

## Within Subject Design

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In a within subject design, unlike a between subjects design, every single participant is subjected to every single treatment, including the control.

This gives as many data sets as there are conditions for each participant; the fact that subjects act as their own control provides a way of reducing the amount of error arising from natural variance between individuals.

These tests are common in many research disciplines. An education researcher might want to study the effect of a new program on children and test them before, and after, the new method has been applied.

Psychologists often use them to test the relative effectiveness of a new treatment, often a difficult proposition. The sheer complexity of the human mind and the large number of potential confounding variables often renders between subjects designs unreliable, especially when necessarily small sample groups make a more random approach impossible.

Within Subject Design



The banner features the Explorable logo at the top center, with the text "EXPLORABLE" in a large, bold, white font and "Quiz Time!" in a smaller, white, cursive font below it. Below the logo are three square images, each with a white border and a white caption below it. The first image shows a pair of red roller skates on a wooden deck, with the caption "Quiz: Psychology 101 Part 2". The second image shows a fan of colorful pencils, with the caption "Quiz: Psychology 101 Part 2". The third image shows a Ferris wheel at sunset, with the caption "Quiz: Flags in Europe". In the bottom right corner of the banner, there is a white button with the text "See all quizzes =>" in a white font.

## Examples of Within Subject Designs

One of the simplest within subject designs is opinion - watch any formalized debate and you will see the process. The chairperson will take a vote before the debate, to establish a

baseline opinion, and will ask the audience to vote again at the end. The team that gained the most votes obviously managed to sway opinion in the same subjects much better, so can be announced as the winner.

Another common example of a within-subjects design is medical testing, where researchers try to establish whether a drug is effective or whether a placebo effect [1] is in order. The researchers, in the crudest form of the test [2], will give all of the participants the placebo, for a time, and monitor the results. They would then administer the drug for a period and test the results [3].

Of course, the researchers could just as easily administer the drug first and then the placebo. This ensures that every subject acts as their own control [4], so there are few problems with matching age, gender and lifestyle, reducing the chance of confounding factors.

## The Advantages of Within Subject Designs

The main advantage that the within subject design has over the between subject design [5] is that it requires fewer participants, making the process much more streamlined and less resource heavy.

For example, if you want to test four conditions, using four groups of 30 participants is unwieldy and expensive. Using one group, which is tested for all four, is a much easier way. Ease is not the only advantage, because a well planned within subject design allows researchers to monitor the effect upon individuals much more easily and lower the possibility of individual differences skewing the results.

## The Disadvantages of Within Subject Designs

One disadvantage of this research design [6] is the problem of carryover effects, where the first test adversely influences the other. Two examples of this, with opposite effects, are fatigue and practice. In a long experiment, with multiple conditions, the participants may be tired and thoroughly fed up of researchers prying and asking questions and pressuring them into taking tests. This could decrease their performance on the last study.

Alternatively, the practice effect might mean that they are more confident and accomplished after the first condition, simply because the experience has made them more confident about taking tests. As a result, for many experiments, a counterbalance design [7], where the order of treatments is varied, is preferred, but this is not always possible.

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### Links

[1] <https://staging.explorable.com/placebo-effect>

[2] <https://staging.explorable.com/hypothesis-testing>

[3] <https://staging.explorable.com/statistically-significant-results>

[4] <https://staging.explorable.com/scientific-control-group>

[5] <https://staging.explorable.com/between-subjects-design>

[6] <https://staging.explorable.com/research-designs>

[7] <https://staging.explorable.com/counterbalanced-measures-design>