

What does a p-value less than 0.05 indicate? Can you provide examples?

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May 2, 2024

RECOMMENDED CITATION

stats writer (2024). *What does a p-value less than 0.05 indicate? Can you provide examples?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=141859>

A p-value less than 0.05 indicates that there is a statistically significant difference between the observed data and the expected results. This means that the likelihood of obtaining the observed results by chance is less than 5%. In other words, the result is unlikely to occur due to random chance and is considered to be statistically significant. For example, if a study comparing two groups has a p-value of 0.03, it indicates that there is a 3% chance that the difference between the two groups is due to chance, and a 97% chance that the difference is real and not a result of random variation. This indicates strong evidence that the two groups are truly different.

Interpret a P-Value Less Than 0.05 (With Examples)

A is used to test whether or not some hypothesis about a is true.

Whenever we perform a hypothesis test, we always define a null and alternative hypothesis:

Null Hypothesis (H₀): The sample data occurs purely from chance.
Alternative Hypothesis (H_A): The sample data is influenced by some non-random cause.

If the p-value of the hypothesis test is less than some significance level (e.g. $\alpha = .05$), then we can reject the null hypothesis and conclude that we have sufficient evidence to say that the alternative hypothesis is true.

If the p-value is not less than .05, then we fail to reject the null hypothesis and conclude that we do not have sufficient evidence to say that the alternative

hypothesis is true.

The following examples explain how to interpret a p-value less than .05 and how to interpret a p-value greater than .05 in practice.

Example: Interpret a P-Value Less Than 0.05

Suppose a factory claims that they produce tires that each weigh 200 pounds.

An auditor comes in and tests the null hypothesis that the mean weight of a tire is 200 pounds against the alternative hypothesis that the mean weight of a tire is not 200 pounds, using a 0.05 level of significance.

The null hypothesis (H_0): $\mu = 200$

The alternative hypothesis: (H_A): $\mu \neq 200$

Upon conducting a hypothesis test for a mean, the auditor gets a p-value of 0.0154.

Since the p-value of 0.0154 is less than the significance level of 0.05, the auditor rejects the null hypothesis and concludes that there is sufficient evidence to say that the true average weight of a tire is not 200 pounds.

Example: Interpret a P-Value Greater Than 0.05

Suppose a biologist believes that a certain fertilizer will cause plants to grow more during a three-month period than they normally do, which is currently 20 inches. To test this, she applies the fertilizer to each of the plants in her laboratory for three months.

She then performs a hypothesis test using the following hypotheses:

The null hypothesis (H_0): $\mu = 20$ inches (the fertilizer will have no effect on the mean plant growth)

Upon conducting a hypothesis test for a mean, the biologist gets a p-value of 0.2338.

Since the p-value of 0.2338 is greater than the significance level of 0.05, the biologist fails to reject the null hypothesis and concludes that there is not sufficient evidence to say that the fertilizer leads to increased plant growth.