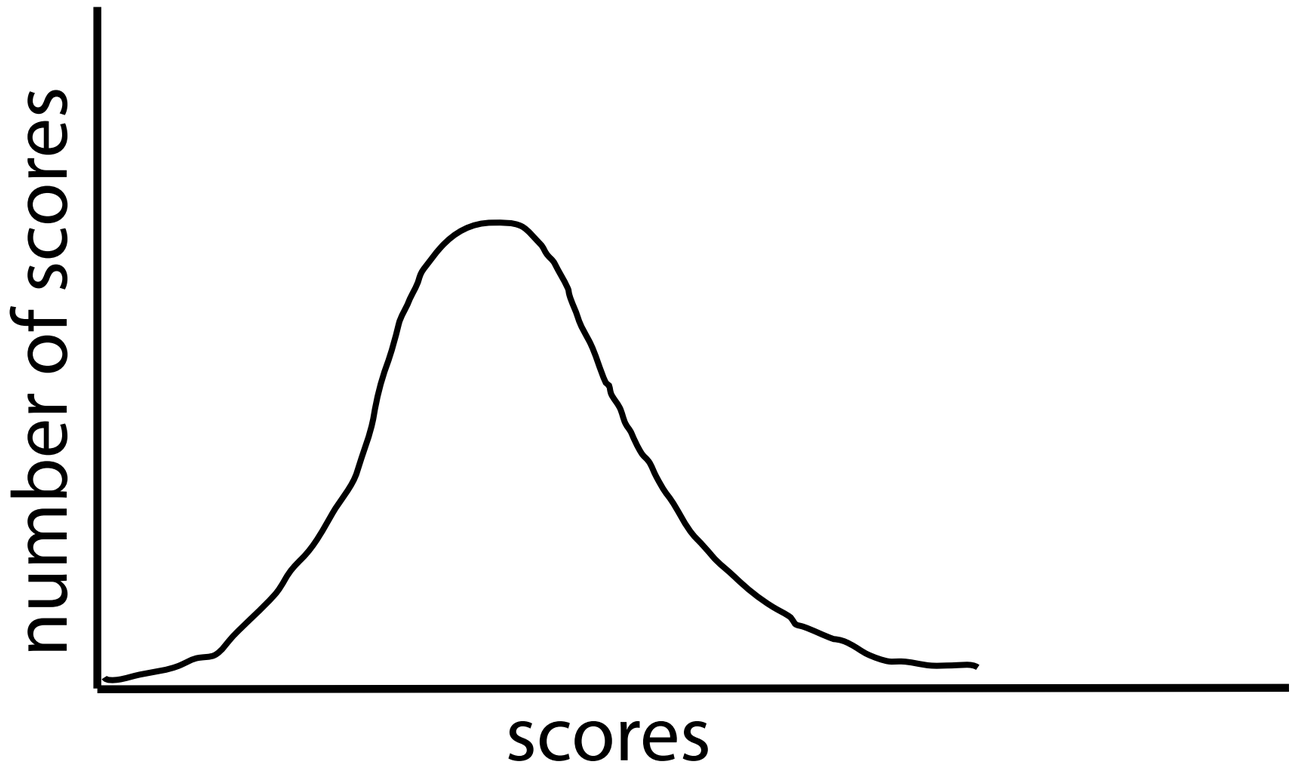

