Research Method examples and Notes

## Psychology studies fall in four broad categories:

**Description:**

1. What effects video games have on children
2. The prevalence of stress in the Haiti earthquake survivors
3. The effects children have on marriage

**Explanation:**

1. Why do men not call when they say they’re going to?
2. Why do some people put their own lives on the line in order to help someone but other people refuse to help?
3. Why do children do worse in school when their parents get divorced?

**Prediction:**

1. Who will do well in college (high school GPA, SAT, etc.)
2. Which marriages will survive and which won’t?
3. Which people who threaten suicide will actually do it?

**Control:**

1. How can we control temper tantrums in toddlers?
2. How can a marriage be saved?
3. How can you manipulate your boss into letting you telecommute?

## Some truths about science:

1. Any scientific law must be testable, or it’s not scientific.
2. Science is NOT proving something is true.
3. Science is being able to falsify a theory (proving something is wrong).
4. All scientific statements have to be willing to be found to be wrong or they are not scientific.

Theories & hypotheses:

In science, a theory means “a well-tested explanation which successfully predicts the phenomenon under review.” We start out with a hypothesis (a tentative explanation or prediction about something) and test them. Once enough evidence comes in about the accuracy of a hypothesis, a theory is born. A theory is a set of formal statements that explains how and why certain events are related to each other. They’re more general, or broader, than hypotheses are. There’s a circular relationship between theories and hypotheses. *A theory must be able to correctly predict all known evidence and can be used to predict things that are as yet unknown.*  All theories are subject to being disputed if new evidence comes in that counteracts it. Different from a fact in that facts are known to be true and cannot be disputed (the Earth is round). Most theories do not become facts.

Examples of theories: 1) The theory of aerodynamics explains why planes fly; 2) The theory of “germs” in medicine explains bacterial infections: 3) Big Bang theory; 4) The theory of evolution

# Setting up your study: Operational definitions; Independent and Dependent Variables

**\*\***Scientists use the **scientific method** to conduct studies. The steps in the scientific method are 1) formulate a problem and hypothesis; 2) decide how you’re going to test it; 3) collect the data; 4) analyze the data; and 5 ) communicate the results. Part of deciding how to test your study involves choosing a specific, testable definition, called an **operational definition**. Examples: Pain rating scales, anxiety or depression inventories, IQ tests. Operational definitions help other scientists replicate your results and help contribute to a study’s objectivity. (e.g., You can’t just ask someone whether they’re tall or short; you need exactly feet and inches in order to quantify it exactly.)

**Operational Definitions: Examples**

1. Do blondes have more fun? Define blonde. Is it a certain set of colors appearing on a chart of hair dyes ranging from dirty blonde through platinum? Define fun. The number of men who come up to speak with a woman at a bar in a one-hour period? Operational definitions are precise definitions of a given variable. They are not CONCEPTUAL DEFINITIONS.
2. Engagement ring study: Do women with bigger diamond engagement rings have happier marriages? Define the size of the ring by carat (operational definition). Define “marital happiness.” (Self-rating scales for happiness; independent observations by an objective observer, etc.)
3. Does having a dog help you attract a mate? Does the size of the dog matter? Define the size of the dog precisely. You might use weight or height as criteria.
4. Are women more intelligent than men in verbal IQ? IQ test would be the operational definition.
5. Are college students more anxious than any other population? Anxiety inventory would be the operational definition.
6. How tolerant are men and women to pain? Your operational definition of “pain” might be how long—in number of seconds-- the subjects can stand to keep their hands in a bucket of ice water. (Keeping hands in a bucket of ice water is a common pain manipulation in psych studies. This is called the “cold pressor” test. Try it—you’ll find that it gets very painful after 30 seconds or so.)

**\*\*\**The next step in setting up your study is defining your independent and dependent variables and controlling all known extraneous variables.***

**Independent variables (IVs):** Variables that you believe will have an effect on something that you’re measuring. True independent variables are manipulated by the experimenter. That is, the experimenter assigns subjects to one or more experimental conditions (known as “levels of the independent variable.” For instance, I gave each of my Psych sections a different questionnaire about their beliefs in the paranormal. One class’s title was simply called “Questionnaire;” another section got one titled “Open-Minded Questionnaire,” and the third got the same questionnaire with the title “Gullibility Questionnaire.” The only thing different was the title. The title was the independent variable.

In a very simple example, suppose you want to see how much water a plant needs. You buy three identical plans, potted in exactly the same kind of soil, and sitting in the same amount of sunlight. You water one plant once a day, water the second plant once a week, and water the third one once every two weeks. The independent variable is the amount of water that you give the plant.

Some independent variables cannot be manipulated, but they can still have an effect on what you’re measuring. Things like the subject’s age, gender, race, socioeconomic status, religion, etc.—anything at all about the subject that cannot be changed—must be controlled (and measured) because they might have an effect on your experiment. These variables are called **subject variables** and are a special type of independent variable. For instance, I also measured gender in my Gullibility/Open-Mindedness questionnaire. In all three cases, females believed more in the paranormal than males did. Gender was a subject variable that had an effect on what I was measuring (namely, the percentage of agreement with 7 different aspects of “pseudoscience.”) Subject variables that are not taken into account can become extraneous variables, or confounds, that can ruin your experiment by providing an *alternative explanation* for your findings.

**Dependent variables (DVs):** The variable that you are measuring. It is “dependent on” the action of the independent variable. Ideally, the DV should be the result SOLELY of the IV. In the example of the plant growth in which water was the IV, the growth of the plant is the DV. In my study, percent agreement with the aspects of pseudoscience is the DV.

***Here are some IV/DV: Examples***

1. Texting while driving causes accidents. (Texting while driving is the IV; accidents-DV)
2. The threat of pain increases our desire to be with others (IV: pain; DV: desire to be with others).
3. Watching another person go through pain increases our own pain (IV: watching another go through pain; DV: our own pain ratings).
4. Impact of divorce on children’s grades (IV: whether parents are divorced; DV: children’s grades)
5. People eat more after watching food commercials. (IV: watching food commercials; DV: eating)
6. Telling people that a beer is expensive makes it taste better in a blind taste test. (IV: being told a beer is expensive or not; DV: taste ratings)
7. The smell of lavender promotes relaxation. (IV: smell of lavender; DV: relaxation)
8. Children whose parents smoke have more asthma. (IV: whether parents smoke or not; DV: asthma in kids)

**Extraneous variables (EVs)** are also known as confounds. They can screw up your experiment because they provide another potential explanation of the changes in your dependent variable. For example, in your plant study, you may have one of your plants sitting in the shade (or in different potting soil). Now you don’t know if the growth is affected by sunlight (or the type of soil) or the amount of water you’re giving the plant. Extraneous variables must be controlled by the experimenter so that they’re not allowed to interfere with the experiment. That’s why everything EXCEPT the independent variable must be kept exactly the same across all experimental conditions.

1. Parents’ education predicts IQ levels in children. (Socioeconomic status, the fact that intelligence is largely genetic, better health of educated parents, etc. confounds IQ scores)
2. Old people have lower IQ scores than young people do (result of education, experience)
3. Doing a mood study on a cold, rainy Monday (Mood may be result of weather & day rather than your mood manipulation)
4. Doing a study on how fast people can thread a needle and not realizing that you have older people in one group and younger people in another. Age is a confound because arthritis and poorer vision in older people can have a negative impact on how fast they can thread a needle.

## Test Yourself:

[The following questions are very much like the ones you will see on your exam.]

A researcher wants to test whether college students who eat a meal low in carbs and high in protein do better on a math test than those who eat a sugary breakfast. She feeds the “low carb” group eggs, turkey bacon, and no-sugar green tea, whereas the ones in the sugary breakfast get a doughnut, bowl of Fruit Loops, and orange juice. Then he gives all the subjects a math test in which they have to do advanced multiplication and division problems. Subjects are timed on two dimensions : speed and accuracy. Results showed that subjects who ate the low-carb, high-protein breakfast were more accurate in their results, but the high-sugar group finished more quickly.

1. What is the independent variable in the study?
   1. College students
   2. Type of breakfast served
   3. Multiplication and division problems
   4. Performance on the test
2. What is the dependent variable?
   1. College students
   2. Type of breakfast served
   3. Multiplication and division problems
   4. Performance on the math test
3. How did the researcher operationally define the dependent variable?
   1. How fast the subjects finished the test
   2. The multiplication & division problems
   3. How accurate the results were
   4. The kind of food they ate
   5. Both a and c.
4. If the researcher decided to test whether juniors and seniors performed better across the board than freshmen and sophomores did, what would “undergraduate class status” represent?
   1. An extraneous variable
   2. A dependent variable
   3. A true independent variable
   4. A subject variable
5. If the researcher failed to notice that she had more males in the low-carb group and more females in the sugar group…
   1. She would have an extraneous variable, or confound.
   2. She would have an extra independent variable.
   3. She would have an extra dependent variable.
   4. It wouldn’t make any difference.

*Answers: 1) b 2) d 3) e 4) d 5) a*

# Setting Up Your Research Design: Types of Studies in Psychology

There are several basic designs to choose from:

1. Naturalistic observation
2. Surveys/self-report
3. Case studies
4. Correlational designs
5. True Experiments
6. Quasi-experiments

**Naturalistic observation:**  Observing subjects in their natural environment with no attempt to intervene. All you’re doing is recording natural behavior in the subject’s natural setting. Subjects may not even realize that you’re there. You make no attempt to intervene in the natural course of events or behavior. Example: Recording how many times a particular shy child speaks up in the classroom. Recording how children interact with each other on the playground. Noticing bathroom behavior (e.g., how many people wash their hands? How long do they wash their hands? Which bathroom stall do they go into?) Looking at animals in the zoo and seeing how they interact.

**Surveys/self-report:** In this design, you can either give people a written survey or interview them in person. This type of design asks a limited amount of questions to a relatively large sample. You have to be careful that you get a truly random sample, meaning that every subject in your population has an EQUAL chance of being selected for your study. If you’re looking at what the percentage of Americans use Twitter but only sample college students at GGC, you do not have a truly random, representative sample because young people are probably more likely to use Twitter than older people are. This lack of a random sample produces skewed results. You also have to be very careful how you word your questions in your survey. Finally, response rate is a problem. If you send out a survey to parents asking them how many of them regret having children and find out that 80% said they regretted it, it probably represents the fact that only parents who really regret having children bother to respond to the survey.

**Case studies:**  gathering a large amount of detailed information on one or only few subjects. Case studies are done when you’re looking at rare medical or psychological disorders in which there are limited numbers of subjects with the condition. E.g., Children diagnosed with schizophrenia; serial killers; people who have lost all four of their limbs in freak accidents and how they cope, etc. Freud also used case studies of a few upper-class women from Vienna to come up with his theory of psychosexual development.

**Correlational designs :** These kinds of designs test the relationship between two variables. The goal is to see how one variable changes when the other changes. There are three possible outcomes: 1) as variable A increases, variable B also increases (a positive correlation); 2) as variable A increases, variable B decreases (a negative correlation); and 3) as variable A increases or decreases, there is no change in variable B (a zero correlation). **Correlations tell us about the link between variables but not about cause/effect. They tell us about relationships, but you can’t say that one variable “causes” another.**

Correlations have a range of values between -1 and +1. The closer the correlation coefficient (symbolized by the letter “r”) is to either -1 or +1, the stronger the correlation is. A correlation that is close to zero is a weak correlation. A correlation of -1 is equal in strength to that of +1. (In other words, look at the absolute value of the number, not its sign, to determine how strong a correlation is.)

*Examples of correlations:*

1. Do overweight people exercise less than normal-weight people? (weight vs. exercise)
2. Do people living in the South live fewer years than people in the North? (Location vs. life expectancy)
3. Do angry people have more heart attacks than peaceful people? (Emotion vs. heart disease)
4. Do stepfathers treat their stepchildren worse than their biological children? (biological relatedness vs. parental care)
5. Do more hours of athletic practice lead to more successful performance? (Practice vs. success)

Positive correlations:

1. GPA and SAT scores
2. Self-esteem and academic grades
3. Temperature & crimes (hotter weather = more crimes)
4. Education & income (+.79 correlation)

Negative correlations:

1. Stress level increases, immune system decreases.
2. Temperature outside and the amount of clothes worn (hotter = fewer clothes)
3. Personal wealth and presence of psychiatric diseases (poorer people have more mental illness)
4. Absence from class and GPA

Zero correlation:

1. How tall you are and the number of freckles you have.
2. Shoe size and intelligence.
3. SAT scores and toe size
4. Hair color and schizophrenia

Why you can’t assume causation from correlation:

1. Cigarette smokers make lower grades than nonsmokers. Does smoking cause low grades? Does making low grades cause one to smoke & drink as a distraction? Does low SES cause both cigarette smoking and low grades?
2. Type II Diabetes and weight—Does being overweight cause diabetes? Does diabetes cause you to be overweight? Does unhealthy eating (and/or low SES) cause both?
3. As crowding increases, crime rates increase. (Low SES may cause both.)

