Chapter 1 Review Guide

Chapter 1: Research Methods

The Scientific Method
Theory: An integrated set of principles that organizes and predicts behavior.
Hypothesis: A testable prediction often implied by a theory.
Operational Definitions: Statements (descriptions) of the procedures used to define research variables.
Replication: Repeating the essence of a study, usually with different participants and in different situations.
Hindsight Bias: The tendency to believe, after learning the outcome, that you knew that was how it would turn out.
Goal of research: To *describe, predict, & explain behavior.*

I. Research that Describes only

Case Study: A descriptive technique in which one person is studied in depth in the hope of revealing universal principles.
Naturalistic Observation: Observing & recording behavior in naturally occurring situations without manipulating or controlling the situation.
Survey: A techniques for obtaining self-reported attitudes or behaviors of people, usually by questioning a representative, random sample of them.
Population: All of the people in a particular group from with a sample may be drawn.
Random Sample: A subset of people who fairly represent the population because each person has an equal chance of being selected. Using a random sample increase the **generalizability (external validity)** of a study.
Generalizability: The extent to which results of a study can be applied to the outside world. Also called **External Validity.**
False Consensus Effect: The tendency to overestimate the extent to which others share our beliefs and behaviors.
Social Desirability Bias: Tendency of subjects to present themselves in a socially desirable light.

II. Research the Describes and Predicts Behavior (Non-Experimental Designs)

Correlational Research: Research that seeks to measure the RELATIONSHIP between two variables without trying to determine causality or manipulating either of the variables.
Scatterplot: A graphed cluster of dots, each which represents the values of two variables. The slope of the dots represents the direction (+ or -) of the relationship while the amount of "scatter" suggests the strength of the correlation.
Correlation Coefficient: A statistical measure of the extent to which two factors vary together, and thus how well either factor predicts the other. The statistic is always between -1.00 and +1.00.
A Positive correlation coefficient means that as one variable increases, so does the other.
A Negative correlation coefficient means that as one variable increases, the other decreases (i.e., an inverse relationship).

Regardless of the strength of the relationship, correlations cannot tell us that one variable CAUSES changes in the other because:
1) Variable X could be affecting variable Y OR variable Y could be affecting variable X.
2) Third variables could be affecting BOTH variables X and Y.
Illusory Correlation: The perception of a relationship between two variables where none truly exists.

Differential Research: Research that involves comparing two or more exiting groups on some variable of interest. The groups are typically based on some pre-existing subject variable (e.g., gender, age, IQ, personality trait, etc.)

III. Research that Describes, Predicts, & Explains Behavior (i.e., cause and effect)

The True Experiment: A research method in which an investigator manipulates one or more factors

Control Techniques used to control confounding variables.

Random Assignment: Controls pre-existing subject variables.

(*independent variables*) in order to observe the effect on some behavior or mental process (*dependent variable*). By *randomly assigning* participants to groups, other relevant factors are controlled.
Independent Variable: The factor that is being manipulated by the researchers. The theoretical "cause" in the cause and effect relationship.
Dependent Variable: The factor (a behavior or mental process) that is being measured by the researchers. The variable that is predicted to change in response to the manipulation of the IV.
Operational Definitions: Specific statements describing how the the IV is manipulated and how the DV is measured.
Random Assignment: Assigning participants to *control and experimental conditions* on the basis of chance, thus minimizing pre-existing differences between the groups (i.e., it controls preexisting subject variables.
Experimental Condition (or Group): The condition of an experiment that exposes participants to the treatment of interest, that is, to one level of the independent variable.
Control Condition (or Group): The condition of an experiment that contrasts with the experimental condition and serves as a comparison for evaluating the effect of the treatment.

*At the conclusion of an experiment, the mean scores the experimental and control groups receive on the DEPENDENT VARIABLE are COMPARED to determine if a **statistically significant difference** exists.

Internal Validity: The extent to which one can be confident that the manipulation of the IV caused the changes in the DV. Internal validity can be assured only if all potential *confounding variables* have been *controlled*.

Control Group: Controls history, maturation, and testing effects.
Placebo: An inert substance given to the control group in place of an actual medication. It controls the *Placebo Effect.*
Placebo Effect: Experimental results caused by the subjects' expectations alone.
Double-Blind Design: An experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether subjects are in the control or experimental groups (commonly used in drug-evaluation studies). This type of design controls *subject and experimenter effects.*
Subject Effects or Biases: Any response by subjects in a study that does not represent how they would normally behave if not under study. Two powerful subject effects are the placebo effect and the *demand characteristics* of the study.
Demand Characteristics: Aspects of the study that suggest to the subjects what type of behavior is expected or desired by the researchers.
Experimenter Effects or Biases: Any behavior of a researcher that might affect the behavior of the subjects or affect the measurement and recording of the dependent variable.