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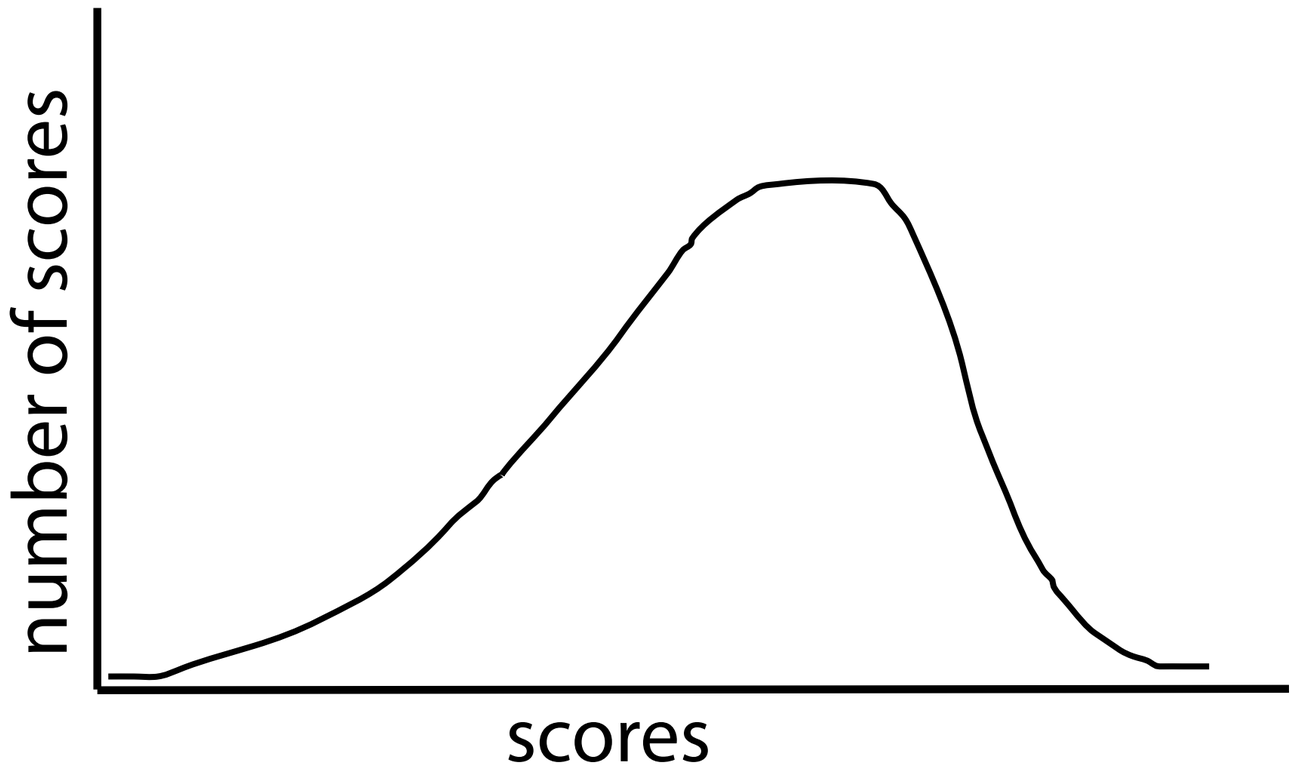

