

# How do you perform a t-Test for correlation?

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## RECOMMENDED CITATION

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A t-Test for correlation is a statistical analysis used to determine if there is a significant relationship between two variables. This type of test is typically performed when the two variables are continuous and normally distributed. The procedure involves calculating a correlation coefficient, which measures the strength and direction of the relationship between the two variables. The test then evaluates whether this correlation coefficient is significantly different from zero, indicating a significant relationship. This is done by calculating a t-statistic and comparing it to a critical value from a t-distribution. A p-value is also calculated to further determine the significance of the relationship. The t-Test for correlation is an important tool in understanding the strength of relationships between variables and is commonly used in research and data analysis.

## Perform a t-Test for Correlation

**A Pearson correlation coefficient is used to quantify the linear association between two variables.**

**It always takes on a value between -1 and 1 where:**

**-1 indicates a perfectly negative linear correlation. 0 indicates no linear correlation. 1 indicates a perfectly positive linear correlation.**

**To determine if a correlation coefficient is statistically significant you can perform a t-test, which involves calculating a t-score and a corresponding p-value.**

**The formula to calculate the t-score is:**

$$t = r\sqrt{(n-2) / (1-r^2)}$$

where:

**r:** The correlation coefficient  
**n:** The sample size

The p-value is calculated as the corresponding two-sided p-value for the t-distribution with  $n-2$  degrees of freedom.

The following example shows how to perform a t-test for a correlation coefficient.

**Example: Performing a t-Test for Correlation**

Suppose we have the following dataset with two variables:

| Variable 1 | Variable 2 |
|------------|------------|
| 6          | 19         |
| 7          | 22         |
| 7          | 27         |
| 9          | 25         |
| 10         | 30         |
| 12         | 28         |
| 13         | 30         |
| 14         | 29         |
| 15         | 25         |
| 17         | 32         |

Using some statistical software (Excel, R, Python, etc.) we can calculate the correlation coefficient between the two variables to be 0.707.

This is a highly positive correlation, but to determine if it's statistically significant we need to calculate the corresponding t-score and p-value.

We can calculate the t-score as:

$$t = r\sqrt{(n-2) / (1-r^2)} = .707\sqrt{(10-2) / (1-.707^2)} = 2.828$$

## T Score to P Value Calculator

t score

2.828

Degrees of freedom

8

One-tailed or two-tailed hypothesis?

One-tailed

☐

Two-tailed

☒

Significance level

0.01

☐

0.05

☒

0.10

☐

CALCULATE

P-value: 0.02222

The result is **SIGNIFICANT** at  $p < 0.05$

**Since this p-value is less than .05, we would conclude that the correlation between these two variables is statistically significant.**