

CHAPTER 2

THINGS THAT VARY

At this point, you have laid the foundation of good research, investigated your topic thoroughly with an exhaustive literature review, and you've narrowed your topic down to a basic, researchable question. It's time to build on that foundation, and to build something, you have to understand how to use the tools in your tool box. This chapter goes into the basic tools of research—what variables are, how to get them from a **hypothesis**, how to break down a concept and create composite measures for it, and proper techniques for sampling.

Variables are things that vary. That means that with a variable there are always options. Some variables have more options, such as favorite color, with the options being one of an almost endless number of colors, and some have fewer options, such as gender, with the options being male and female. The exercises in this chapter will cover **independent** and **dependent variables** and how they interact with each other. Other exercises will cover the causal order of variables, which is important to understand so that the results of your research can have legitimacy. Finally, you will learn how best to measure variables without clear-cut categories through composite measures. If this is starting to make your head spin, don't worry, the activities are fun and informative and will naturally facilitate an understanding of these vital concepts.

We're getting into real "roll up your sleeves and start working territory." The tools you learn to use in this chapter and the next have a certain sweat equity. You've got to put in the legwork to learn how to use them. Hopefully, these activities can make that a more fun and interesting process, but in the end, it's up to you to take advantage of them and really own the concepts.

REVIEWING MAJOR CONCEPTS IN RESEARCH METHODS THROUGH AN EXPERIMENTAL ACTIVITY AND CLASS DISCUSSION

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OBJECTIVES

This activity and discussion is intended to serve as a refresher for some research methods topics that are already familiar to you and to introduce some new terms and concepts as well. As part of the experimental activity, you will build a structure made of paper under different experimental conditions. Your instructor will assign you to an experimental condition. Following the experimental activity, the class discussion will include a review of such concepts as

- independent and dependent variables,
- operational definitions,
- different types of dependent variables,
- extraneous variables,
- between-subjects designs and within-subjects designs,
- one-and two-tailed hypotheses,
- **reliability** and **validity**,
- experimental versus control groups, and
- data analysis.

INSTRUCTIONS

Your instructor will guide you through the in-class exercise including assigning you to specific experimental conditions, providing specific instructions for building your structure, forming a hypothesis, collecting your data, discussing and reviewing important concepts, and analyzing your data.

To prepare for this activity, you may want to review concepts such as

- independent and dependent variables,
- operational definitions,

- quantitative and qualitative variables,
- extraneous variables,
- between-subjects designs and within-subjects designs,
- one- and two-tailed hypotheses,
- reliability and validity,
- experimental versus control groups, and
- descriptive and **inferential** statistics.

GRADING

Your instructor may grade your engagement in the class discussion, your ability to answer worksheet questions correctly, or your ability to correctly analyze the data. Consult your instructor to determine whether you should complete the student worksheet before or after the class discussion.

You will *not* be graded on your ability to build a successful structure out of paper during the experimental activity.

<p><i>Reviewing Major Concepts in Research Methods Through an Experimental Activity and Class Discussion</i></p>	<p><i>Worksheet</i></p>
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Answer the following questions after engaging in the experimental activity.

1. For a variable to be a true independent variable, the researcher must _____ that variable.
2. The dependent variable(s) is (are) _____ by the researcher.
3. In the experimental activity, how was the “successful example” operationally defined?
4. What were the two major dependent variables, and how were they operationally defined?
5. Which of the two major dependent variables was quantitative, and which was qualitative?
6. What is an extraneous variable? What were some possible extraneous variables that could have influenced your performance while building your structure? What is one way to control for extraneous variables?
7. Was the independent variable in this activity manipulated between-subjects or within-subjects? Why do you think this type of design was used?
8. Formulate a hypothesis that describes what you expect the results of this activity to show. Explain the rationale behind your hypothesis. Why do you expect those results?

