

CHAPTER 9

CONDUCTING EXPERIMENTS

LEARNING OBJECTIVES

- ✓ Distinguish between straightforward and staged manipulations of an independent variable
- ✓ Describe three types of dependent variables
 - ✓ Self-report
 - ✓ Behavioral
 - ✓ Physiological
- ✓ Discuss sensitivity of a dependent variable, contrasting floor effects and ceiling effects
- ✓ Describe ways to control participant expectations and experimenter expectations
- ✓ List the reasons for conducting pilot studies
- ✓ Describe the advantages of including a manipulation check in an experiment

SELECTING RESEARCH PARTICIPANTS

- ✓ Samples may be drawn from the population using:
 - ✓ Probability sampling:
 - ✓ If you recall, with **probability sampling**, each member of the population has a specifiable probability of being chosen.
 - ✓ Non-probability sampling
 - ✓ If you recall, with **non-probability sampling**, the probability of any particular member of the population being chosen is unknown.
- ✓ Sampling affects external validity to generalize to other populations
 - ✓ **External validity** is defined as the extent to which results from a study can be generalized to other populations and settings.
- ✓ **Determine the sample size**
 - ✓ Larger samples provide more accurate estimates of population values (higher p-values, meaning a more likely chance of seeing significant results.)

MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Manipulating the Independent Variable**
 - ✓ To manipulate an independent variable, one would have to construct an operational definition of the variable.
 - ✓ That is, one must turn a conceptual variable into a set of operations—specific instructions, events, and stimuli to be presented to the research participants.
- ✓ **Setting the stage**
 - ✓ In setting the stage, one usually has to supply the participants with the information necessary for them to provide their informed consent to participate.
 - ✓ This generally includes information about the underlying rationale of the study.
- ✓ **Two Types of Manipulations:**
 - ✓ **Straightforward manipulations**
 - ✓ **Staged manipulations**

MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Straightforward manipulations**
 - ✓ Researchers are usually able to manipulate an independent variable with relative simplicity by presenting written, verbal, or visual material to the participants.
 - ✓ Such **straightforward manipulations** manipulate variables with instructions and stimulus presentations.

MANIPULATION OF THE INDEPENDENT VARIABLE

✓ Staged manipulations

- ✓ **Staged manipulation** or **event manipulations** are sometimes used to stage events during an experiment in order to manipulate the independent variable successfully.
 - ✓ *In staged manipulations participants are involved in social situation that they perceived as real.*
 - ✓ (It often involves rigging something in the real world and making it appear real)
- ✓ Staged manipulations frequently employ a confederate (sometimes called an “accomplice”).
 - ✓ *Usually, the confederate appears to be another participant in an experiment but is actually part of the manipulation.*

MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Strength of the Manipulation**
 - ✓ The simplest experimental design has two levels of the independent variable.
 - ✓ In planning the experiment, the researcher has to choose these levels.
 - ✓ *A general principle to follow is to make the manipulation as strong as possible, especially in its early stages.*
 - ✓ A strong manipulation maximizes the differences between the two groups and increases the chances that the independent variable will have a statistically significant effect on the dependent variable.
- ✓ **Considerations for strength**
 - ✓ External validity of the study
 - ✓ Ethics

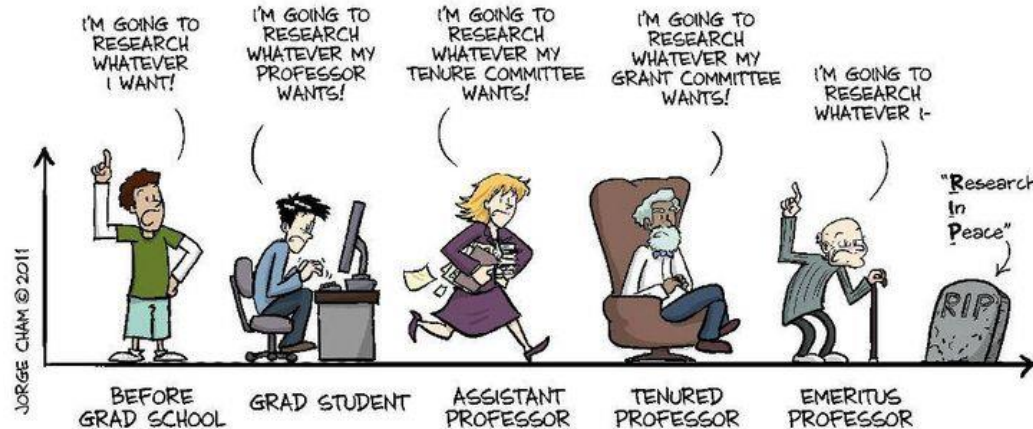
MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Considerations for strength**
 - ✓ External validity of the study
 - ✓ *If the manipulation is too strong, it may create unrealistic situations*
 - ✓ *Thus, it can create a situation different from the real world.*
 - ✓ **Ethics**
 - ✓ It may not be ethically responsible to subject participants to extreme manipulations.

MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Cost of the Manipulation**
 - ✓ Cost is another factor in the decision about how to manipulate the independent variable.
 - ✓ Researchers who have limited monetary resources may not be able to afford expensive equipment, salaries for confederates, or payments to participants in long-term experiments.

THE EVOLUTION OF INTELLECTUAL FREEDOM



MEASURING THE DEPENDENT VARIABLE

- ✓ Types of measures:
- ✓ The dependent variable in most experiments is one of three general types: self-report, behavioral, or physiological.
 - ✓ *Self-report measures are participants' responses to interviews and questionnaires.*
 - ✓ They can be used to measure attitudes, liking for someone, judgments about someone's personality characteristics, intended behaviors, emotional states, attributions about why someone performed well or poorly on a task, confidence in one's judgments, and many other aspects of human thought and behavior.

MEASURING THE DEPENDENT VARIABLE (CONT.)

- ✓ ***Behavioral measures*** are direct observations of behaviors.
 - ✓ As with self-reports, measurements of an almost endless number of behaviors are possible.
- ✓ **Physiological measures** are recordings of responses of the body.
 - ✓ Examples include the galvanic skin response (GSR), electromyogram (EMG), and electroencephalogram (EEG). An MRI provides an image of an individual's brain structure. In addition, a functional MRI (fMRI) allows researchers to scan areas of the brain while a research participant performs a physical or cognitive task.

MEASURING THE DEPENDENT VARIABLE

- ✓ Multiple measures:
 - ✓ Although it is convenient to describe single dependent variables, most studies include more than one dependent measure.
 - ✓ One reason to use multiple measures stems from the fact that a variable can be measured in a variety of concrete ways.

MEASURING THE DEPENDENT VARIABLE

- ✓ Sensitivity of the dependent variable
 - ✓ The dependent variable should be sensitive enough to detect differences between groups.
 - ✓ The issue of **sensitivity** is particularly important when measuring human performance. Issues include:
 - ✓ **Ceiling effect:** *Is when independent variable appears to have no effect on the dependent variable because the participants quickly reach the maximum performance level on the measure.*
 - ✓ Example: Nearly every student aced the final exam! This indicates the exam was so easy, it failed to measure their true aptitude.
 - ✓ **Floor effect:** (The opposite of ceiling effects) This is a problem that occurs when the task is so difficult that hardly anyone can perform well.
 - ✓ Example: Nearly every student fails the final exam!

MEASURING THE DEPENDENT VARIABLE

- ✓ Cost of measures
 - ✓ Another consideration is cost—some measures may be more costly than others.
 - ✓ Paper-and-pencil self-report measures are generally inexpensive
 - ✓ measures that require trained observers or elaborate equipment can become quite costly.



ADDITIONAL CONTROLS

✓ **Controlling for participant expectations**

- ✓ The basic experimental design has two groups: an **experimental group** that receives the treatment and a **control group** that does not.
 - ✓ Use of a control group makes it possible to eliminate a variety of alternative explanations for the results, thus improving internal validity.

✓ **Demand characteristics**

✓ **Informs purpose of the study to participants**

- ✓ As noted previously, experimenters generally do not wish to inform participants about the specific hypotheses being studied or the exact purpose of the research.
- ✓ The reason for this lies in the problem of **demand characteristics** (Orne, 1962), which is any feature of an experiment that might inform participants of the purpose of the study.
- ✓ The researcher may also attempt to disguise the dependent variable by using an unobtrusive measure or by placing the measure among a set of unrelated **filler items** on a questionnaire.

ADDITIONAL CONTROLS

- ✓ Controlling for participant expectations, continued:
 - ✓ **Placebo groups**
 - ✓ Can control through the use of placebo effect
 - ✓ Used to assure external validity is maintained
 - ✓ For example: A special kind of participant expectation arises in research on the effects of drugs.
 - ✓ Just administering a pill or an injection may be sufficient to cause an observed improvement in behavior.
 - ✓ To control for this possibility, a **placebo group** can be added.
 - ✓ Participants in the placebo group receive a pill or injection containing an inert, harmless substance; they do not receive the drug given to members of the experimental group.
 - ✓ If the improvement results from the active properties of the drug, the participants in the experimental group should show greater improvement than those in the placebo group.
 - ✓ If the placebo group improves as much as the experimental group, all improvement could be caused by a placebo effect.

ADDITIONAL CONTROLS

- ✓ Controlling for experimenter expectations
 - ✓ Experimenters are usually aware of the purpose of the study and thus may develop expectations about how participants should respond.
 - ✓ These expectations can in turn bias the results.
 - ✓ This general problem is called **experimenter bias** or **expectancy effects**.

ADDITIONAL CONTROLS

- ✓ **Experimenter bias or expectancy effects**
 - ✓ Research has shown that experimenter expectancies can be communicated to humans by both verbal and nonverbal means.
 - ✓ A generalization of this particular finding is called “teacher expectancy.”
 - ✓ Research has shown that telling a teacher that a pupil will bloom intellectually over the next year results in an increase in the pupil’s IQ score.

ADDITIONAL CONTROLS

- ✓ Solutions to the expectancy problem
 - ✓ **Single-blind experiment:** Participant is unaware of whether a placebo or the actual drug is being administered
 - ✓ **Double-blind experiment:** Neither the participant nor the experimenter knows whether the placebo or actual treatment is being given
 - ✓ *A double blind experiment helps reduce expectancy effects.*
 - ✓ To use a procedure in which the experimenter or observer is unaware of either the hypothesis or the group the participant is in, one must hire other people to conduct the experiment and make observations.

ADDITIONAL CONSIDERATIONS

✓ **Research proposals**

- ✓ After putting considerable thought into planning the study, the researcher writes a research proposal.
- ✓ **The proposal will include a literature review that provides a background for the study.**
- ✓ The intent is to clearly explain why the research is being done—what questions the research is designed to answer.
- ✓ The details of the procedures that will be used to test the idea are then given.

ADDITIONAL CONSIDERATIONS

- ✓ **Pilot studies:** Researcher does a trial run with a small number of participants
 - ✓ The pilot study will reveal whether participants understand the instructions, whether the total experimental setting seems plausible, whether any confusing questions are being asked, and so on.
 - ✓ *It helps researchers become comfortable with their roles and to standardize their procedures.*
- ✓ **Manipulation check** is an attempt to directly measure whether the independent variable manipulation has the intended effect on the participants.
 - ✓ Manipulation checks provide evidence for the construct validity of the manipulation.
- ✓ **Debriefing**
 - ✓ After all the data are collected, a debriefing session is usually held. This is an opportunity for the researcher to interact with the participants to discuss the ethical and educational implications of the study.

ANALYZING AND INTERPRETING RESULTS

- ✓ After the data have been collected, the next step is to **analyze** them
 - ✓ Examine and interpret the pattern of results
 - ✓ Decide if a relationship between the independent and dependent variables exists
- ✓ The final step is to write a report that details why you conducted the research, how one obtained the participants, what procedures were used, and what was found.

COMMUNICATING RESEARCH TO OTHERS

✓ **Professional meetings**

- ✓ Meetings sponsored by professional associations are important opportunities for researchers to present their findings to other researchers and the public.

✓ **Journal articles**

- ✓ Peer review - Two or more reviewers read the paper submitted by the researcher and recommend acceptance or rejection.
- ✓ When a researcher submits a paper to a journal, two or more reviewers read the paper and recommend acceptance (often with the stipulation that revisions be made) or rejection.
- ✓ This process is called peer review and it is very important in making sure that research has careful external review before it is published.
- ✓ 90% of papers submitted to the more prestigious journals are rejected

LAB

- ✓ Complete “Confounding Variables Activity”
- ✓ Complete “Conducting Experiments Activity”
- ✓ Complete “Online Experiments Activity”

(Due before class next Tuesday)

○ **Next class:**

- **Chapter 10 lecture and Exam Review with BONUS SLIDE!**

