



Introduction to Psychology, v3.0

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CHAPTER 2

Psychological Science



Psychological Science

- Psychologists Use the Scientific Method to Guide their Research
- Psychologists Use Descriptive, Correlational, and Experimental Research Designs to Understand Behavior
- You Can Be an Informed Consumer of Psychological Research



Psychological Science

Basic Research

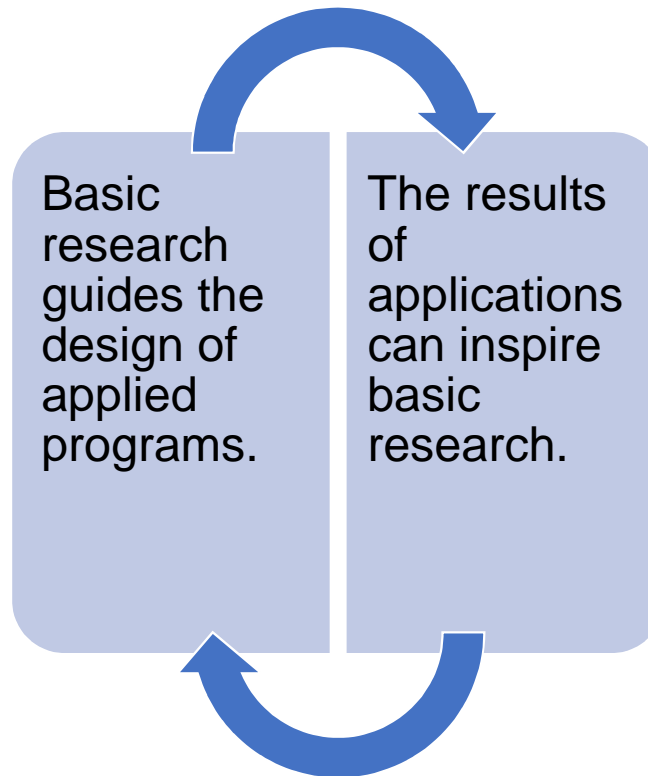
- Answers fundamental questions about behavior
 - e.g., how nerves conduct impulses from the skin to the brain

Applied Research

- Investigative issues with implications for everyday life; provides solutions to problems
 - e.g., which type of advertising campaign will reduce alcohol abuse



Psychological Science





Psychological Science

- The results of psychological research are communicated in reports published in scientific journals.
 - *Peer review* – the research reported in scientific journals has been screened, critiqued, and improved by scientists in the field



The Scientific Method

Learning Objectives

1. Describe the principles of the scientific method, and explain its importance in conducting and interpreting research.
2. Differentiate laws from theories and explain how research hypotheses are developed and tested.
3. Discuss the procedures that researchers use to ensure that their research with humans and with animals is ethical.

