SCIENCE FOUNDATIONS

Control groups

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how you tell whether a new medicine or a new fertilizer actually works, by comparing the people or plants that got it with a similar group that did not. Without that comparison group, you cannot tell if the patients got better because of the drug or just because time passed. A farmer testing a new fertilizer plants one field with it and one without, under the same weather and soil. Knowing control groups keeps you from being fooled by a change that would have happened anyway.



Rule

Control groups: a fair test changes one factor only.

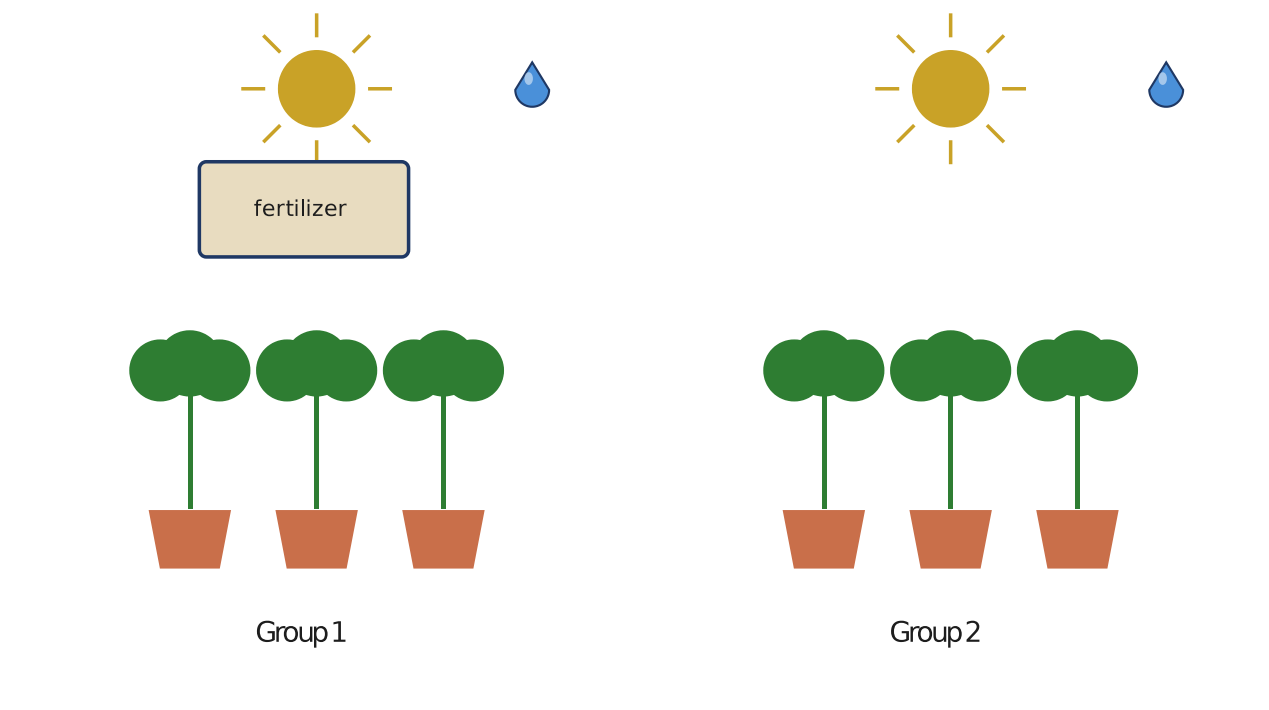
The control group is treated exactly like the experimental group except for the one factor being tested, so any difference in the results must come from that factor.

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Worked examples

EXAMPLE 1

Q You are testing a new fertilizer on plants. How should you set up the experimental group and the control group?



SOLUTION

Give one group of plants the new fertilizer: the experimental group.

Give a second, identical group no fertilizer: the control group.