NARCISSISTIC YOUTH? USING COMPOSITE MEASURES TO UNDERSTAND ENTITLEMENT

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OBJECTIVES

Recently, this generation of college students has come under criticism for possessing a sense of entitlement. The basic criticism is that students have an expectation that they are entitled to a comfortable lifestyle. Critics contend that this attitude does not correspond with the amount of effort students put into college or how much work they think should be required for success. Consider the following excerpts from an Associated Press article on current research:

Today's college students are more narcissistic and self-centered than their predecessors, according to a comprehensive study by five psychologists who worry that the trend could harm personal relationships and American society.

Twenge, the author of *Generation Me: Why Today's Young Americans Are More Confident, Assertive, Entitled—and More Miserable Than Ever Before*, said narcissists tend to lack empathy, react aggressively to criticism and favor self-promotion over helping others. The researchers traced the phenomenon back to what they called the “self-esteem movement” that emerged in the 1980s, asserting that the effort to build self-confidence had gone too far.

“Current technology fuels the increase in narcissism,” Twenge said. “By its very name, MySpace encourages attention-seeking, as does YouTube.”

Lastly, consider the following quote from the book *The Dumbest Generation: How the Digital Age Stupefies Young Americans and Jeopardizes Our Future (Or, Don't Trust Anyone Under 30)*:

An anti-intellectual outlook prevails in their leisure lives, squashing the lessons of school, and instead of producing knowledge and querulous young minds, the youth culture of American society yields an adolescent consumer enmeshed in juvenile matters and secluded from adult realities. . . . The insulated mindset of individuals who know precious little history or civics and never read a book or visit a museum is fast becoming a common shame-free condition.

While these scholars acknowledge that generational gaps and lack of understanding often lead to criticism of younger generations, they argue that this phenomenon is qualitatively different. Do you agree with these authors assessment, or do you feel that the current younger generation is no different than other generations or previous younger generations?

INSTRUCTIONS

Step 1

Briefly discuss this claim as a group. Do you feel this is an accurate generalization of the current younger generation?

Step 2

To either prove or disprove your opinion about the entitlement of the younger generation, you need to create a tool to measure the concept. For this exercise, you will be creating an **index** you can give to subjects to measure their levels of entitlement.

Create a seven item **Likert scale** that measures the concept of entitlement. Create a scale that we could use to disprove or prove the claim that your generation is “entitled.”

1. Create a definition of the concept of entitlement.
2. List at least four dimensions of your **conceptualization** of entitlement.
3. Which of these dimensions are you interested in studying?
4. What are the seven items you will include in your scale?
5. What are the **ordinal** categories for your items (i.e., agree, disagree, sometimes disagree, never agree)?
6. Explain how you will code the answers to each question.
7. Describe how you will score the index (what scores indicate the presence or absence of entitlement).

GRADING

The assignment will be graded on the following criteria:

- How clearly and creatively you define your concept and consider the relevant dimensions
- How accurately your items measure your definition and chosen dimensions
- How correctly your scale meets the criteria of scale construction described in your readings

LEARNING ABOUT CAUSAL ORDER THROUGH ANALYSIS OF WHETHER ADULTS HAVE CHILDREN

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OBJECTIVES

Social researchers often focus on establishing causality. We want to know if past experiences *cause* people to have certain attitudes about issues such as the death penalty, if particular attitudes *cause* individuals to support specific political candidates, if adoption of free trade practices *causes* nations to be more prosperous, if implementation of sex education programs in schools *cause* a reduction in teenage pregnancy, and so forth.

Social scientists have identified a number of principles for establishing causality. For example, in his widely used methods text,¹ Earl Babbie specifies three main criteria for determining if Variable X *causes* a change in Variable Y. (Recall that the factor causing the change is traditionally referred to as the *independent variable* and the factor being affected is traditionally referred to as the *dependent variable*.) First, Variable X must be statistically correlated with Variable Y. Second, and most critical, the score on Variable X *must precede in time the score on Variable Y*. Third, the relationship between Variables X and Y must be nonspurious, that is, not caused by some missing Variable Z. Babbie's example follows: We may see a positive statistical correlation between ice cream sales (Variable X) and drowning deaths in a geographic area (Variable Y). But that statistical correlation is very likely spurious because weather (Variable Z) strongly influences both ice cream sales and drowning. That is, people both consume more ice cream and are more vulnerable to swimming accidents when the thermometer reading pushes past 90°F.