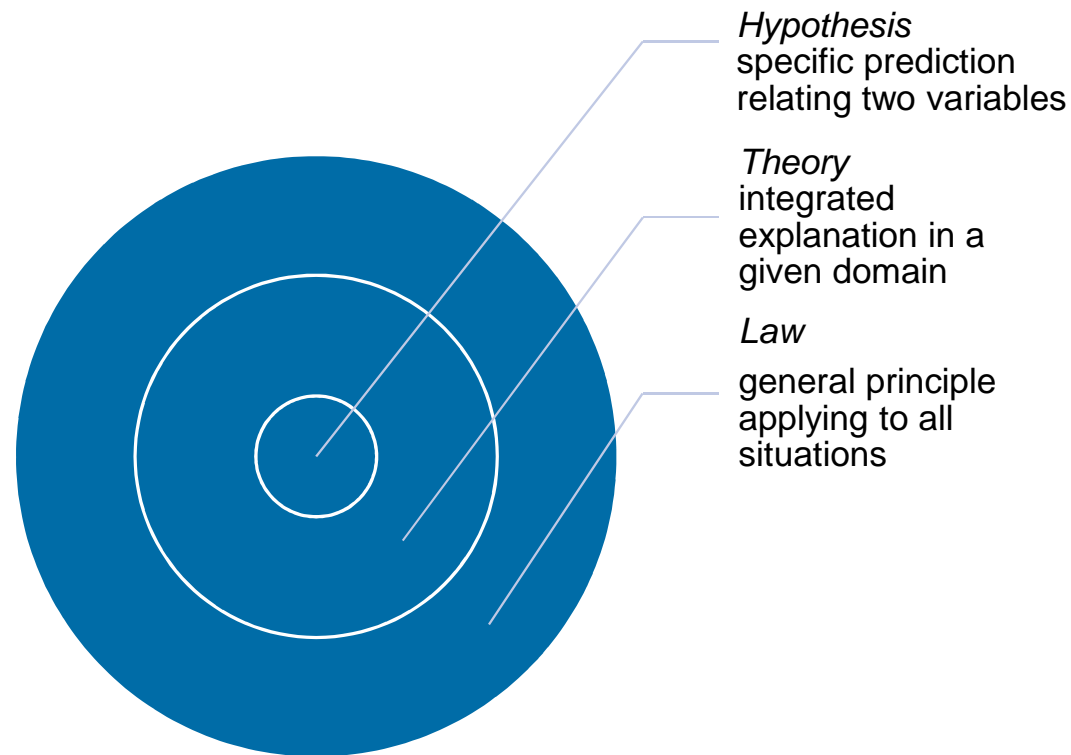


The Scientific Method

- Science is empirical and objective.
 - **Empirical:** based on the systematic collection and analysis of data
 - Data – information collected through formal observation and measurement
 - **Objective:** free from the personal bias of the scientist
- **Scientific method:** the set of assumptions, rules, and procedures scientists use to conduct research
- Replication – most research is designed to repeat, extend, or modify previous research findings



The Scientific Method: Laws and Theories as Organizing Principles



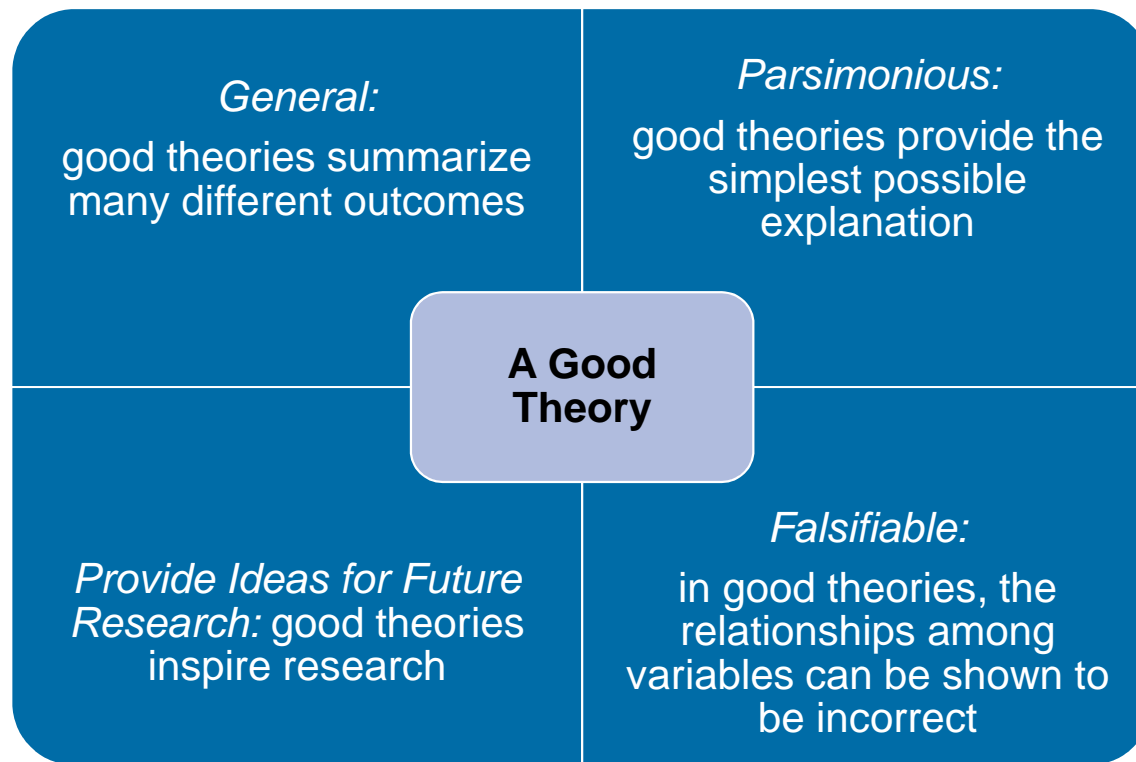


The Scientific Method: Laws and Theories as Organizing Principles

- **Law:** principle so general it applies to all situations
 - Psychology has few laws – Weber's Law might be one example.
- **Theory:** an integrated set of principles that explains many but not all of the relationships in a given domain
 - Piaget's stage theory of cognitive development is one example.