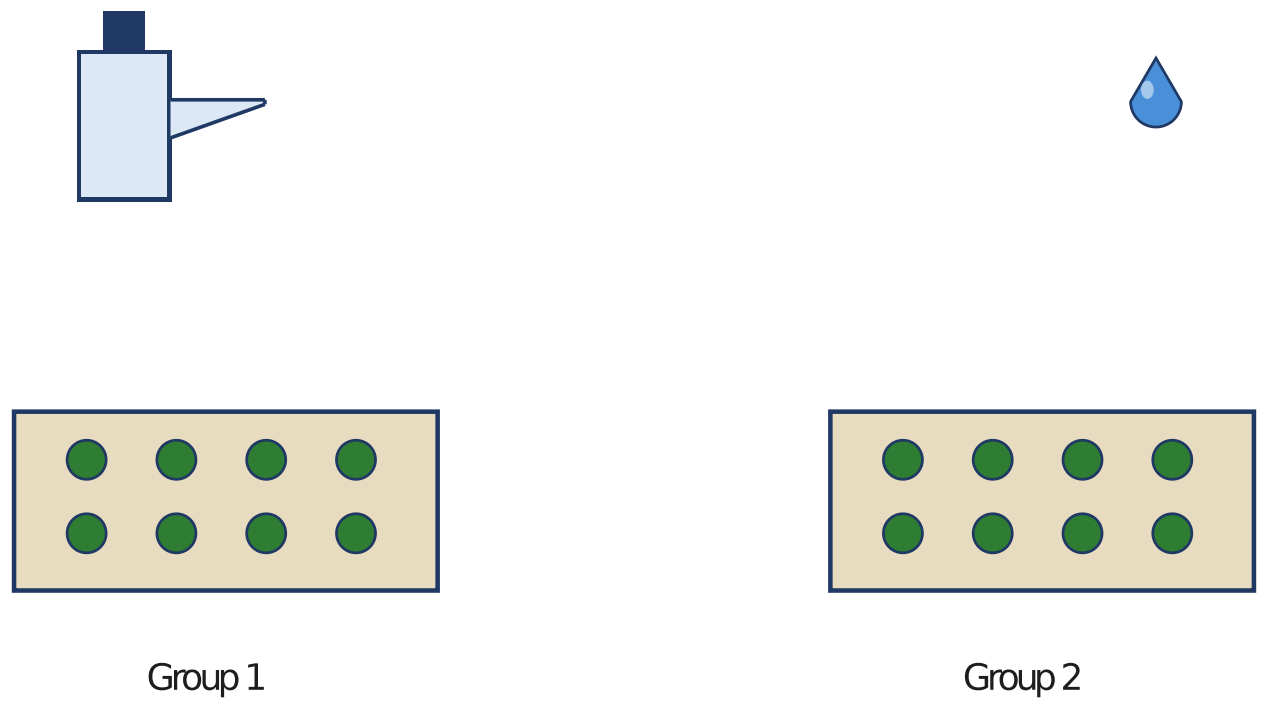
Keep light, water, soil, and plant type the same, then compare heights.

The result is any height difference is evidence about the fertilizer.

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EXAMPLE 2

Q You are testing a cleaning spray on seeds to see if it helps them sprout. How should you set up the experimental group and the control group?



SOLUTION

Give one set of seeds the spray: the experimental group.

Give a second set plain water only: the control group.

Count how many seeds sprout in each group and compare.

The result is compare sprouting in spray group against water-only group.

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Practice questions

1 You are testing whether a new soil mix helps sunflower plants grow taller. Which setup is a fair test?

- **A** One group in the new soil mix, one group in the old soil, same light, water and plant type, compare the heights
- **B** All plants in the new soil mix, compare them with last year's plants
- **C** One group in the new soil mix with extra water, one group in the old soil with less water
- **D** One group in the new soil mix and no other group, just measure the heights

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2 **You are testing a new plant food on bean plants. Describe the experimental group, the control group, what you keep the same, and what you compare.**

- **A** Experimental group gets the new plant food, control group gets plain water only, same light, water, soil and plant type, compare the heights
- **B** Both groups get the new plant food, compare the heights
- **C** Experimental group gets the new plant food, control group gets a different plant food as well
- **D** Experimental group gets plain water only, control group gets the new plant food

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3 You are testing a new pill to see if it helps headaches. Which group is the control group?

- **A** The patients who get a pill with no medicine in it
- **B** The patients who get the new pill
- **C** The patients with the worst headaches
- **D** The patients who feel better

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4 You are testing whether a new liquid helps cress seeds sprout. Which of these is the independent variable in the test?

- **A** Whether the seeds get the liquid or plain water
- **B** How many seeds sprout
- **C** The type of seed used
- **D** The amount of light the seeds get

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5 What is a control group?

- A The group that gets no treatment, for comparison
- B The group that gets the treatment being tested
- C The group with the most plants
- D The group measured first

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6 What is an experimental group?

- A The group that gets the treatment being tested
- B The group that gets no treatment, for comparison
- C The group with the fewest plants
- D The group measured last

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7 Why have a control group?

- **A** It shows what happens without the treatment
- **B** It makes the plants grow faster
- **C** It gives the treatment to more plants
- **D** It removes the need to measure

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8 What must be the same for both groups?

- **A** Everything except the treatment
- **B** Nothing needs to be the same
- **C** Only the treatment
- **D** Only the plant type

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9 A test has no control group. What is the problem?

- **A** You cannot tell if the treatment caused the result
- **B** The plants will not grow
- **C** The results are always wrong
- **D** You cannot measure anything

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10 If both groups grow the same, what does that suggest?

- **A** The treatment had no clear effect
- **B** The treatment worked very well
- **C** The control group was wrong
- **D** The plants were measured wrongly

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ANSWER KEY

1. One group in the new soil mix, one group in the old soil, same light, water and plant type, compare the heights

2. Experimental group gets the new plant food, control group gets plain water only, same light, water, soil and plant type, compare the heights

3. The patients who get a pill with no medicine in it

4. Whether the seeds get the liquid or plain water

5. The group that gets no treatment, for comparison

6. The group that gets the treatment being tested

7. It shows what happens without the treatment

8. Everything except the treatment

9. You cannot tell if the treatment caused the result

10. The treatment had no clear effect

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