This exercise is aimed at prompting you to think carefully about what is usually given little attention: how to best determine the causal order of a set of variables. The exercise is partly lighthearted; I would be pleased rather than offended if you laugh at some of the variables I use. However, there is a serious underlying purpose: helping you to avoid the kinds of errors in determining causal order that can get you in serious trouble in making causal claims.

INSTRUCTIONS

The worksheet asks you to stipulate the causal order of specific variables (e.g., age and income) that might affect whether adults have children. But absent greater expertise or reading, how are

¹ Earl Babbie, *The Practice of Social Research, 11th ed.* (Belmont, CA: Thomson Wadsworth, 2007), ch. 4. Note: other researchers may use variants of Babbie's principles, but his are common.

you to know? After all, you are students, not professional social scientists. The answer is that you need to draw on *a lot of relevant information you already have* about what factors are fixed at birth, when certain events are likely to occur in the life cycle, and so on. More specifically, Davis (1985) suggests the following helpful rules of thumb in attempting to determine if Variable X comes before Variable Y, or vice versa:

- Assume that X comes before Y if Y starts after X freezes. For instance, Barack Obama's presidency (Variable Y) cannot have caused Lehman Brothers's decision to seek bankruptcy protection (Variable X) because that decision was made in fall of 2008, and Obama assumed the presidency in early 2009.
- Assume that X comes before Y if X is an earlier step in a well-known sequence. For example, in discussing means of assessing student work, Davis notes that SAT Reasoning Test (formerly Scholastic Assessment Test) scores in high school precede college grades. Therefore, SAT scores (Variable X) might influence college grades (Variable Y), but not the reverse.
- Assume that X comes before Y if X never changes but Y sometimes changes. Consider race (Variable X) and political party identification (Variable Y). At the individual level, race should be causally prior to political party identification because one's ethnicity freezes at birth while one's party identification does not, though it may generally be stable for adults.

GRADING

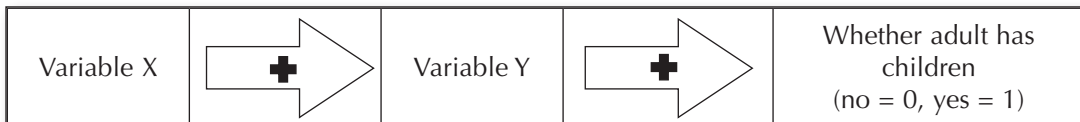
Your instructor will provide grading instructions for this exercise.

***Learning About Causal Order Through
Analysis of Whether Adults Have Children***

Worksheet

Worksheet Instructions

The question is about the order of factors (i.e., independent variables) that influence whether or not *at a single point in time* an individual American adult has one or more children (i.e., the dependent variable). You are to draw the most appropriate causal map, with variables early in the causal sequence on the left side, causally subsequent variables in the middle, and the dependent variable on the right side. Put the variables in boxes with lines connecting those earlier in the causal chain to those later in the causal chain, and attach a positive or negative sign to indicate whether the relationship is positive or negative. For example, if you think that Variable X is causally prior to Variable Y and also has a positive effect on that variable and that Variable Y in turn has a positive impact on whether an adult has children, you would draw the relationship as follows:



Notes: (1) You may only be able to determine with confidence that *some* variables are causally prior to *some* others.
(2) You do not need to assume that *each* variable affects every other variable, only that *some* variables affect some others.

Just do the best you can with the map; there is no single “correct” diagram. The most important thing is that you think carefully about *why* one variable is causally prior to another, and be prepared to discuss your reasoning.

