

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=more likely to see significant results.

MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Manipulating an IV:** you must construct an operational definition of the variable.
 - ✓ turn a variable into a set of operations
 - ✓ specific instructions, events, and stimuli to be presented to the research participants.
- ✓ **Setting the Stage:** Supply participants with enough information necessary for them to provide informed consent to participate.
 - ✓ 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**
 - ✓ Such **straightforward manipulations** manipulate variables with instructions and stimulus presentations.

MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **Staged manipulation or event manipulations**
 - ✓ Rigging something in the real world and making it appear real
 - ✓ *In staged manipulations participants are involved in social situation that they perceived as real.*
 - ✓ Used to conceal purpose of the experiment in order to manipulate the IV successfully.
 - ✓ Staged manipulations frequently employ a confederate (a.k.a. “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
 - ✓ Simplest experimental design = two levels of the IV.
 - ✓ *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
 - ✓ increases the chances the IV will have a significant effect on the DV.

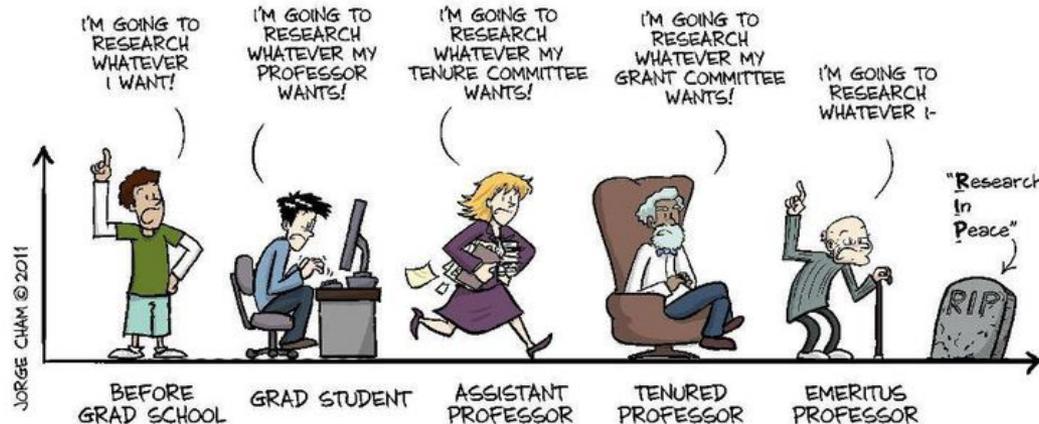
MANIPULATION OF THE INDEPENDENT VARIABLE

- ✓ **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 with limited 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 DV 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 measure:
 - ✓ attitudes
 - ✓ liking for someone/something
 - ✓ personality characteristics
 - ✓ intended behaviors
 - ✓ emotional states
 - ✓ Etc.

MEASURING THE DEPENDENT VARIABLE (CONT.)

- ✓ *Behavioral measures are direct observations of behaviors.*
 - ✓ measurements of an endless number of behaviors are possible.
- ✓ **Physiological measures** are recordings of responses of the body.
 - ✓ galvanic skin response (**GSR**)
 - ✓ Measures changes in sweat gland activity that are reflective of the intensity of our emotional state
 - ✓ electromyogram (**EMG**)
 - ✓ Measures the electrical activity of the nerves and muscles
 - ✓ electroencephalogram (**EEG**)
 - ✓ Detects electrical activity in your brain using small, metal discs (electrodes) attached to your scalp.
 - ✓ magnetic resonance imaging (**MRI**)
 - ✓ A medical **imaging** technique used in radiology to form pictures of the anatomy and the physiological processes of the body.
 - ✓ 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, many 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 DV
 - ✓ DV should be sensitive enough to detect differences between groups.
 - ✓ Issues include:
 - ✓ **Ceiling effect:** *Is when IV appears to have no effect on the DV 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.



“With this much grant money, only experiment we can do is ‘flip a coin’.

ADDITIONAL CONTROLS

- ✓ **Controlling for participant expectations**
 - ✓ The basic experimental design has two groups: **experimental group** and a **control group**
 - ✓ Use of a control group makes it possible to eliminate a variety of alternative explanations for the results,
 - ✓ thus improving **internal validity**.
 - ✓ **Demand characteristics**(Orne, 1962): Any feature of an experiment that might inform participants of the purpose of the study
 - ✓ The researcher may attempt to disguise the DV:
 - ✓ by using an unobtrusive measure
 - ✓ by placing the measure among a set of unrelated **filler items** on a questionnaire.

ADDITIONAL CONTROLS

- ✓ Controlling for participant expectations:
 - ✓ **Placebo groups**
 - ✓ 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.
 - ✓ Example:
 - ✓ 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** (a.k.a. **experimenter bias** or **expectancy effects**)
 - ✓ Experimenters are usually aware of the purpose of the study
 - ✓ They may develop expectations about how participants should respond.
 - ✓ These expectations can bias the results.
 - ✓ 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 do a double-blind experiment, other people must be hired 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.**
- ✓ It clearly explains why the research is being done—what questions the research is designed to answer.
- ✓ It details the procedures that will be used to test the idea.

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,
 - ✓ etc.
 - ✓ *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 shows:
 - ✓ why the research was conducted
 - ✓ how participants were obtained
 - ✓ what procedures were used
 - ✓ 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 and recommend acceptance or rejection
 - ✓ (often with the stipulation that revisions be made)
- ✓ Peer review 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