The Quasi-experimental Design: Designs similar to true experiments, but without all of the control techniques built in (e.g., random assignment may not be used).

Statistics & Test Construction

Scales of Measurement:
Nominal Scale: A set of categories for classifying people or objects (e.g., eye color, gender, political affiliation)
Ordinal Scale: A scale indicating the order or relative position of items or people based on some criterion (i.e., 1st place, 2nd, 3rd, etc.)
Interval Scale: Scale with equal distances between points, but with no true zero point (e.g., temperature, most psychological tests)
Ratio Scale: Scale with equal distances

The Normal Distribution

Positively Skewed Distribution: A distribution where most scores are clustered at the lower end of the curve, with a few very high scores creating a long "tail" to the right. In this case, the mean is greater than the median and the median is greater than the mode.

Negatively Skewed Distribution: A distribution where most scores are clustered at the upper end of the curve, with a few very low scores creating a long "tail" to the left. In this case,

between points and with a true zero point, thus we can say something is twice as much as something else (e.g., inches of rainfall, distance in miles, etc.)

Measures of Central Tendency

Mean: Arithmetical average calculated by dividing a sum of values by the total number of cases

Median: Point that divides a set of scores in half.

Mode: The most frequent score in a distribution of scores

*Of these three measures, the MEAN is most affected by **outliers** or extreme scores.

Measures of Variation

Range: Difference between the largest and smallest scores in a distribution.

Variance: A statistical average of the amount of dispersion around the mean in a distribution of the scores. It is the Standard Deviation squared.

Standard Deviation: A statistical measure of the amount of dispersion in a set of scores. Specifically, it is the square root of the average squared deviations from the mean of a set of scores. It is simply the square root of the variance.

*Of the three measures, the STANDARD DEVIATION is most affected by **outliers.**

Distributions of Scores

Normal Curve: Hypothetical, bell-shaped distribution of scores that occurs when a normal distribution is plotted as a frequency polygon.

In a **normal distribution, the** the mean is less than the median and the median is less than the mode.

mean, median, and mode are all equal and divide the distribution in half (the 50th percentile).

Percentile Rank: Reflects the percentage of subjects who score lower than the subject in question

Chapter 1: Statistics & Test Construction (cont.)

Scatterplot: A graphed cluster of dots, each which represents the values of two variables. The slope of the dots represents the direction (+ or -) of the relationship while the amount of "scatter" suggests the strength of the correlation.

Correlation Coefficient (r): A statistical measure of the extent to which two factors vary together, and thus how well either factor predicts the other. The statistic, **r,** is always between -1.00 and +1.00.

A Positive correlation coefficient means that as one variable increases, so does the other.

Regression to the Mean: The tendency for extreme or unusual scores to fall back (regress) toward their average.

Statistical Significance: Probability that the results obtained were due to chance (represented by the value of 'p').

In psychology, it is standard that a p-value of .05 or less means that results were statistically significant (i.e., not due to chance).

A Negative correlation coefficient means that as one variable increases, the other decreases (i.e., an inverse relationship).	**t-test:** A statistical procedure designed to test the difference between the means of two groups **Test Construction** **Reliability:** Ability of a test to produce consistent and stable scores. *Test-retest Reliability:* give the same test to the same group of subjects twice and correlate the results. **Validity:** Ability of a test to actually measure what it has been designed to measure. **Face Validity:** Do the questions "appear" to measure the construct of interest. **Content Validity:** Does the test adequately sample the skills or knowledge that it is supposed to measure. **Predictive Validity:** The success with which a test predicts the behavior it is designed to predict. This is assessed by computing the correlation between the test scores (e.g., SAT scores) and the **criterion** (e.g., college GPA). **Criterion:** The behavior that a test is designed to predict. **Restricted Range:** A narrow range of scores (such as only very high GRE score for graduate school admission) reduces the predictive validity of the test. **Standardization:** Giving individual scores meaning by comparing them with the performance of a pretested group (e.g., give the test to a large representative sample of subjects and determine the mean and standard deviation. Now, you know if individual score are high, low, or average).