VARIABLES

Dependent Variable

- CHILDREN (dummy variable with 0 = no children, 1 = 1 or more children)

Independent Variables

- AGE of the adult
- INCOME
- SIBLINGS (number of adult's own siblings)
- CARED FOR SIBLINGS (dummy variable with 0 = did *not* have any responsibility for caring for siblings when growing up, 1 = had such responsibility)
- MARRIAGE (0=not married, 1 = married)
- DORA AND DIEGO (0 = never watched *Dora the Explorer* or *Go, Diego, Go* on television; 1 = has watched either or both of these television programs)
- NOISE TOLERANCE (low = little tolerance, high = very tolerant)

PAPER AIRPLANES, FLYING THROUGH VARIABLES

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OVERVIEW

This activity uses paper airplanes to examine the important concepts of independent and dependent variables.

OBJECTIVES

By the end of this activity, participants will be able to

- Distinguish between independent variables and dependent variables,
- Apply independent and dependent variables to experimental scenarios,
- Explain how independent and dependent variables can be visually represented, and
- Use independent and dependent variables in creating directional and null hypotheses.

INSTRUCTIONS

Materials

For this activity, a minimum of two identical pieces of paper will be required. There is no limit to the creativity that can be applied to this activity. You might use paperclips, scissors, staples, glue, tape, pennies, markers, and anything else that you have handy.

Process

This activity requires you to create two identical paper airplanes. They can be simple or sophisticated, but they must be identical (please see Appendix A for instructions on creating a simple paper airplane). The class will conduct two separate races to determine a winner. Before this, as a class, you need to come up with a set of criteria for determining which plane is the best. This might be based on flight time, distance, height, aerodynamics, loops, or something else. Once the class has determined the winning criteria, it is time to test your planes. Record the results in a data table (Worksheet 1) and determine a winner.

Now, think about your plane. Is there a single modification that may make it perform better in the competition? Go back to your plane's twin (the one that you have not yet flown), and make only one single modification. You might add some weight to the back or front, change the wing shape, or blow on the top of it—any single modification that you can think of to make your plane perform better. In the data table, record the modification you have made, and get ready for the second round.

Try to remember exactly how you flew your first plane and duplicate the height, angle, and force with which you launched it. The only change between this flight and your first flight should be that one modification you chose to make. Did the plane's performance improve according to the chosen measure? Record the results in the data table on Worksheets 1 and 2. Then, practice your skills in identifying independent and dependent variables to complete Worksheet 3.

GRADING

This activity is not evaluated based on paper airplane making ability; rather, it is based on the ability to identify independent and dependent variables and link them into hypotheses. There is a student practice worksheet that can help you evaluate whether you are ready for a quiz on identifying independent and dependent variables and for turning those variables into directional and null hypotheses.

<i>Paper Airplanes, Flying Through Variables</i>	<i>Worksheet 1</i>
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Data Table

Dependent Variable	
1. How did your class decide to measure the success of your paper airplanes?	
a. What were some of the options that were not chosen? And why were they not chosen?	
2. What was the result of your first flight? (If distance/height, provide a unit or benchmark)	
a. Who won?	
b. How did their plane differ from yours?	
Independent Variable	
3. How will you modify your second plane?	
a. Why are you choosing that modification?	

<i>Paper Airplanes, Flying Through Variables</i>	<i>Worksheet 2</i>
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A hypothesis links the independent and the dependent variable into an educated guess. One common format for an experimental hypothesis follows: If we modify the independent variable (3) in this way, then the dependent variable (1) will be changed this way because of this (2b/3a).

Hypothesis	
State a hypothesis for your second trial.	
Results	
1. What was the result of the second flight?	
a. Who won?	
b. How was that plane different or similar to the plane that “won” the first round?	
c. Did the data from this trial of the experiment support your hypothesis?	

Was your hypothesis supported by the data? _____

<i>Paper Airplanes, Flying Through Variables</i>	<i>Worksheet 3</i>
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Identifying Variables and Creating Directional and Null Hypotheses

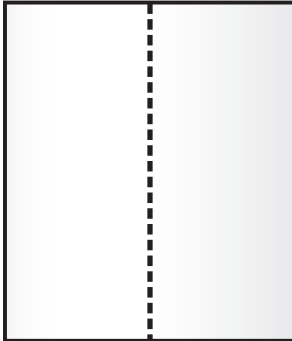
Identifying Variables	
For each of the given scenarios, identify the independent (IV) and dependent (DV) variables.	
Ex. Evelynne is trying to decide which color candy to buy for her friends; she has red, orange, purple, and blue candies. Evelynne asks 10 people what their preference is to help her decide.	IV: Color of candy. DV: Frequency selected or the number of times that color was chosen.
1/2. Pete has several types of grass seed, and he wants to know which will sprout the fastest.	1. IV: 2. DV:
3/4. Insulation has different R-values depending on its ability to prevent heat flow. Giselle has set up an experiment to see which brand of R-30 insulation keeps the heat in 100°C water best.	3. IV: 4. DV:
5/6. Alisha heard that red fades in the sun faster than blue. She purchased red and blue cloth, yo-yos, and knit hats and set them in the sun.	5. IV: 6. DV:

Creating Hypotheses For each scenario, write a directional (H_1) and then a null (H_0) hypothesis.	
Ex. Kalliope wanted to find out whether a lighter kite will fly higher than a heavier kite.	H_1 : A lighter kite will fly higher than a heavier kite because there is less mass to lift. H_0 : There is no difference in the height a kite will fly depending on its weight. H_0 : There is no relationship between the weight of a kite and the height it will fly.
7/8. Edouard was intrigued by something he heard about slugs. He heard that a slug will shrivel up if salt is placed on it. Edouard wants to test this on five identical slugs with differing amounts of salt.	7. H_1 : 8. H_0 :
9/10. Matteo noticed that he only saw rainbows in the afternoon. He wondered if the time of day was important for rainbow formation. To investigate this, Matteo set up video cameras and through them watched the sky for a year.	9. H_1 : 10. H_0 :

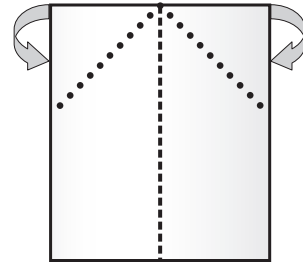
Paper Airplanes, Flying Through Variables***Appendix A***

How to Make a Basic Paper Airplane

First, fold a piece of paper (any size) down the middle.

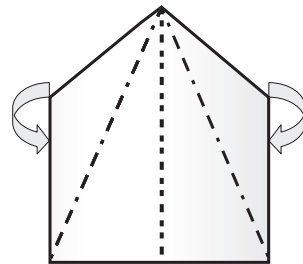


Then, fold each of the top corners toward the middle. Your paper should now look like a house shape. Take a minute to crease the folds very well. Using the back of your fingernail makes the creases very crisp.

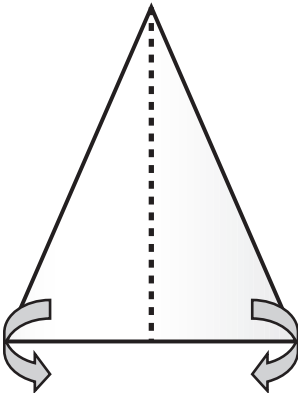


The next fold is again from the peak of the top down to the side. The outside corner will just hit the middle crease.

You can see that you have created a triangular shaped piece of paper. Fold the triangle on the middle crease that you made in the first step.



Your triangle is almost a paper airplane now.



The last step is to fold down the wings. Before you do this, take the time to really press your folds. The tighter the folds, the better your plane will look (and maybe even fly!). To create the wings, orient the new folded triangle with the fold at the bottom. Take one of the top corners (there are two, stacked one on top of the other) and fold it down toward you. You may have it just hit the bottom, or go beyond the bottom of the fold. Where you start from nose to tail is up to you as well. These choices will determine the wing size and shape. Press your fold, repeat on the other side and enjoy!