The Scientific Method: Laws and Theories as Organizing Principles



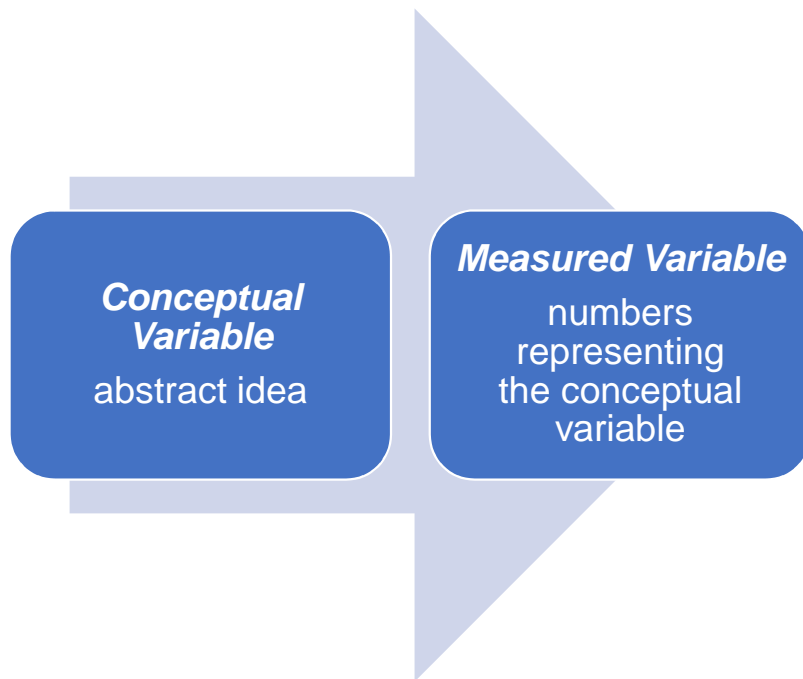


The Scientific Method: The Research Hypothesis

- **Research hypothesis:** a specific and falsifiable prediction regarding relationships among two or more variables
 - **Variable:** any attribute that can assume different values
- Example: “Participating in psychotherapy will reduce anxiety.”



The Scientific Method: The Research Hypothesis

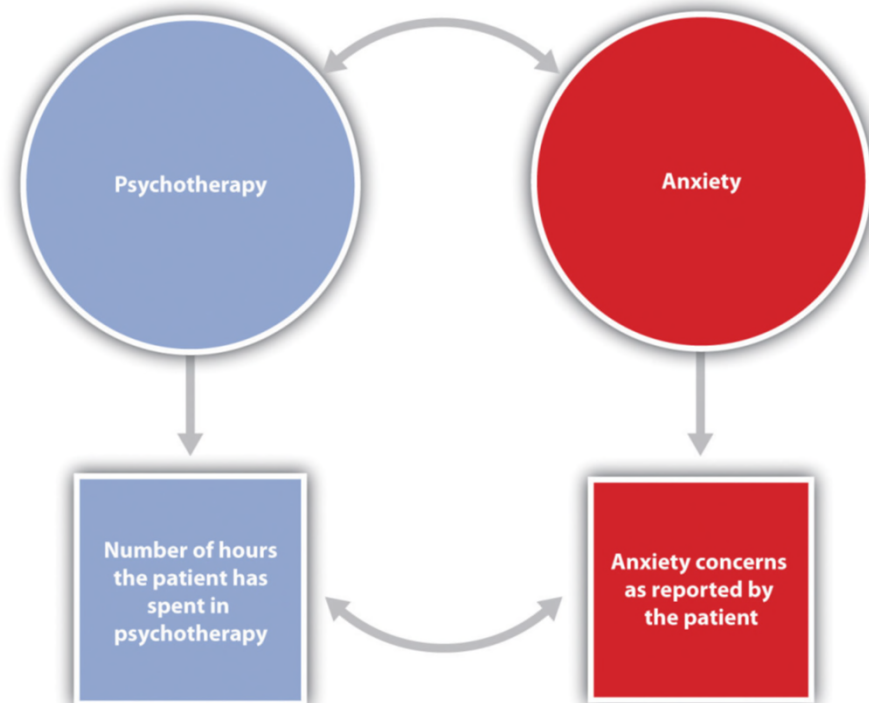


- **Operational definition:** precise statement of how a conceptual variable is translated into a measured variable



The Scientific Method: The Research Hypothesis

- *Hypothesis*: more psychotherapy will be related to less reported anxiety.
- The conceptual variable of attending psychotherapy is operationalized using the number of hours of psychotherapy the client has completed.
- The conceptual variable of anxiety is operationalized using self-reported levels of anxiety.



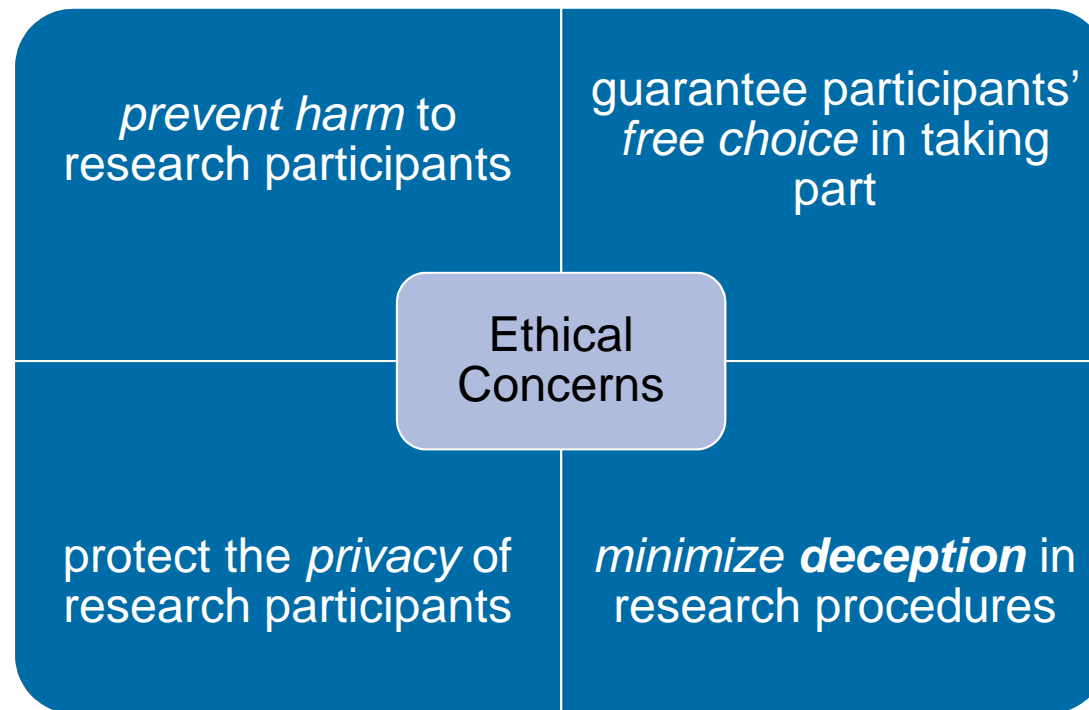


The Scientific Method: Conducting Ethical Research

- Psychological research may cause stress, harm, or inconvenience to participants.
- Before conducting research, psychologists must weigh such costs against the potential benefits of the research.



The Scientific Method: Conducting Ethical Research





The Scientific Method: Ensuring that Research Is Ethical

- At the university level, an Institutional Review Board (IRB) ensures that research using human participants meets ethical guidelines.
 - **Institutional Review Board:** committee consisting of at least 5 members whose goal is to determine the cost-benefit ratio of proposed research



The Scientific Method: Ensuring that Research Is Ethical

Informed Consent

- Conducted before the participant begins a research session
- Explains the procedure of the research
- Informs the participant of her rights during the research

Debriefing

- Fully explains the purposes and procedures of the research
- Removes any harmful aftereffects of participation



The Scientific Method: Research With Animals

- Basic principles have been developed to guide scientists in making ethical decisions about research with animals.
- Most scientists believe that there are sufficient benefits from animal research to justify such research, as long as the humane treatment of the animals are guaranteed.



The Scientific Method

Key Takeaways

- Psychologists use the scientific method to generate, accumulate, and report scientific knowledge.
- Basic research, which answers questions about behavior, and applied research, which finds solutions to everyday problems, inform each other and work together to advance science.
- Research reports describing scientific studies are published in scientific journals so that other scientists and laypersons may review the empirical findings.



The Scientific Method

Key Takeaways, continued

- Organizing principles, including laws, theories and research hypotheses give structure and uniformity to scientific methods.
- Concerns for conducting ethical research are paramount. Researchers assure that participants are given free choice to participate and that their privacy is protected. Informed consent and debriefing help provide humane treatment of participants.
- A cost–benefit analysis is used to determine which research should be allowed to proceed.



Descriptive, Correlational, and Experimental Research Designs

Learning Objectives:

1. Differentiate the goals of descriptive, correlational, and experimental research designs, and explain the advantages and disadvantages of each.
2. Explain the goals of descriptive research and the statistical techniques used to interpret it.
3. Summarize the uses of correlational research and describe why correlational research cannot be used to infer causality.
4. Review the procedures of experimental research and explain how it can be used to draw causal inferences.



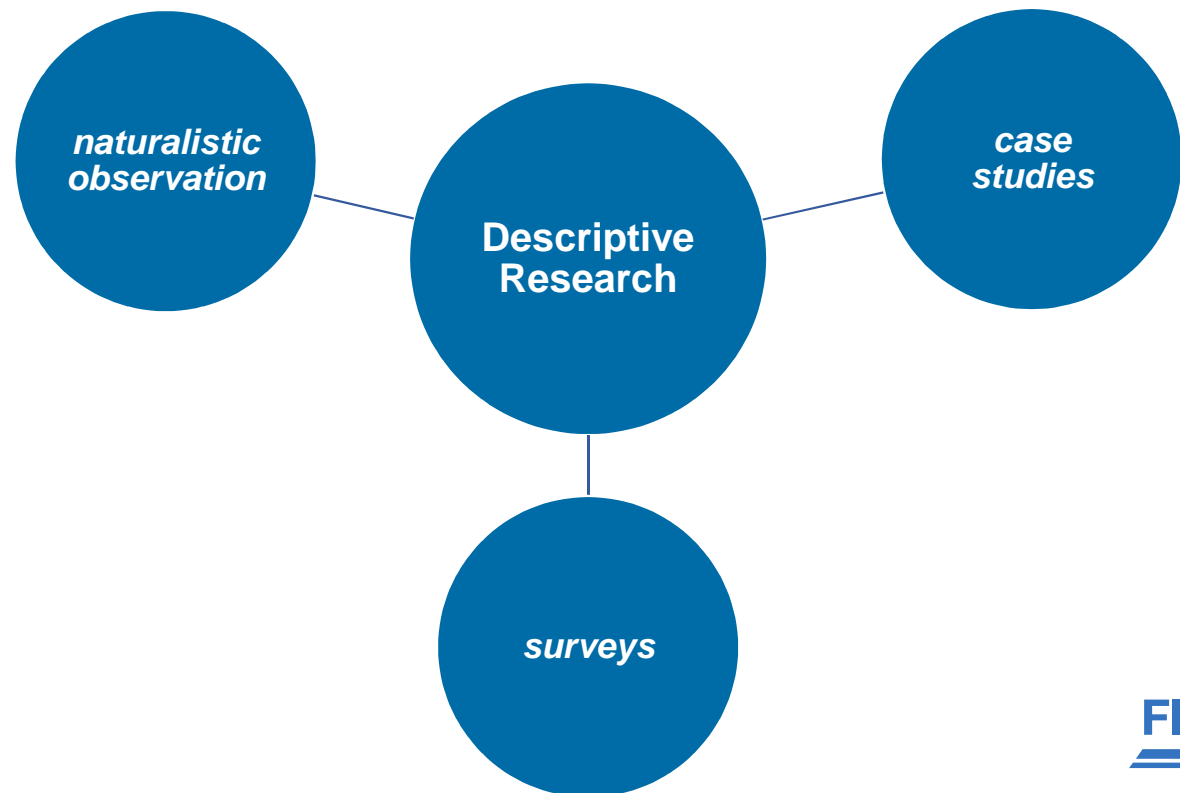
Descriptive, Correlational, and Experimental Research Designs

Research Design	Goal	Advantages	Disadvantages
Descriptive	to depict the current state of affairs	provides a detailed picture; inspires further research	does not assess relationships among variables
Correlational	to assess relationships among variables	allows predictions	does not allow cause-and-effect conclusions
Experimental	to assess the effect of manipulations on a dependent variable	allows cause-and-effect conclusions	some variables cannot be manipulated



Descriptive, Correlational, and Experimental Research Designs

Descriptive Research





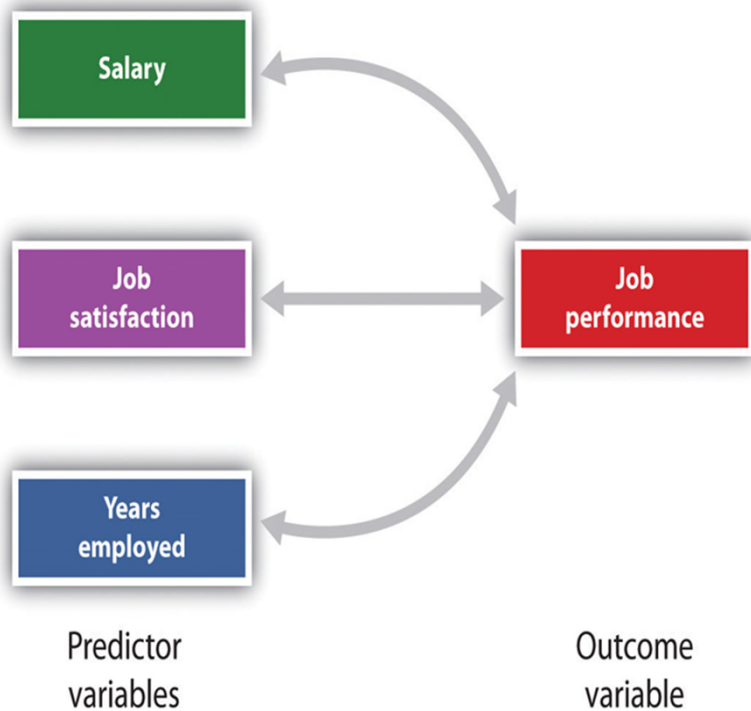
Descriptive, Correlational, and Experimental Research Designs

Correlational Research

- **Pearson correlation coefficient (r):**
most common statistical measure of the strength of linear relationships among variables
- r ranges from -1.00 to +1.00
 - positive values indicate positive linear relationships; negative values indicate negative linear relationships
 - the absolute value indicates the strength of the relationship



Descriptive, Correlational, and Experimental Research Designs



Correlational Research

- **Multiple regression:** statistical technique based on correlation coefficients that allows the prediction of an outcome variable from more than one predictor variable.



Descriptive, Correlational, and Experimental Research Designs

Correlational Research

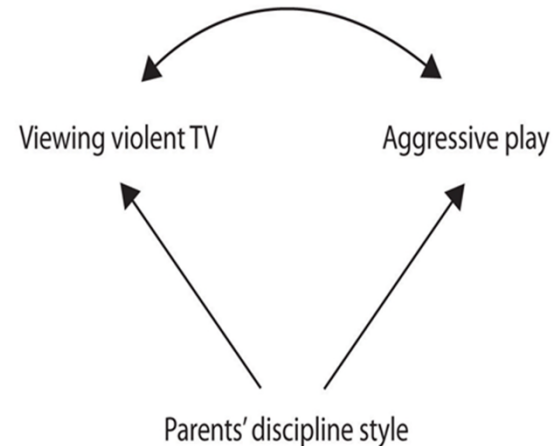
- Correlational research does not allow causal conclusions.
- A positive correlation between the number of violent TV shows children watch and scores on a measure of aggressive play can mean:
 1. Violent TV leads to aggressive behavior
 2. Aggressive behavior leads to watching violent TV
 3. Viewing violent TV and aggressive behavior mutually influence each other
 4. A third variable (e.g., parenting style) leads both to viewing violent TV and behaving aggressively



Descriptive, Correlational, and Experimental Research Designs

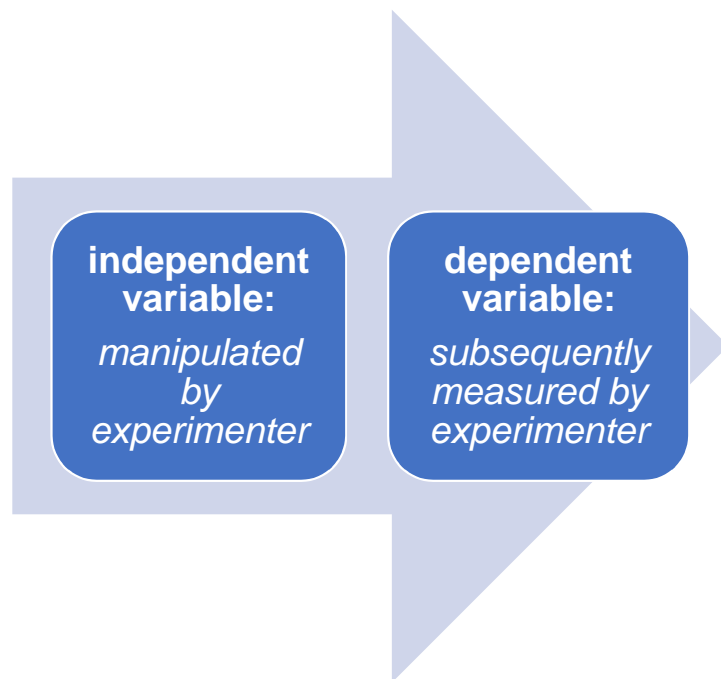
Correlational Research

- **Common-causal variables:** not part of the research hypothesis, but cause both the predictor and the outcome and therefore produce the observed correlation
- **Spurious relationship:** a relationship between two variables that is explained away by the influence of a common-causal variable





Descriptive, Correlational, and Experimental Research Designs

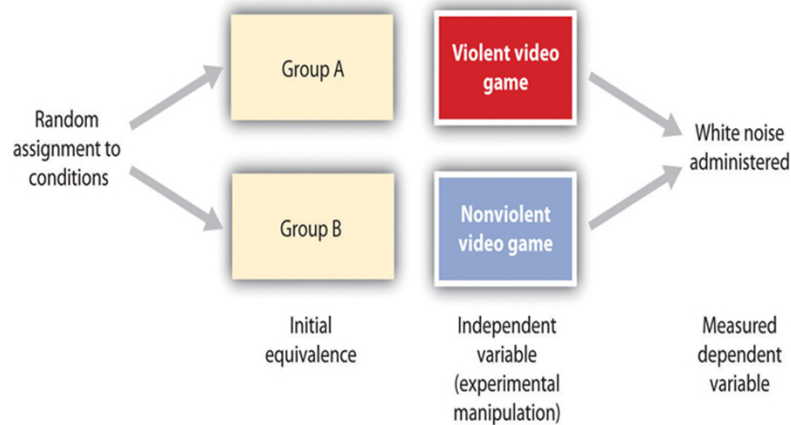


Experimental Research

- Experimental research allows more definite cause-and-effect conclusions.
- The variables of interest are called the independent and dependent variables.



Descriptive, Correlational, and Experimental Research Designs



Experimental Research

- Two advantages of the experimental research design are:
 - the independent variable (the experimental manipulation) occurs prior to the measured dependent variable
 - the creation of initial equivalence between the conditions of the experiment (in this case by using random assignment to conditions)



Descriptive, Correlational, and Experimental Research Designs

Key Takeaways

- Descriptive, correlational and experimental research designs are used to collect and analyze data.
- Descriptive designs include case studies, surveys, and naturalistic observation. These designs give a picture of the current thoughts, feelings or behaviors in a group of people. Descriptive research is summarized using descriptive statistics.
- Correlational designs measure two or more variables and assess relationships between or among them. The variables may be presented on a scatterplot to show the relationships. The Pearson Correlation Coefficient (r) is a measure of the strength of the linear relationship between two variables.



