ACTIVITY 8

Testing a Well-Being Strategy

LABORATORY

Be thoughtful when designing an experiment to control for variables that might affect your results.

8: TESTING A WELL-BEING STRATEGY

GUIDING QUESTION

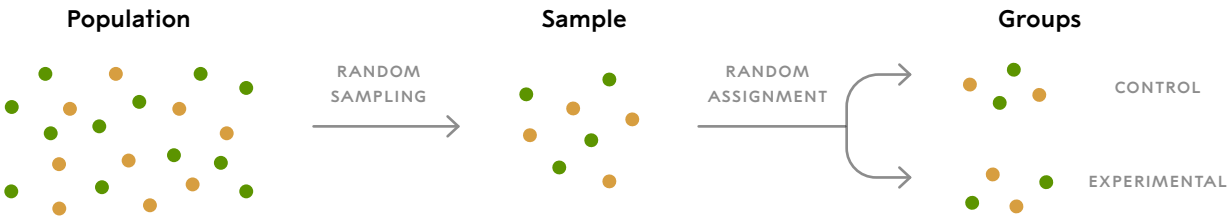
How do you design a randomized controlled trial?

INTRODUCTION

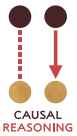
Experiments provide strong evidence for cause and effect when they are designed to prevent alternative explanations, such as confounding variables. A type of experiment called a randomized controlled trial (RCT) is an experiment in which participants are randomly assigned to an experimental group or a control group. The experimental group receives the treatment, while the control group does not. By keeping everything the same except for the treatment, researchers can be more confident that any differences between groups are due to the treatment itself. RCTs provide stronger evidence than associations alone because they control timing and eliminate most confounds. In this activity, you will run and participate in a randomized controlled trial in your classroom.

FIGURE 8.1
Randomized Controlled Trials

Participants in an RCT are randomly selected from the population and randomly assigned into an experimental group or a control group.



CONCEPTUAL TOOLS



MATERIALS LIST

FOR EACH GROUP OF FOUR STUDENTS

- RCT SUMMARY CARD (corresponding to the chosen strategy)

FOR EACH STUDENT

- STUDENT SHEET 8.1 "Experimental Design of RCTs"

PROCEDURE

PART A: TESTING A STRATEGY

1 With your class, read the following fictional scenario.

> *The Well-Being Task Force wants to gather evidence for the four well-being strategies under consideration. The task force decides to design and run a simple randomized controlled trial to see if one of the strategies affects their school population.*

2 As a class, choose one of the four well-being strategies from Salas High School to investigate.

FIGURE 8.2
Proposed Well-Being Strategies for Salas High School

Gratitude Writing

A way for students to express gratitude through writing such as keeping a journal, writing a letter to someone, sharing thank-you notes, or another form of written expression.

Pet Therapy

A way for students to interact with animals such as helping at an animal shelter, visiting with a therapy animal, or providing time to spend with a dog at school.

Green Spaces

A way for students to spend more time in natural places such as tending a school garden, regular visits to a park, adding more plants around campus, or another way to bring nature into their routine.

Quality Sleep

A way to help students get more and better sleep such as starting school later, teaching about healthy sleep habits, or some other way of helping students get better rest.

3 With your group, brainstorm treatments you could realistically do in your classroom in order to test the strategy your class has chosen.

4 As a class, discuss your ideas and come to consensus for a treatment that is a version of the strategy, could easily be done in the classroom, and is likely to have an effect. At the top of Student Sheet 8.1, "Experimental Design of RCTs," record the well-being strategy and the treatment your class chose.

5 With your group, make a plan to test the treatment idea your class chose. Use the following questions to guide your plan, based on each row of the table on the student sheet. Record your design ideas in the "Group Proposal" column.

   a Hypothesis
   What do you think the results will show?

   b Sample Size
   What is your sample size? Who are your participants?

   c Method of Assignment to Group
   How will you assign participants to the control group and the experimental group?

   d Experimental Group
   What treatment will the experimental group receive?

   e Control Group
   What will the control group do instead of the treatment?

   f Measurement of Effect
   How will you measure the effect on well-being?

   g Possible Confounds
   What are possible confounding variables? Is there a way to avoid them?

6 As a class, review each group's experimental design and identify its strengths and weaknesses, including possible confounds. Combine the best ideas into one experimental design to perform as a class. Record your consensus design for a classroom RCT in the "Classroom RCT" column of the table on the student sheet.

7 Conduct the randomized controlled trial as a class and record the data according to your teacher's instructions.

8 Analyze your results by identifying any differences between the experimental group and the control group. Record your findings in the last row ("Results") of the "Classroom RCT" column on the student sheet.

9 Revisit your hypothesis from the first row ("A. Hypothesis") on the student sheet and discuss with your group whether your results do or do not support your hypothesis. Discuss your reasoning and decide what can and cannot be concluded about causation from your experiment.

A published randomized controlled trial describes a study's design and its results.

PART B: COMPARING THE CLASSROOM RCT TO A PUBLISHED RCT

10 With your group, read the RCT Summary card that your teacher handed out.

11 Describe the experimental design (summarized on the card) for the published RCT by completing the "Published RCT" column on Student Sheet 8.1.

12 With your partner, compare your experimental design and results with the published RCT and its results. Identify the similarities and differences between the two experiments in terms of design, results, and limitations. Record your ideas in your science notebook.

13 With the class, share your comparison of the classroom RCT findings with those of the published RCT.

BUILD UNDERSTANDING

① There are limitations in any scientific experiment, but this is especially true for the RCT you conducted in your class. Now that you've compared your class experiment to a published RCT, describe at least three ways you could improve your class study design to reduce confounds and make the results more reliable.

② Researchers sometimes call RCTs the strongest kind of evidence for cause-and-effect relationships. What features of RCTs help make them better for studying cause and effect than an observational study, which just looks for a correlation? In your response, explain how RCTs compare to correlation studies in terms of the following:

- **a** timing
- **b** association
- **c** mechanism
- **d** alternative explanations

CONNECTIONS TO EVERYDAY LIFE

③ Randomized controlled trials are used in many different fields of science, such as medicine, psychology, and education, to test the effects of treatments or interventions. Imagine a friend is choosing between two medicines to take for their stomach pains. There is a strong correlation between taking Medicine A and reporting less stomach pain. People who took Medicine B in an RCT experienced significantly greater relief from stomach pain than those who took a sugar pill. Which medicine, A or B, would you recommend to your friend and why? Base your answer on the kinds of evidence a correlation provides and an RCT provides.

④ You read an article online that described a new pain medication awaiting approval from the Food and Drug Administration (FDA), a federal agency within the United States Department of Health and Human Services. The article mentioned that the researchers who developed the medication ran an RCT to test it before it could be approved for sale to the public.

a Why would it be important to use an RCT to test a new medication before it is sold to the public?

b Why is it important to have a control group when testing a new medication?

c Why is it important to randomly pick who goes into the experimental and control groups when testing the medication?

New medications must be tested carefully in labs and with human trials before they're approved.

EXTENSION

When a new medication is developed, the manufacturer is required to show effectiveness in a randomized controlled trial (RCT) before it can be approved by a regulatory agency, such as the Food and Drug Administration (FDA) in the United States. Investigate a recent RCT for a medication related to health and well-being and identify the key components of the RCT for that study.

KEY SCIENTIFIC TERMS

randomized controlled trial (RCT)