# What is Eta Squared?

Authored by

**stats writer**

April 23, 2024

Eta Squared is a statistical measure used to determine the effect size of a specific factor or variable on an outcome in a study or experiment. It is calculated by dividing the sum of squares of the factor by the total sum of squares, and it represents the proportion of variance in the outcome that can be attributed to the factor. Eta Squared is commonly used in analysis of variance (ANOVA) and other statistical tests to determine the strength of the relationship between variables. It provides a standardized and meaningful way to interpret the importance of a factor in a study, making it a valuable tool in research and data analysis.

## What is Eta Squared? (Definition & Example)

## Eta squared is a measure of that is commonly used in ANOVA models.

## It measures the proportion of variance associated with each main effect and interaction effect in an ANOVA model.

### How to Calculate Eta Squared

## The formula to calculate Eta squared is straightforward:

## Eta squared = SSeffect / SStotal

## where:

## SSeffect: The sum of squares of an effect for one variable.SStotal: The total sum of squares in the ANOVA model.

**The value for Eta squared ranges from 0 to 1, where values closer to 1 indicate a higher proportion of variance that can be explained by a given variable in the model.**

**The following rules of thumb are used to interpret values for Eta squared:**

**.01: Small effect size.06: Medium effect size.14 or higher: Large effect size**

### Example: Calculating Eta Squared

**Suppose we want to determine if exercise intensity and gender impact weight loss.**

**To test this, we recruit 30 men and 30 women to participate in an experiment in which we randomly assign 10 of each to follow a program of either no exercise, light exercise, or intense exercise for one month.**

**The following table shows the results of a using exercise and gender as factors and weight loss as the :**

**Df Sum Sq Mean Sq F value p value**

**gender 1 15.8 15.80 9.916 0.00263**
**exercise 2 505.6 252.78 158.610 < 2e-16**
**Residuals 56 89.2 1.59**

**We can calculate SStotal, the total sum of squares, as follows: 15.8 + 505.6 + 89.2 = 610.6.**

**We can then calculate Eta squared for gender and exercise as follows:**

**Eta squared for gender: 15.8 / 610.6 = .02588Eta squared for exercise: 505.6 / 610.6 = .828**

**We would conclude that the effect size for exercise is very large while the effect size for gender is quite small.**

**These results match the p-values shown in the output of the ANOVA table. The p-value for exercise ( <.000) is much smaller than the p-value for gender (.00263), which indicates that exercise is much more significant at predicting weight loss.**

**This example also illustrates why Eta squared is useful: Although gender is statistically significant (p = .00263), the effect size associated with it is actually quite small.**

**A can only tell us whether or not there is some significant association between two variables, but a measure of effect size like Eta squared can tell us the strength of association between the variables.**