Descriptive, Correlational, and Experimental Research Designs

Key Takeaways, continued

- Common-causal variables may cause both the predictor and outcome variable in a correlational design, producing a spurious relationship and making it impossible to draw causal conclusions.
- Experimental research involves the manipulation of an independent variable and the measurement of a dependent variable. Random assignment to conditions is normally used to create initial equivalence between the groups, allowing researchers to draw causal conclusions.



You Can Be An Informed Consumer of Psychological Research

Learning Objectives:

1. Outline the four potential threats to the validity of research and discuss how they may make it difficult to accurately interpret research findings.
2. Describe how confounding may reduce the internal validity of an experiment.
3. Explain how generalization, replication, and meta-analyses are used to assess the external validity of research findings.



You Can Be An Informed Consumer of Psychological Research

Threats to the Validity of Research

Threats to construct validity

The measured variables or experimental manipulations may not relate to the conceptual variable of interest.

Threats to statistical conclusion validity

Statistical tests were not completed, or the tests were incorrectly interpreted

Threats to internal validity

The dependent variable may have been caused by a confounding variable, rather than by the independent variable.

Threats to external validity

The observed effects may be found only under limited conditions, or only among specific groups of people.



You Can Be An Informed Consumer of Psychological Research

- **Construct validity:** the extent to which the variables used in the research adequately assess the conceptual variables they were designed to measure
 - Construct validity requires that measures be **reliable**, or consistent.



You Can Be An Informed Consumer of Psychological Research

- **Statistical conclusion validity:** the extent to which the researcher has drawn appropriate statistical inferences about the data
 - **statistical significance:** the confidence with which a researcher can conclude that the data do not reflect chance or random error