Comparison of Common Research Designs

	Non-experimental		**Experimental**	
	Correlational	**Differential(Correlational)**	**Quasi-experimental**	**Tru Experir**
Manipulation	**No manipulation** of variables.	**No manipulation** of variables.	**Manipulation** of the independent variable	**Manipula** the indepe variable
Subjects	Subjects are **NOT** assigned to groups. Usually, there is only ONE group of subjects. However,	Subjects **cannot** be randomly assigned to groups. The groups of subjects differ on some PRE- EXISTING variable (ex: gender) Subjects should still be	Subjects are **NOT randomly assigned** to control and experimental groups because it is logistically difficult (e.g., comparing 3rd period and 5th period AP psych classes after each class	Subjects a **randomly assigned** control an experimer groups. (Ex: contr

	subjects are **Randomly SELECTED** for participation.	**randomly selected** for participation	has be "treated" differently.) But, there are control & experimental groups in this type of design....just no random assignment. If possible, they should be **randomly selected** for participation.	group gets regular teaching and the experimental group gets new teaching method) If possible, they should be **randomly selected** for participation.
Variables	Two variables (X and Y) are measured and the STRENGTH and DIRECTION of the RELATIONSHIP is determined. (Ex: measuring GPA and depression level)	Subjects are divided into groups based on a **pre-existing variable** (X) (such as sex, religion, etc.) and compared on some other variable (Y) (i.e., IQ, self-esteem, depression, anxiety, etc.).	Subjects are in pre-formed groups. But, unlike correlational and differential research, an **independent variable (IV)** is *manipulated* and the groups are *measured* & compared on a **dependent variable (DV)**. (Ex: Using one teaching technique with 3rd period and a new technique with 5th period. Then the two classes would be compared on final grades (the DV) to see if a **statistically significant difference** existed)	The **Independent variable (IV)** is *manipulated* and the **dependent variable (DV)** is *measured*. The groups' scores on the **dependent variable** are then COMPARED to determine if a STATISTICALLY SIGNIFICANT DIFFERENCE EXISTS.
Statistics	Pearson product-moment, correlation (Pearson's r)	Chi-square, t-test, ANOVA, point-biseral correlation	Chi-square, t-test, ANOVA	Chi-square, t-test, ANOVA
Conclusions	Variable X co-varies with variable Y (i.e., there is a **relationship** between the two variables.) **Cause and effect cannot be proven.**	Differences in variable X may be **RELATED** to the differences in variable Y, **but cause and effect cannot be proven**.	While we may be able to draw **some causal conclusions**, we can't do it with as much confidence as if we had used a TRUE experimental design. (This is due to lack of random assignment and other controls).	Changes in the IV **CAUSED** changes in the DV. We can be most confident when we have controlled for as many threats to internal validity as possible.

OUTLINE OF AN EXPERIMENT

(or How to Kick Butt on the AP Psychology Exam Essay)

I. Identify you subjects

    1. Provide a reasonable number (ex: 100-300 subjects AT MOST)
    2. Provide any subject characteristics that are important (ex: 100 subjects suffering from depression)
    3. While it often is not possible, talk about selecting a **random sample** (or representative sample) of subjects who AGREE to participate in your study.

1. RANDOMLY ASSIGN your subjects to a:
    1. CONTROL GROUP and an
    2. EXPERIMENTAL GROUP
    3. Mention that random assignment will make the groups equivalent with respect to PRE-EXISTING SUBJECT VARIABLES.
1. Identify the:
    1. Independent Variable (the variable you will manipulate and that you believe will cause a change in the dependent variable
    2. Dependent Variable (the variable you will measure and that you believe will be AFFECTED by the I.V.)

IV. Operationalize (provide an operational definition for) the:

    1. Independent Variable: Explain how you will <u>MANIPULATE</u> it. Explain how the two groups will be treated DIFFERENTLY with respect to the I.V.
    2. Dependent Variable: Explain SPECIFICALLY how you will <u>MEASURE</u> the D.V.

1. Discuss CONTROL techniques you will use and what they control. ALWAYS include:
    1. **Random Assignment** to the control and experimental groups.

This controls pre-existing subject variables

B. Use of a **control group.**

This controls for history, maturation, and testing effects

1. Other Control Techniques: (Discuss these when they are appropriate for the experiment)
    1. Single or double-blind design to control subject and experimenter biases
    2. Use of a placebo to control the placebo effect (which includes experimenter and subject biases)
    3. Any other EXTRANEOUS variables you want to be the SAME in both groups. This allows you to rule out alternative explanations for your results.
1. Describe how you would EVALUATE your results
    1. Explain that you will **COMPARE** the control and experimental groups with respect to the DEPENDENT VARIABLE
    2. Explain that you need to find a **STATISTICALLY SIGNIFICANT <u>DIFFERENCE</u>** (not a correlation) between the scores of the two groups.
    3. Explain that to be sure of your results, you would probably want to **REPLICATE** your experiment.

PERIMENTAL DESIGNS:

THREATS TO VALIDITY AND

ASSOCIATED CONTROL TECHNIQUES

I. Internal Validity

Internal validity: Accuracy of the research study in determining that changes in the independent variable CAUSED changes in the dependent variable, as opposed to the possibility that some "confounding" variable may have caused the observed results.

Threat	Description	Control
A. Maturation	Changes in the DV that occur due to the natural maturation of the subjects.	Include a control group in your design.
B. History	Changes in the DV that are due to events that occurred during the study that were not part of the study.	Include a control group in your design.
C. Testing (Practice Effects)	Changes in the DV due to the fact subjects have been tested on the same instrument more than once.	Include a control group in your design.
D. Instrumentation	Changes in the calibration of a measuring instrument that affects scores on the DV.	Recalibrate instruments often.
E. Regression to the mean	Tendency for subjects who obtain extreme scores on a variable to have less extreme scores on follow-up testing.	Beware of this threat when selecting subjects for inclusion in your study.
F. Selection	Any factor that creates control and experimental groups that are not equivalent on some important subject variable.	Random assignment of subjects to control and experimental groups.

G. Diffusion of Treatment	Changes seen in subjects' responses due to information they received from other subjects in the study.	Controls may not be possible depending on the design of your study.
H. Attrition	The differential loss of subjects during a study. (Those who drop out are likely to be different from those who continue in the study).	No real control.
I. Sequencing (Order Effects)	Effects on a subject's performance or behavior due to the experiences the subject has had in earlier parts of the study.	Employ counterbalancing techniques.

II. Subject and Experimenter Effects

A. Experimenter Bias: Any effect that the "expectations" of the researcher may have had on the measurement and recording of the dependent variable.

Experimenter Effect	Description	Control
Knowledge, expectations, and information that could affect the outcome of the experiment.	Knowledge of which subjects are in the control and experimental groups.	Utilize a single (or double) blind design so that the researcher does not know which subjects are in each group.
	Biased measurement (i.e., seeing what the experimenter wants to see).	Use objective (rather than subjective) measurements.
		Utilize multiple observers or "research assistants" who are unaware of the hypothesis driving the study. (Check for inter-rater reliability).

B. Subject Effects: Any response by subjects in a study that does not represent the way they would normally behave if not in the study.

Subject Effects	Description	Control
Demand Characteristics	Elements in a study that may cue a subject as to the purpose of the study.	Use deception (i.e., keep the subjects in the dark as to the true purpose of the study).
Placebo Effect or Self-fulfilling Prophecy	An observed improvement in subjects because subjects believe a change will occur.	Provide a placebo for the control group and ensure that all subjects are "blind" as to which group they are in (a single-blind placebo design).

III. External Validity

External Validity: The <u>generalizability</u> of the results of the study. The extent to which the results of a particular study can extend to other subjects, times, and settings.

The more NATURAL* the setting, the LARGER the sample, and the more REPRESENTATIVE the sample is of the larger population from which it was drawn, the greater the external validity of the study.

REPLICATING a study using different subjects in different settings with slightly different procedures will help you demonstrate external validity of a study.

***Keep in mind that while a "natural" setting increases external validity, it greatly decreases internal validity**

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RESEARCH WITH HUMAN PARTICIPANTS

The decision to undertake research rests upon a considered judgment by the individual psychologist about how best to contribute to psychological science and human welfare. Having made the decision to conduct research, the psychologist considers alternative directions in which research energies and resources might be invested. On the basis of the this consideration, the psychologist carries out the investigation with respect and concern for the dignity and welfare of the people who participate and with cognizance of federal and state regulations and professional standards governing the conduct of research with human participants.

- In planning a study, the investigator has the responsibility to make a careful evaluation of its ethical acceptability. To the extent that the weighing of scientific and human values suggests a compromise of any principle, the investigator incurs a correspondingly serious obligation to seek ethical advice and to observe stringent safeguards to protect the rights of human participants.
- Considering whether a participant in a planned study will be a “subject at risk” or a “subject at minimal risk”, according to recognized standards, is of primary ethical concern to the investigator.
- The investigator always retains the responsibility for ensuring ethical practice in research. The investigator is also responsible for the ethical treatment of research participants by collaborators, assistants, students, and employees, all of whom, however, incur similar obligations.
- Except in minimal-risk research, the investigator establishes a clear and fair agreement with research participants, prior to their participation, that clarifies the obligations and responsibilities of each. The

investigator has the obligation to honor all promises and commitments included in that agreement. The investigator informs the participants of all aspects of the research that might reasonably be expected to influence willingness to participate and explains all other aspects of the research about which the participants inquire. Failure to make full disclosure prior to obtaining informed consent requires additional safeguards to protect the welfare and dignity of the research participants. Research with children or with participants who have impairments that would limit understanding and/or communications requires special safeguarding procedures.