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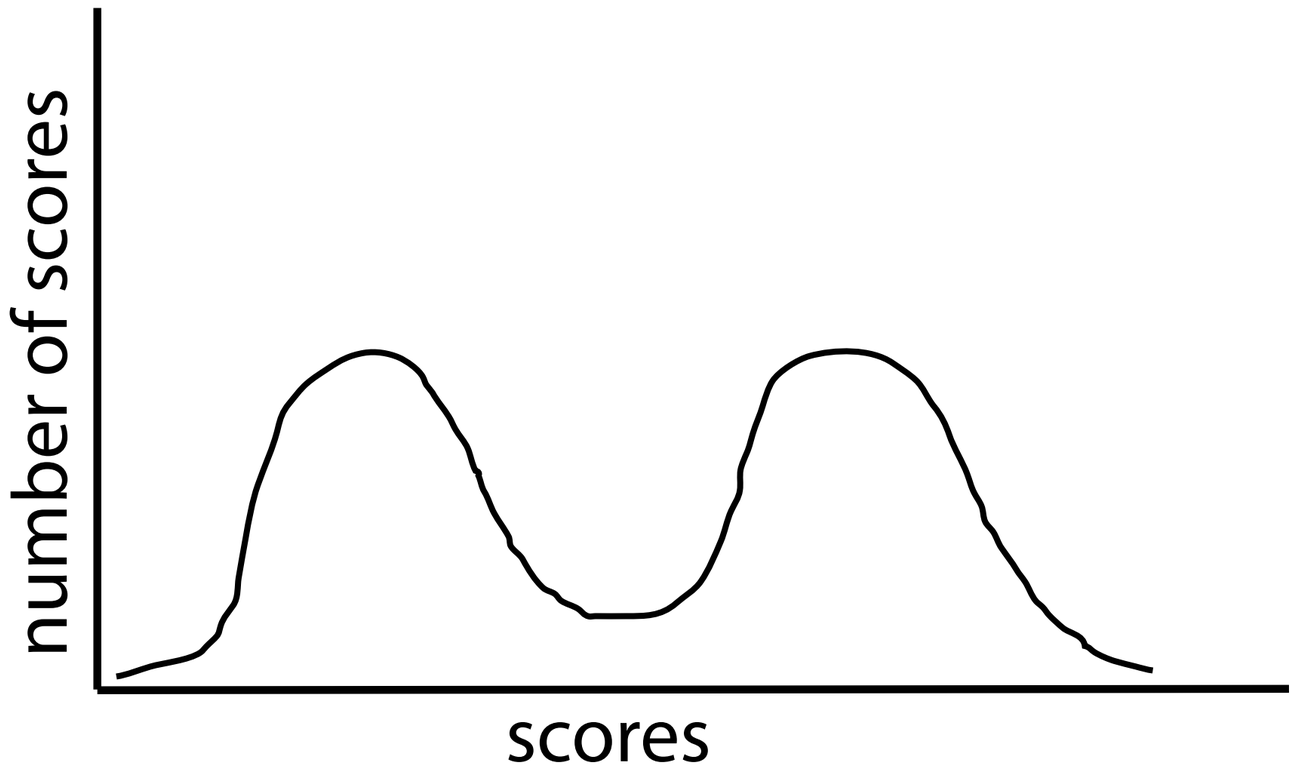

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Descriptive Statistics

Measures of Central Tendency

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3

So we need something else in addition to a measure of central tendency in order to fully describe a given data set.

Descriptive Statistics

Measures of Variability

There are quite a few ways to describe variability. We will consider 3:

1. Range.
2. Variance.
3. Standard Deviation.

Descriptive Statistics

Measures of Variability

1
2
2
3
3
3
4
4
5

Descriptive Statistics

Measures of Variability: Range

1
2
2
3
3
3
4
4
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Range = 5 - 1 = 4 = the difference between the smallest observation and the largest observation

Descriptive Statistics

Measures of Variability

For the remaining two measures of variability we must first calculate the mean for the data set.

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Recall: Mean = Total of scores / Number of scores

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Recall: Mean = Total of scores / Number of scores

Mean = 27 / 9 = 3.0

Measures of Variability

1
2
2
3
3
3
4
4
5

We then determine how far each score lies from the mean (mean = 3.0).

Descriptive Statistics

Measures of Variability: Variance

1	-2	4
2	-1	1
2	-1	1
3	0	0
3	0	0
3	0	0
4	1	1
4	1	1
5	2	4

To calculate the variance the deviation scores first need to be squared.

Descriptive Statistics

Measures of Variability: Variance

1	-2	4
2	-1	1
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5	2	4

To calculate the variance the deviation scores first need to be squared.

Variance = Sum of the squared deviations / number of scores = 12/9 = 1.33

Descriptive Statistics

Measures of Variability: Standard Deviation

1	-2	4
2	-1	1
2	-1	1
3	0	0
3	0	0
3	0	0
4	1	1
4	1	1
5	2	4

To calculate the variance the deviation scores first need to be squared.

Variance = Sum of the squared deviations / number of scores = 12/9 = 1.33

Standard Deviation = Square root of the variance = $\sqrt{1.33} = 1.15$

Descriptive Statistics

Correlation

A third type of descriptive statistic.

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Some examples:

- height and weight
- number of neurons and age

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Some examples:

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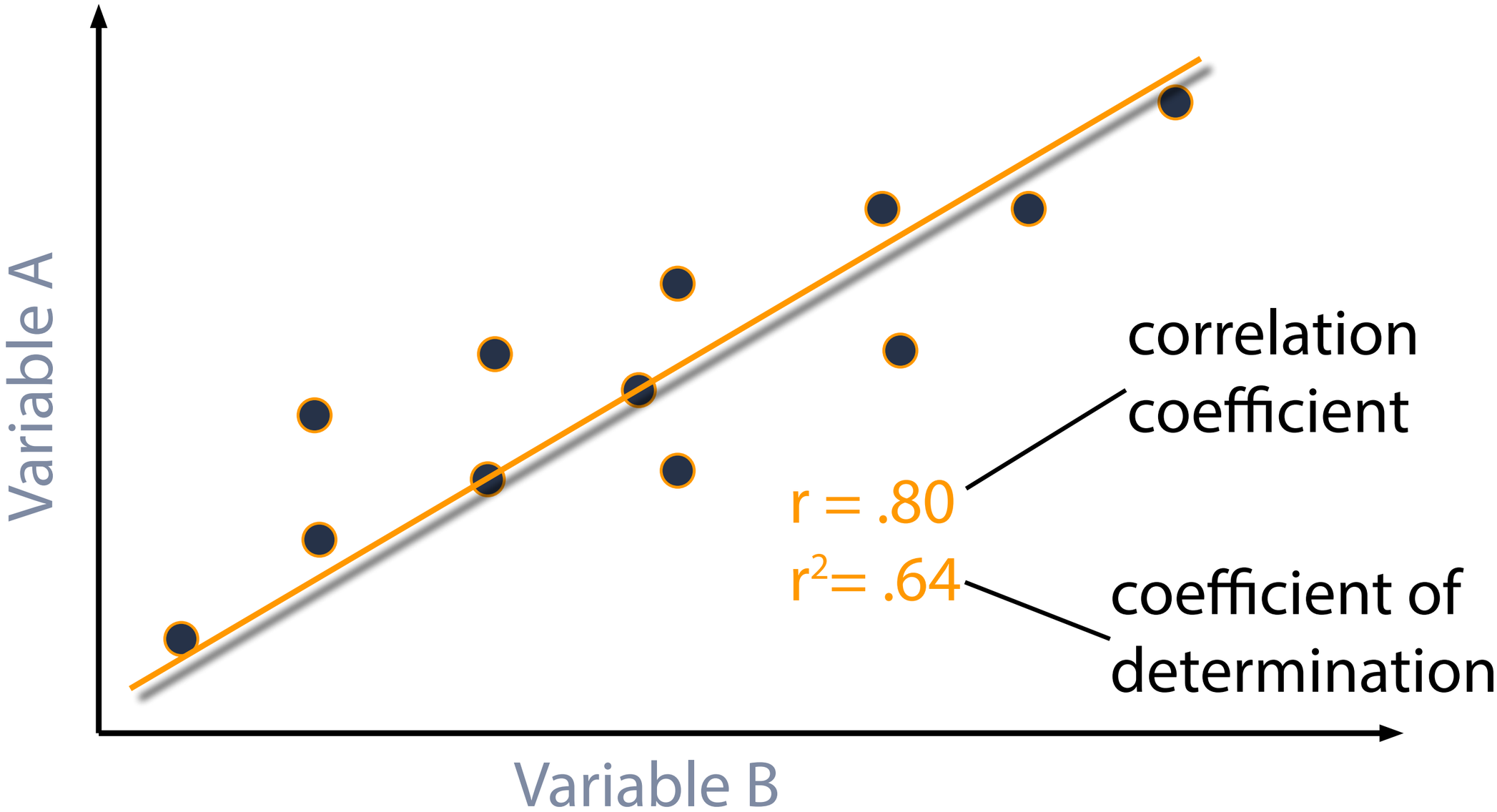
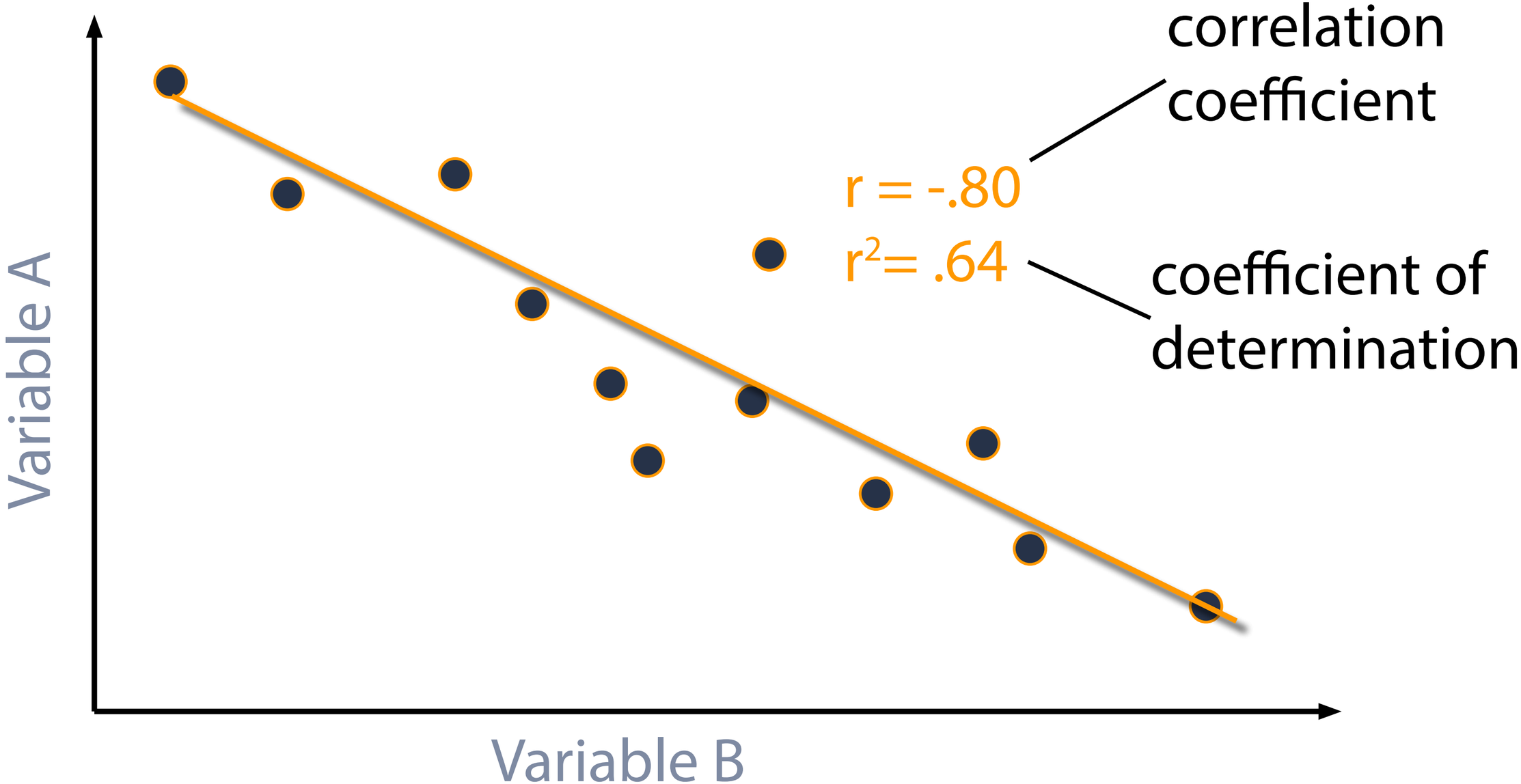
Correlations make it possible to use the value of one variable to predict the value of another.

