

Matched-pair Design

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WHAT'S COVERED

This tutorial will explain matched-pair design experiments by examining the characteristics and examples of:

1. Matched-Pair Design

1a. With Subjects in Pairs

1b. With Subjects as Individuals

1. Matched-Pair Design

In a **matched-pair design** experiment, you form experimental units by pairing subjects that are as similar as possible. One subject goes to the treatment group and the other subject goes to the control group. Having very similar pairs helps control for the other variables we haven't considered.

⇒ **EXAMPLE** Choosing a pair of women who are the same age, have the same exercise habits, and live in the same area allows us to look at only the variable we are studying, while avoiding the effects of age, exercise, and location on the outcomes of the experiment.

In matched-pair design, subjects can be assigned to the treatment and control groups in two different ways:

- Subjects who are similar with respect to variables that could affect the outcome of the experiment are paired together, and then one of them is assigned to the treatment group and one is assigned to the control group
- Each subject is assigned to both groups, where each subject acts as their own matched-pair.



HINT

This type of design is also similar to a case-control study, but here researchers are giving a treatment instead of just observing the participants.



TERM TO KNOW

Matched-Pair Design

An experimental design where two subjects who are similar with respect to variables that could affect the outcome of the experiment are paired together, then one of them is assigned to one treatment and one is assigned to the control. This can also be done by assigning each subject to both groups, where each subject acts as their own matched-pair.

1a. With Subjects in Pairs

Matched-pair design involves matching subjects into pairs that are as similar as possible with respect to any variable that may affect the outcome.



WATCH

IN CONTEXT

There are 20 participants for an experiment for a flu vaccine. Gender and age may play a role in how well this treatment works. Groups of two are created; each group is as similar as possible with respect to any variable that may affect the outcome.

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Gender	M	F	M	M	F	F	F	M	F	M	M	M	F	F	F	M	F	M	F	M
Age	24	21	42	39	35	37	22	25	31	32	51	31	61	26	38	55	26	56	52	48

There are 10 men and 10 women of all different ages. Participants will be listed by gender. So participant 1, 3, 4, 8, 10, 11, 12, 16, 18, and 20 are the males. The rest are females.

Males	Participant	1	3	4	8	10	11	12	16	18	20
	Age	24	42	39	25	32	51	31	55	56	48
Females	Participant	2	5	6	7	9	13	14	15	17	19
	Age	21	35	37	22	31	61	26	38	26	52

Age is suspected to also play a role in effectiveness, so within the male category, two ages that are closest together--24 and 25--are chosen. Therefore, participants 1 and 8 will form a matched pair. Participants 10 & 12, 4 & 3, 20 & 11, and 16 & 18 are also matched pairs due to similarly aged males. The same criteria is applied for similarly aged females.

Males	Participant	1	8	12	10	4	3	20	11	16	18
	Age	24	25	31	32	39	42	48	51	55	56

Females	Participant	2	7	14	17	9	5	6	15	19	13
	Age	21	22	26	26	31	35	37	38	52	61

Now, to continue the experiment, one of the two in the pair is randomly assigned to receive the flu vaccine and the other one will be assigned to the control group.

1b. With Subjects as Individuals

Also in a matched-pair design, each subject can be assigned to both groups instead of one, then randomly assigned the order in which treatments are applied. Each participant then counts as his or her own matched pair. This design essentially compares someone to themselves.

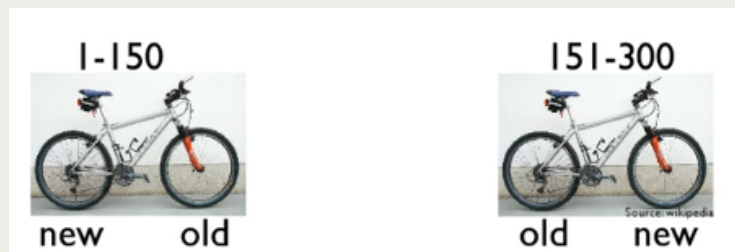
IN CONTEXT

Suppose that you have a tire company that's considering rolling out a new type of rubber for its bicycle tires. There are 300 bicycles available. In a completely randomized design, you would place the numbers 1 - 300 in a hat. Bikers that pull numbers 1 -150 would receive old rubber tires, and the 151-300 would receive the new rubber tires. They won't necessarily know who's getting which tires.

But what if the 300 riders don't all ride the same way or equally as often? What do you do then? How do you create two groups that are roughly the same, with the exception of the bicycle tires?

One way to do it is with a matched-pair design. You could still put the numbers 1 - 300 in a hat. The only difference is that the people who pull out 1- 150 would get both the old and the new. They would put the old in the front and the new rubber tire in the back.

Then, the people who pulled out 151 - 300 would get the new rubber tire in the front and the old one in the back.



So there's still some randomization going on. The only difference is that every biker will get one old tire and one new tire. This will allow you to compare the tread wear for each bike because the front and rear tire get worn somewhat equally. It won't matter how much the biker rides or where.



SUMMARY

In a matched-pair design, two numbers whose characteristics are very similar are paired, then each one is sent to a different group. When applying matched-pair design, typically, each subject is assigned to both groups instead of one, as was the case with the bicycle tires situation. Matched-pairs designs are often done by assigning both treatments to every participant, which is commonly used in the matched-pairs design.

Good luck!

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TERMS TO KNOW

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An experimental design where two subjects who are similar with respect to variables that could affect the outcome of the experiment are paired together, then one of them is assigned to one treatment and one is assigned to the control. This can also be done by assigning each subject to both treatments, where each subject acts as their own matched-pair.