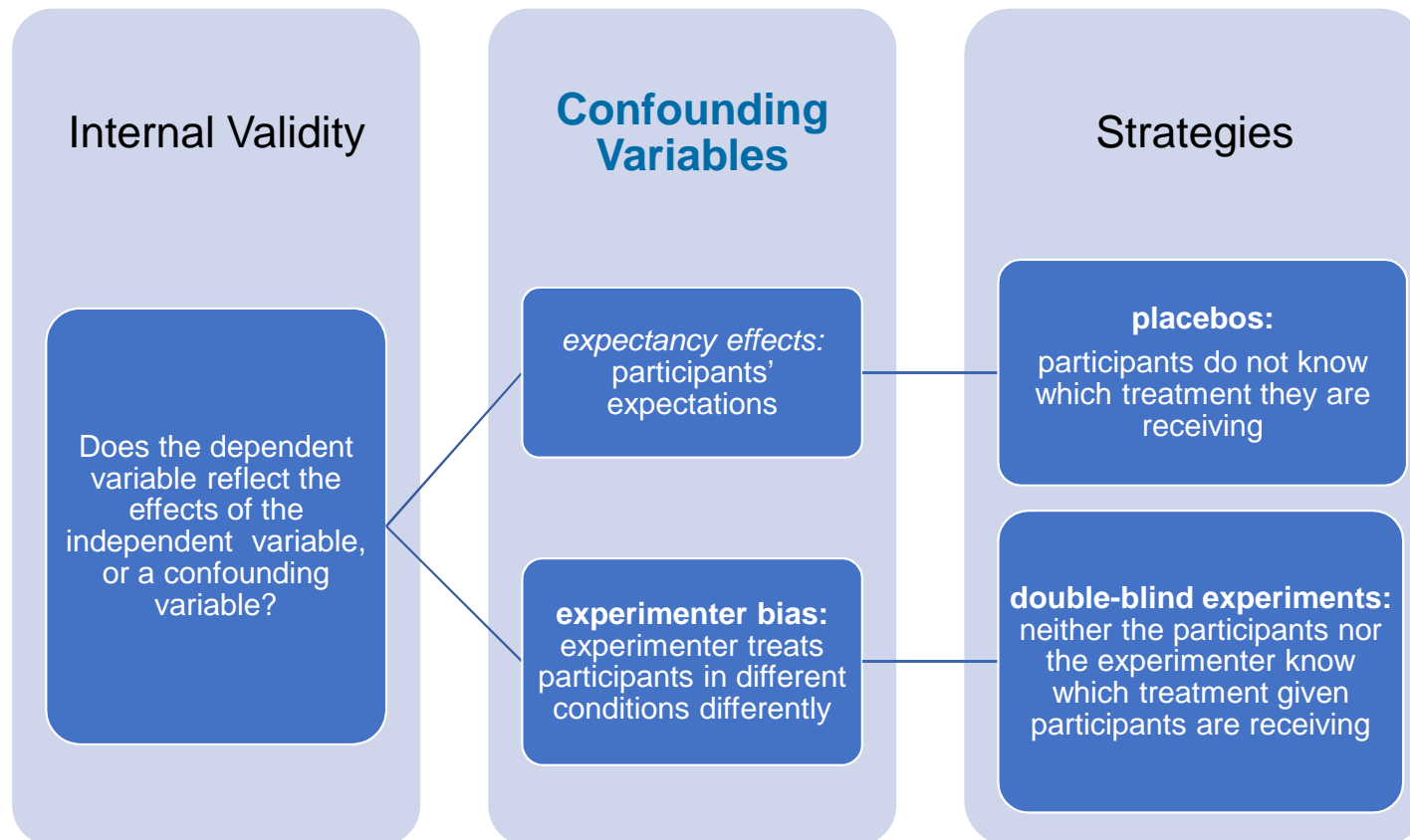


You Can Be An Informed Consumer of Psychological Research

- **Internal validity:** extent to which we can trust the conclusions that have been drawn about the causal relationship between the independent and dependent variables



You Can Be An Informed Consumer of Psychological Research



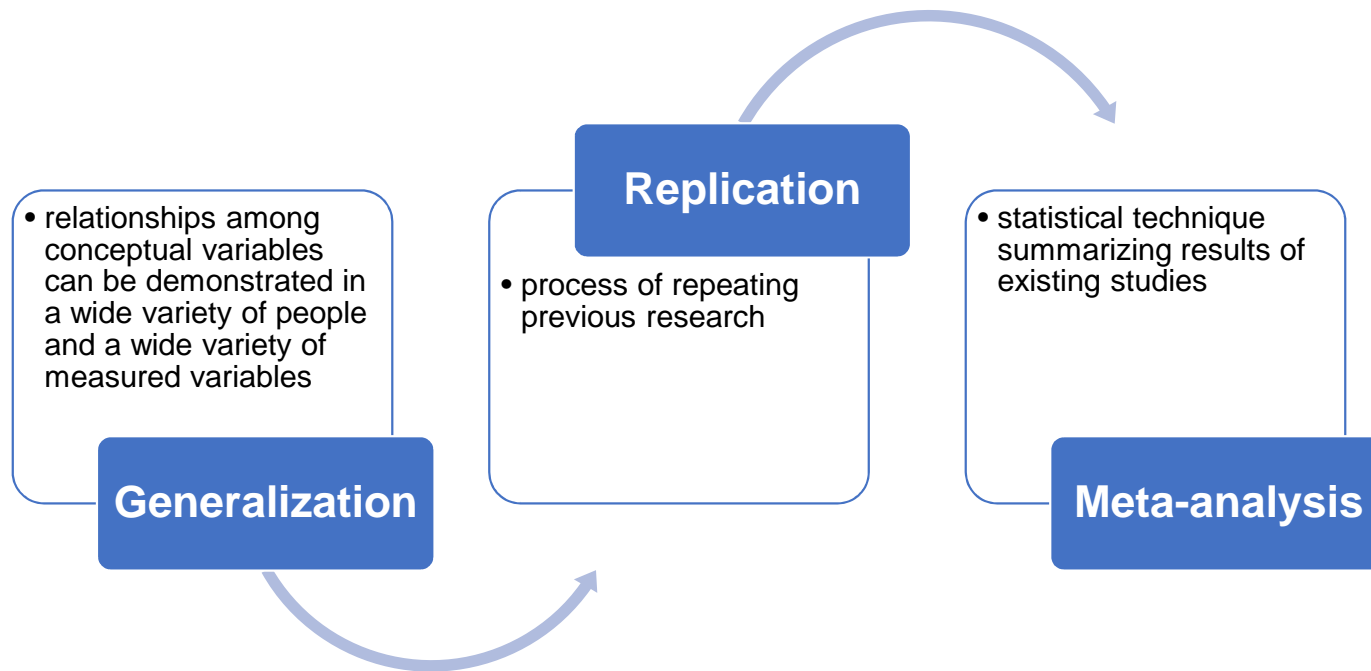


You Can Be An Informed Consumer of Psychological Research

- **External validity:** extent to which the results of research can be generalized beyond the specific way the original experiment was conducted



You Can Be An Informed Consumer of Psychological Research





An Informed Consumer of Psychological Research

Key Takeaways

- Research is said to be valid when the conclusions drawn by the researcher are legitimate. Because all research has the potential to be invalid, no research ever “proves” a theory or research hypothesis.
- Construct validity, statistical conclusion validity, internal validity, and external validity are all types of validity that people who read and interpret research need to be aware of.
- Construct validity refers to the assurance that the measured variables adequately measure the conceptual variables.



An Informed Consumer of Psychological Research

Key Takeaways, continued

- Statistical conclusion validity refers to the assurance that inferences about statistical significance are appropriate.
- Internal validity refers to the assurance that the independent variable has caused the dependent variable. Internal validity is greater when confounding variables are reduced or eliminated.
- External validity is greater when effects can be replicated across different manipulations, measures and populations. Scientists use meta-analyses to better understand the external validity of research.