Spurious correlations

1. Ice cream sales and the number of shark attacks on swimmers are correlated. Common denominator: hot weather
2. Skirt lengths and stock prices are highly correlated (as stock prices go up, skirt lengths get shorter). Common denominator: General attitudes of the country—liberal vs. conservative. Predicts both skirt length & stock prices).
3. The number of cavities in elementary school children and vocabulary size have a strong positive correlation. Common denominator: children’s age.

**True experiments-**the only type of design that allows you to say that one variable CAUSES another.

\*\****Four requirements for a true experiment:***

1. You must have at least one MANIPULATED independent variable. You can’t have only subject variables. You must also have at least one dependent variable.
2. You must have at least two levels (or experimental conditions) of the independent variable: e.g., treatment group and control group.
3. You must have RANDOM ASSIGNMENT to conditions.
4. You have to have control over ALL extraneous variables.

\*If even one of these conditions is not met, then you don’t have a true experiment.

***Examples of true experiments:***

1. Randomly assign people to either go on a particular drug vs. placebo. See what effect there is.
2. Randomly assign people to have a root canal with 3 types of music playing: 1) soft music; 2) rock music; 3) no music. DV: anxiety and perception of pain.
3. Randomly assign subjects to pain vs. no pain and see how well they learn a list of nonsense syllables.
4. Randomly assign smokers to Chantix vs. “the patch” for 12 weeks and measure which treatment was more effective.

**Quasi-experiments—**these look like true experiments, but they lack at least one of the four conditions of a true experiment. Usually, you’ll see a study that has only subject variables (not manipulated ones) or one that lacks random assignment. Note: If you have only subject variables, then by definition you can’t randomly assign subjects to conditions since subject variables cannot be changed. (You can’t randomly assign someone to be male or female.)

***Examples of quasi-experiments:***

1. Compare health of children who were vaccinated or not vaccinated (can’t randomly assign kids to get vaccines or not).
2. Compare smokers vs. nonsmokers’ lung capacity. (Can’t randomly assign people to smoke or not smoke)
3. Compare teens from divorced vs. intact homes to see what age they first had sex. (Can’t randomly assign kids to be from divorced or non-divorced homes.)
4. Effects of starvation on health of fetuses (can be done looking at records of WWII survivors in the Moscow blockade)
5. Religious people vs. nonreligious people: Which are healthier?

**Internal Validity:**  the extent to which your experiment supports clear, causal conclusions. In other words, how tightly controlled is your experiment? How much faith can you have in the conclusions? (Confounds = low internal validity)

**External Validity:** the extent to which your results can be generalized outside the lab in a “real-world” setting. Typically, studies high in internal validity have lower external validity because you can’t have as much control in the real world as you do in a lab. You need to replicate in both settings to maximize both internal and external validity.

**Threats to Experimentation:**

First, confounds (extraneous variables) that you didn’t control can ruin your experiment. Two specific types of confounds are…

1. Experimenter bias: when the experimenter either consciously or accidentally treats the experimental groups differently. For instance, a researcher who is testing the effects of an antidepressant may treat the “drug” group with more interest than the placebo group. This creates a confound because maybe the experimenter’s interest, and not the drug, is responsible for the “drug” group’s decrease in depressive symptoms. To solve this problem, you need a double-blind experiment, in which neither the experimenter nor the subject knows which group (drug or placebo) he is in.
2. Demand characteristics: a confound created in which subjects alter their behavior in some way. Usually it’s because they try to guess your hypothesis and try to either help you out by behaving in a way that they think you want or they want to ruin your experiment, so they behave in a way that they normally wouldn’t. You have to use deception (lying to the subjects about the true nature of the study) to combat demand characteristics. Using deception leads to ethical questions that researchers must be prepared to face.

Institutional Review Boards: governing bodies set up to make sure that subjects’ rights and safety are protected during an experiment. They were set up in the 1970s after the Tuskegee Syphilis Study became public knowledge. Subjects must be give informed consent, in which they agree to being in an experiment after being told what the study is about (when an experimenter is using deception, the subject is told that some aspects of the study will be revealed after the study is over), and are free to withdraw from the study at any time. They must also be debriefed after the study is over, meaning that they must be told exactly what the study was about.