

Does the confidence interval that contains zero indicate a lack of statistical significance?

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A confidence interval is a range of values within which the true value of a population parameter is likely to fall. When this interval includes zero, it suggests that there is a possibility that the true value of the population parameter is equal to zero. This does not necessarily indicate a lack of statistical significance, as the confidence interval may still include values that are significantly different from zero. However, if the confidence interval is narrow and close to zero, it may suggest a lack of statistical significance, as the data does not provide strong evidence to reject the null hypothesis. Ultimately, the presence of zero in a confidence interval should be interpreted in conjunction with other factors, such as the size of the interval and the level of significance, to determine the statistical significance of the results.

Interpret a Confidence Interval that Contains Zero

In statistics, a confidence interval is a range of values that is likely to contain a with a certain level of confidence.

If we calculate a and find that the confidence interval contains the value zero, this means we think that zero is a reasonable value for the true difference between the two population means.

In other words, if a confidence interval contains zero then we would say there is strong evidence that there is not a 'significant' difference between the two population means.

The following examples explain how to interpret confidence intervals with and without the value zero in them.

Example 1: Confidence Interval Contains Zero

Suppose a biologist wants to estimate the difference in mean weight between two different species of turtles. She goes out and gathers a random sample of 15 turtles from each population.

Here is the summary data for each sample:

Sample 1:

$$\bar{x}_1 = 310, s_1 = 18.5, n_1 = 15$$

Sample 2:

$$\bar{x}_2 = 300, s_2 = 16.4, n_2 = 15$$

We can plug these numbers into the to find the following 95% confidence interval for the true difference in mean weights between the two species:

95% Confidence interval =

Since this confidence interval contains the value zero, this means we think that zero is a reasonable value for the true difference in mean weights between the two species of turtles.

In other words, at a 95% confidence level, we would say that there is not a significant difference in the mean weight between the two species.

Example 2: Confidence Interval Does Not Contain Zero

Suppose a professor wants to estimate the difference in mean exam score between two different studying techniques. He recruits 20 random students to use technique A and 20 random students to use technique B, then has each student take the same final exam.

Technique A:

$$\bar{x}_1 = 91, s_1 = 4.4, n_1 = 20$$

Technique B:

$$\bar{x}_2 = 86, s_2 = 3.5, n_2 = 20$$

We can plug these numbers into the to find the following 95% confidence interval for the true difference in mean exam scores:

95% Confidence interval =

Since this confidence interval does not contain the

value zero, this means we think that zero is not a reasonable value for the true difference in mean exam scores between the two two groups.

In other words, at a 95% confidence level, we would say that there is a significant difference in the mean exam score between the two groups.

The following tutorials offer additional information about confidence intervals.