What are three examples of two-tailed hypothesis tests?

Authored by

stats writer

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A two-tailed hypothesis test is a statistical method used to determine if there is a significant difference between two groups or variables. It involves testing the null hypothesis that there is no difference between the two groups against the alternative hypothesis that there is a difference. Three examples of two-tailed hypothesis tests include: comparing the mean test scores of students who received a new teaching method versus those who did not, analyzing the effectiveness of two different medications on treating a certain illness, and examining the relationship between income and job satisfaction among employees in two different industries. In each of these examples, the two-tailed hypothesis test would help determine if there is a significant difference between the two groups being compared.

Two-Tailed Hypothesis Tests: 3 Example Problems

In statistics, we use to determine whether some claim about a is true or not.

Whenever we perform a hypothesis test, we always write a null hypothesis and an alternative hypothesis, which take the following forms:

H0 (Null Hypothesis): Population parameter = ≤, ≥ some value

HA (Alternative Hypothesis): Population parameter <, >, ? some value

There are two types of hypothesis tests:

One-tailed test: Alternative hypothesis contains either < or > signTwo-tailed test: Alternative hypothesis

contains the ? sign

In a two-tailed test, the alternative hypothesis always contains the not equal (?) sign.

This indicates that we're testing whether or not some effect exists, regardless of whether it's a positive or negative effect.

Check out the following example problems to gain a better understanding of two-tailed tests.

Example 1: Factory Widgets

Suppose it's assumed that the average weight of a certain widget produced at a factory is 20 grams. However, one engineer believes that a new method produces widgets that weigh less than 20 grams.

To test this, he can perform a one-tailed hypothesis test with the following null and alternative hypotheses:

H0 (Null Hypothesis): μ = 20 gramsHA (Alternative Hypothesis): μ ? 20 grams

This is an example of a two-tailed hypothesis test because the alternative hypothesis contains the not

equal "? " sign. The engineer believes that the new method will influence widget weight, but doesn't specify whether it will cause average weight to increase or decrease.

To test this, he uses the new method to produce 20 widgets and obtains the following information:

n = 20 widgetsx = 19.8 gramss = 3.1 grams

Plugging these values into the , we obtain the following results:

t-test statistic: -0.288525two-tailed p-value: 0.776

Since the p-value is not less than .05, the engineer fails to reject the null hypothesis.

He does not have sufficient evidence to say that the true mean weight of widgets produced by the new method is different than 20 grams.

Example 2: Plant Growth

Suppose a standard fertilizer has been shown to cause a species of plants to grow by an average of 10 inches. However, one botanist believes a new fertilizer causes

this species of plants to grow by an average amount different than 10 inches.

To test this, she can perform a one-tailed hypothesis test with the following null and alternative hypotheses:

H0 (Null Hypothesis): µ = 10 inchesHA (Alternative Hypothesis): µ ? 10 inches

This is an example of a two-tailed hypothesis test because the alternative hypothesis contains the not equal "? " sign. The botanist believes that the new fertilizer will influence plant growth, but doesn't specify whether it will cause average growth to increase or decrease.

To test this claim, she applies the new fertilizer to a simple random sample of 15 plants and obtains the following information:

n = 15 plantsx = 11.4 inchess = 2.5 inches

Plugging these values into the , we obtain the following results:

t-test statistic: 2.1689two-tailed p-value: 0.0478

Since the p-value is less than .05, the botanist rejects the null hypothesis.

She has sufficient evidence to conclude that the new fertilizer causes an average growth that is different than 10 inches.

Example 3: Studying Method

A professor believes that a certain studying technique will influence the mean score that her students receive on a certain exam, but she's unsure if it will increase or decrease the mean score, which is currently 82.

To test this, she lets each student use the studying technique for one month leading up to the exam and then administers the same exam to each of the students.

She then performs a hypothesis test using the following hypotheses:

H0: µ = 82HA: µ ? 82

This is an example of a two-tailed hypothesis test because the alternative hypothesis contains the not

equal "? " sign. The professor believes that the studying technique will influence the mean exam score, but doesn't specify whether it will cause the mean score to increase or decrease.

To test this claim, the professor has 25 students use the new studying method and then take the exam. He collects the following data on the exam scores for this sample of students:

n = 25x = 85s = 4.1

Plugging these values into the , we obtain the following results:

t-test statistic: 3.6586two-tailed p-value: 0.0012

Since the p-value is less than .05, the professor rejects the null hypothesis.

She has sufficient evidence to conclude that the new studying method produces exam scores with an average score that is different than 82.

Additional Resources

The following tutorials provide additional information

about hypothesis testing: