

How can I calculate the Eta Squared measure in R?

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April 23, 2024

RECOMMENDED CITATION

stats writer (2024). *How can I calculate the Eta Squared measure in R?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=138460>

Eta Squared is a common measure used in statistical analysis to determine the effect size of a particular factor or variable on the overall outcome of a study. In R, calculating Eta Squared involves using the ANOVA (Analysis of Variance) function, which compares the variability between groups to the total variability in the data set. This results in a ratio, which is then used to calculate the Eta Squared value. The Eta Squared measure can provide valuable insights into the significance and strength of a particular factor, making it a useful tool for researchers and analysts. Using R to calculate Eta Squared requires a basic understanding of ANOVA and can be easily performed with the appropriate syntax and data input.

Calculate Eta Squared in R

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 and is calculated as follows:

$$\text{Eta squared} = \text{SSeffect} / \text{SStotal}$$

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

This tutorial provides a step-by-step example of how to calculate Eta squared for variables in an ANOVA model in R.

Step 1: Create the Data

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 code shows how to create a data frame to hold the data we're working with:

#make this example reproducible

```
set.seed(10)
```

```
#create data frame
```

```
data <- data.frame(gender=rep(c("Male", "Female"),  
each = 30),  
exercise=rep(c("None", "Light", "Intense"), each = 10,  
times=2),  
weight_loss=c(runif(10, -3, 3), runif(10, 0, 5), runif(10, 5,  
9),  
runif(10, -4, 2), runif(10, 0, 3), runif(10, 3, 8)))
```

```
#view first six rows of data frame
```

```
head(data)
```

```
# gender exercise weight_loss
```

```
#1 Male None 0.04486922  
#2 Male None -1.15938896  
#3 Male None -0.43855400  
#4 Male None 1.15861249  
#5 Male None -2.48918419  
#6 Male None -1.64738030
```

```
#see how many participants are in each group
```

```
table(data$gender, data$exercise)
```

```
# Intense Light None
```

```
# Female 10 10 10
```

```
# Male 10 10 10
```

Step 2: Fit the ANOVA Model

The following code shows how to fit a using exercise and gender as factors and weight loss as the :

```
#fit the two-way ANOVA model
```

```
model <- aov(weight_loss ~ gender + exercise, data =  
data)
```

```
#view the model output
```

```
summary(model)
```

```
Df Sum Sq Mean Sq F value Pr(>F)
```

```
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
```

Step 3: Calculate Eta Squared

We can calculate the effect size Eta squared for each variable in our model by using the function from the `lsr` package:

```
#load lsr packagelibrary(lsr)
```

```
#calculate Eta Squared
```

```
etaSquared(model)
```

```
eta.sq eta.sq.part
```

```
gender 0.0258824 0.1504401
```

```
exercise 0.8279555 0.8499543
```

The Eta squared for gender and exercise are as follows:

Eta squared for gender: 0.0258824
Eta squared for exercise: 0.8279555

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.

The following tutorials explain how to fit various ANOVA models in R: