Research Methods in Psychology

Chapter 2:

Scientific Method

Psychological Questions

❖ There always are a lot of questions such as below that we must use of a scientific method to find their answers:

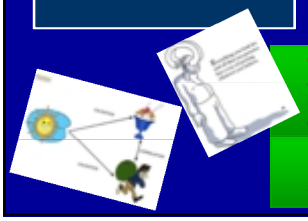
- ✓ Mothers talk to their younger children differently than they talk to their older children.
- ✓ Most individuals will notice if a person they are talking to is replaced by another person.
- ✓ Writing about adjusting to college improves students' grades.

What is the Scientific Method?

- **Is a way to obtain knowledge about behavior and mental processes.**
  - A general approach to gaining knowledge.
  - Not a particular technique or tool.
- Compare scientific method to "everyday" ways of gaining knowledge (non-scientific):
- e.g., using telescope and microscope increase our abilities.

General Attitude are divided:

- Scientific
  - Empirical
  - Judgments based on direct observation and experimentation
  - Skeptical, critical attitude
- Non-scientific
  - Intuitive
  - Judgments are based on "what feels right or seems reasonable"
  - Accept claims without evidence!



Confirmation bias: Tendency to accept evidence consistent with our intuitions and rejecting evidence in contrast with our intuitions.

Illusory correlation: tendency to perceive a relation between event when non exists.

Observations types:

- Non-scientific:
  - Casual, uncontrolled
  - Personal biases influence our observation
- Scientific:
  - Systematic, controlled
  - Control = essential ingredient of science
  - Greatest control is in an experiment

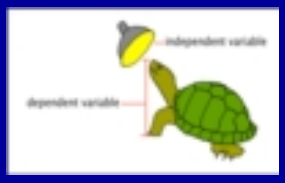
Control in observations:

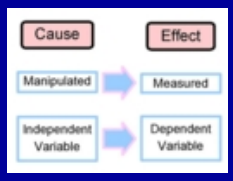
- **Control**
  - Investigate factors one at a time in experiment
  - In an experiment there are at least
    - One independent variable
    - One dependent variable

"**Experiment**" refers to a specific type of research study.

Observations:

- **What is Independent Variable (IV)?**
  - Factors that researchers **controls** or **manipulates** in order to determine their effect on behavior.

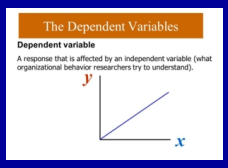


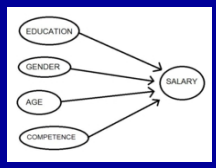


  - Minimum of two levels
    - **Treatment (experimental) condition**
    - **Control condition**

Observations :

- **What is Dependent Variable (DV)?**
  - Measure of behavior used to assess the effect of the independent variable.





  - Most studies involve several dependent variables.

An example:

- **The effect of alcohol consumption on cognitive errors in computer users.**

Alcohol → Cognitive Errors

Independent variables — Dependent variable

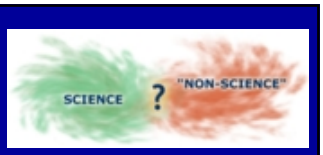
What is concept?

- **Concepts are symbols to refer to:**
- Things
- Events
- Relationships among things or events.

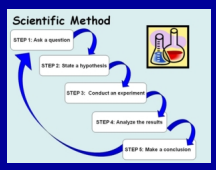
- Concepts are important because researchers refer to concepts under a special name: constructs. Indeed, constructs are built based on concepts.

In Psychology we label concepts with the name of "construct".

Concept Types:

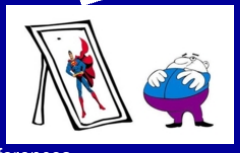


- **Non-scientific**
  - Ambiguous
  - We use words even when not clear in their meaning (e.g., "intelligence").



- **Scientific**
  - Clear, specific definitions
  - *Construct* = concept

Reporting types:



- Non-scientific
  - Biased, subjective
  - Personal impressions

- Scientific
  - Unbiased, objective
  - Separate observations from inferences
  - Inter-observer agreement

Constructs

- Many psychological constructs
  - ✓*Examples:* aggression, depression, emotion, intelligence, memory, personality, stress, well-being.

- Operational definition
  - ✓Specific procedure used to produce and measure a construct by an observable procedure.

Constructs

- **Advantages of operational definitions**
  - ✓ **Define constructs with specificity**
  - ✓ **Allow clear communication**

- **Disadvantages operational definitions**
  - ✓ **Potentially limitless number of operational definitions for any construct.**
  - ✓ **Some operational definitions may be meaningless.**

Instruments

Instruments are used to measure behaviors and mental processes. This is important to have an accurate instruments.

- Scientific
  - Accurate
  - Precise
- Non-scientific
  - Inaccurate
  - imprecise

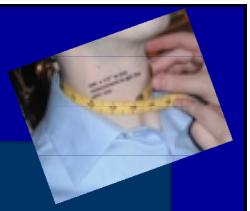
Accuracy is the difference between what an instrument says is true and what is known to be true. Like: good and bad clocks.

Measurements

- **1. Physical measurement**
  - Dimensions have agreed-upon standards and instruments
    - *Examples*: length, weight, time
- **2. Psychological measurement**
  - Constructs have no agreed-upon standard nor instrument
    - *Examples*: beauty, intelligence, aggression

✓ Researchers develop measures to assess psychological constructs for the second group. **7-poin rating scales**.

Measurements

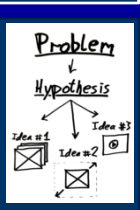


- Non-scientific
  - Not valid nor reliable
  - Measures of concepts are inaccurate or inconsistent
- Scientific
  - Validity and reliability
    - Valid measures are truthful.
    - Reliable measures are consistent.

What is Hypothesis?

➢ **Is a tentative explanation for something to answer to the questions of "How" and "Why".**

❑Two types of hypotheses are:



- Non-scientific
  - Untestable
- Scientific
  - Testable
    - Concepts are clearly defined and measured

Hypotheses

- **An hypothesis is not testable if:**
  - ✓Constructs are not adequately defined.
  - ✓Circular: the event itself is used as an explanation for the event.
  - ✓Appeals to ideas or forces not recognized by science.

Goals of the Scientific Method

- **Four research goals:**
  - Description
  - Prediction
  - Explanation
  - Application

First Goal: Description

- Define, classify, catalogue, or categorize events and their relationships.
- Most psychology research is ***nomothetic***, not ***idiographic***.

- ***Nomothetic***: *Describing the average performance of a group.*
- ***Idiographic***: *Describing the individual rather than group.*

- Most psychology research is *quantitative*, not *qualitative*.

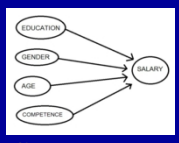
Second Goal: Prediction

- **Correlations (relationships) among variables allow researchers to predict mental processes and behavior.**
- Variable
  - Dimension on which people differ, or vary.
- Correlation

  Two measures of the same people, events, or things vary together or go together.
- Correlation does not imply causation.

Third Goal: Explanation

- Researchers understand and can explain a phenomenon when they can identify its cause(s).



- Conduct controlled experiments to identify causes.
  - Manipulate factors one at a time to determine their effect (= independent variables).
  - Measure dependent variables.

Third Goal: Explanation

- Causal inference
  - Statement about the cause of an event or behavior

- Casual inference has three conditions
  - Covariation of events
  - Time-order relationship
  - Elimination of plausible, alternative causes

Third Goal: Explanation

- Causal inferences and confounding
  - ✓Confounding: when two independent variables co-vary together
    - IV 1 → DV
    - IV 2 → DV
  - ✓We cannot determine which IV caused effect on DV

➢ For causal inference, experiment must be **free of confounding**.

Generalization

- Researchers are not interested in just the one sample of people or one set of circumstances tested in a research study.
- They wish to generalize a study's findings to other
  - People
  - Settings
  - Conditions

The forth Goal: Application

- Means that applying knowledge and research methods to improve people's lives.

- Researches types:
  - Applied research: "to improve people's lives"
    - Often "real-world' or natural settings
  - Basic research: "to understand behavior and mental processes"
    - "Seeking knowledge for its own sake"
    - Often in laboratory settings
    - Goal of testing theories

Scientific Theory Construction and Testing

Theories = proposed explanations for the causes of phenomena

- Explain who, what, when, where, how, and why of behavior and mental processes.
- Logically organized set of statements
  - Define events (concepts)
  - Describe relationships among events
  - Explain the occurrence of events

Psychological Theories

- Theories vary in scope and complexity.
- Successful theories
  - Organize empirical knowledge
  - Suggest testable hypotheses
  - Guide research
  - Survive rigorous testing (e.g., falsification)
  - Are logical, internally consistent, precise, parsimonious

Psychological Theories

- Intervening Variables
  - Processes or mechanisms used to explain relationship between IVs and DVs.
  - "Hidden" processes represented by constructs
  - Example: "thirst"

Intervening Variables