Positive Correlation



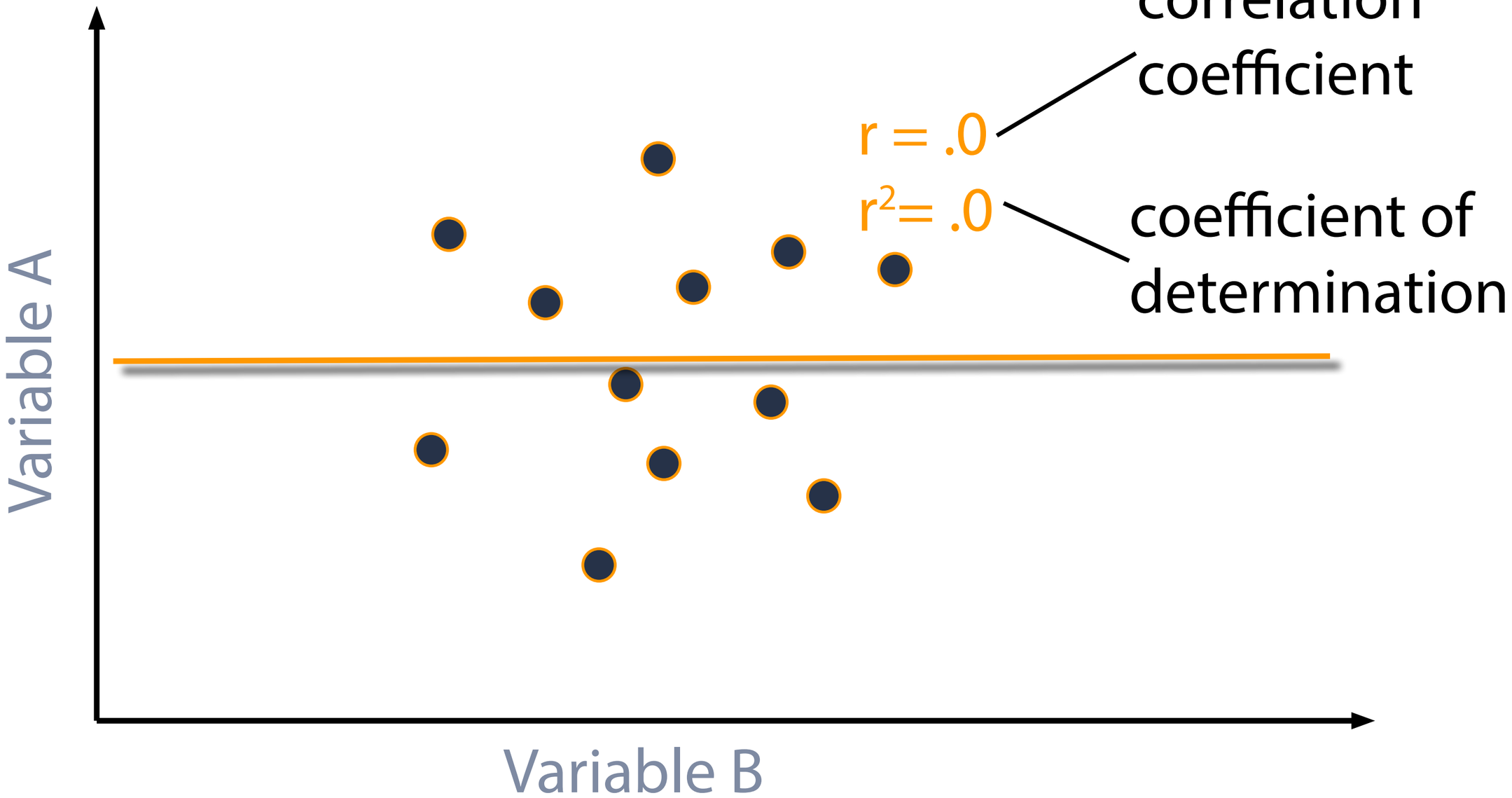
Correlations

Negative Correlation



Correlations

No Correlation



Correlations