

## Repeated Measures ANOVA

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Repeated Measures ANOVA is a technique used to test the equality of means.

It is used when all the members of a random sample are tested under a number of conditions. Here, we have different measurements for each of the sample as each sample is exposed to different conditions.

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In other words, the measurement of the dependent variable is repeated. It is not possible to use the standard ANOVA in such a case as such data violates the assumption of independence of data and as such it will not be able to model the correlation between the repeated measures.

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## Not Multivariate Design

However, it must be noted that a repeated measures design is very much different from a multivariate design.

For both, samples are measured on several occasions, or trials, but in the repeated measures

design, each trial represents the measurement of the same characteristic under a different condition.

For example, repeated measures ANOVA [1] can be used to compare the number of oranges produced by an orange grove in years one, two and three. The measurement [2] is the number of oranges and the condition that changes is the year.

But in a multivariate design, each trial represents the measurement of a different characteristic.

Thus, to compare the number, weight and price of oranges repeated measures ANOVA cannot be used. The three measurements are number, weight, and price, and these do not represent different conditions, but different qualities.

## Why Use Repeated Measures Design?

Repeated measures design is used for several reasons:

- By collecting data from the same participants under repeated conditions the individual differences can be eliminated or reduced as a source of between group differences.
- Also, the sample size [3] is not divided between conditions or groups and thus inferential testing [4] becomes more powerful.
- This design also proves to be economical when sample members are difficult to recruit because each member is measured under all conditions.

## Assumption

This design is based on the assumption of Sphericity, which means that the variance [5] of the population difference scores for any two conditions should be the same as the variance of the population difference scores for any other two conditions.

But this condition is only relevant to the one-way [6] repeated measures ANOVA and in other cases this assumption is commonly violated.

## Hypothesis

The null hypothesis [7] to be tested [8] here is:

$H_0$ : There are no differences between population means.

Some differences will occur in the sample. It is desired to draw conclusions [9] about the population from which it was taken, not about the sample. The F-ratios are used for the analysis of variance and conclusions are drawn accordingly.

## Within-Subject Design

The repeated measures design is also known as a within-subject design [10].

The data presented in this design includes a measure repeated over time, a measure repeated across more than one condition or several related and comparable measures.

## Possible Designs for Repeated Measures

- One-way <sup>[6]</sup> repeated measures
- Two-way <sup>[11]</sup> repeated measures
- Two-way mixed split-plot design (SPANOVA)

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**Source URL:** <https://explorable.com/repeated-measures-anova>

### Links

- [1] [http://en.wikiversity.org/wiki/Advanced\\_ANOVA/Repeated\\_measures\\_ANOVA](http://en.wikiversity.org/wiki/Advanced_ANOVA/Repeated_measures_ANOVA)
- [2] <https://explorable.com/scientific-measurements>
- [3] <https://explorable.com/sample-size>
- [4] <https://explorable.com/inferential-statistics>
- [5] <https://explorable.com/statistical-variance>
- [6] <https://explorable.com/one-way-anova>
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- [10] <https://explorable.com/within-subject-design>
- [11] <https://explorable.com/two-way-anova>