Experiments

Colby Community College

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The treatment drug may have a different reaction to full versus empty stomachs.

To control for food consumption, researchers ask all subjects to take the treatment pill immediately after a meal.

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Afterwards the blood pressure of each subject is measured.

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Example 4

A researcher swabs an existing colony of bacteria and wipes it on a growth plate.

Example 5

An experiment of a new acne treatment randomly assigns 300 patients into the following groups:

Treatment Group: Receives the treatment being tested.

Negative Control: Receives a placebo treatment.

Positive Control: Receives a commercially available medication.

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The negative control is used to show that any positive effects of the new treatment aren't caused by some confounding variable.

The positive control is used to detect any problems with the new treatment or how it is administered.

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The positive control is used to detect any problems with the new treatment or how it is administered.

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A positive control can also be used to benchmark the results of the new treatment against existing treatments.

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Example 6

If researchers are looking into the effect of a drug on heart attack patients, they might split all the patients into high-risk and low-risk blocks. Then half of each block is assigned to the treatment group and half to the control group.

Example 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42

Example 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42

Split into blocks

Low-risk patients

1	2	3	5	7	11	12
13	14	15	16	17	18	20
24	25	26	27	31	34	36
39	41	42				

High-risk patients

4	6	8	9	10
19	21	22	23	28
29	30	32	33	35
37	38	40		

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High-risk patients

4	6	8	9	10
19	21	22	23	28
29	30	32	33	35
37	38	40		

Randomly split each block in half

Control group

2	5	7	12	13	17
18	20	25	36	39	42

4	6	19	28	30	32
35	38	40			

Treatment group

1	3	11	14	15	16
24	26	27	31	34	41

8	9	10	21	22	23
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Experimental Design

A good experiment is built on four principles.

Controlling	Researchers do their best to control for differences in the treatment and control groups.
Randomization	Sampling and assignment into treatment and/or control groups are done randomly.
Replication	A sufficiently large sample is used.
Blocking	Researchers suspect that variables other than the treatment may influence the response.

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While blocking is a slightly more advanced topic, the statistical methods we discuss in this course can be extended to analyze such experiments.

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Suppose researchers want to test the effectiveness of a new treatment for cervical cancer. They decided to use a control group that receives no treatment.

Is this ethical?

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Suppose researchers want to test the effectiveness of a new treatment for cervical cancer. They decided to use a control group that receives no treatment.

Is this ethical?

No, there are existing, effective treatments for cervical cancer. It is unethical to withhold all treatment from a patient.

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If there is no known effective treatment, then having a control group that receives no treatment may be ethical.

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Note

In practice, research groups are responsible to review boards which must weigh the ethical concerns of an experiment before any patients are treated.