- Methodological requirements of a study may make the use of concealment or deception necessary. Before conducting such a study, the investigator has a special responsibility to (i) determine whether the use of such techniques is justified by the study's prospective scientific, educational, or applied value; (ii) determine whether alternative procedures are available that do not use concealment or deception; and (iii) ensure that the participants are provided with sufficient explanation as soon as possible.
- The investigator respects the individual's freedom to decline to participate in or to withdraw from the research at any time. The obligation to protect this freedom requires careful thought and consideration when the investigator is in a position of authority or influence over the participant. Such positions of authority include, but are not limited to, situations in which research participation is required as part of employment or in which the participant is a student, client, or employee of the investigator.
- The investigator protects the participant from physical and mental discomfort, harm, and danger that may arise from research procedures. If risks of such consequences exist, the investigator informs the participant of that fact. Research procedures likely to cause serious or lasting harm to a participant are not used unless the failure to use these procedures might expose the participants to risk of greater harm, or unless the research has great potential benefit and fully informed and voluntary consent is obtained from each participant. The participant should be informed of procedures for contacting the investigator within a reasonable time period following participations should stress, potential harm, or related questions or concerns arise.
- After the data are collected, the investigator provides the participant with information about the nature of the study and attempts to remove any misconceptions that may have arisen. Where scientific or humane values justify delaying withholding this information, the investigator incurs a special responsibility to monitor the research and to ensure that there are no damaging consequences for the participant.
- Where research procedures result in undesirable consequences for the individual participant, the investigator has the responsibility to detect and remove or correct these consequences, including long-term effects.
- Information obtained about a research participant during the course of an investigation is confidential unless otherwise agreed upon in advance. When the possibility, together with the plans for protecting confidentiality, is explained to the participant as part of the procedure for obtaining informed consent.

CARE AND USE OF ANIMALS

An investigator of animal behavior strives to advance understanding of basic behavioral principles and/or to contribute to the improvement of human health and welfare. In seeking these ends, the investigator ensures the welfare of animals and treats them humanely. Laws and regulations notwithstanding, an animal's immediate protection depends upon the scientist's own conscience.

- The acquisition, care, use, and disposal of all animals are in compliance with current federal, state or provincial, and local laws and regulations.
- A psychologist trained in research methods and experienced in the care of laboratory animals closely supervises all procedures involving animals and is responsible for ensuring appropriate consideration of the comfort, health, and humane treatment.
- Psychologists ensure that all individuals using animals under their supervision have received explicit instruction in experimental methods and in the care, maintenance, and handling of the species being used. Responsibilities and activities of individuals participating in a research project are consistent with their respective competencies.
- Psychologists make every effort to minimize discomfort, illness, and pain of animals. A procedure

subjecting animals to pain, stress, or privation is used only when an alternative procedure is unavailable and the goal is justified by its prospective scientific, educational, or applied value. Surgical procedures are performed under appropriate anesthesia; techniques to avoid infection and minimize pain are followed during and after surgery.

- When it is appropriate that the animal's life be terminated, it is done rapidly and painlessly.

Research Methodology & Design: Ways of Knowing

Tenacity	Accepting ideas as valid simply because those ideas have been accepted for so long.
Intuition	Accepting ideas as valid because they "feel" right. Problems: 1) **Hindsight bias**: the tendency to believe, after learning the outcome of something, that we "knew it all along". 2) **Overconfidence**: the tendency to overestimate the accuracy of our beliefs.
Authority	Accepting ideas as valid because an authority figure says they are true.
Rationalism	A process which uses existing ideas and the principles of logic to develop new valid ideas. Problem: Sometimes the existing ideas are invalid.
Empiricism	Gaining knowledge by observing events.
Science	A process that combines rationalism and empiricism. **Rationalism** is needed to develop a theory. **Empiricism** is needed to test the validity of the theory.

Theory: An explanation, using an integrated set of principles, which organizes and predicts behavior.

Hypothesis: A testable prediction implied by a theory.