

The Science of Psychology

I. The Goals of Science

A. Basic Research – Gain Scientific Understanding

1. Describe Phenomenon
2. Predict Phenomenon
3. Explain Phenomenon

B. Applied Research – Solving Practical Problems

4. Controlling Phenomenon (Ethical?)
5. Create Change

II. Scientific Method

A. Sources of Knowledge- Epistemology

1. Unscientific Sources of Knowledge

- a. Authority - Because someone (expert) says so
- b. Folk Wisdom - Cultural Truisms; It seems to have been true in the past, so must be true now.
- c. A Priori Methods (Intuition) - Because it seems reasonable and Likely

- Untested, Unquestioned, & Unconfirmed.

2. Scientific Method - Francis Bacon (1561 - 1626) : Theorize, hypothesize, test, revise

-Self-Correcting Source of Knowledge



B. Components of the Scientific method

1. Empirical - **Empiricism** René Descartes : - only things that can be directly observed can be studied.
2. Public
3. Clearly defined concepts
4. Accurate and Precise Instrumentation
Accuracy = match between what measure says and what really happens:
Precision = the size of the units of measure.
(don't measure reaction time in years)

B. Components of the Scientific method

5. Measurable
 - a. Reliability
 - b. Validity
6. Testable Hypotheses
- Make predictions concerning the cause effect relationships between variables.
 - a. **Independent Variables**: a variable that is expected to cause a change in another variable.
 - b. **Dependent Variables**: a variable that is expected to change as a result of changes in the Independent Variable.
7. Skepticism- Nothing can be proven

III. Psychology as a Soft Science

1. Can't manipulate (control) all variables
- (can't raise children in a box)
 - a. ethical limitations
 - b. practical limitations (time, \$, workers)
2. Human behavior is complex, multi-determinant, and contextually sensitive

IV. Theories in Behavioral Science

- A. Theories describe the relationship between variables to explain social phenomenon
- B. Functions of Theories
 - a. Organize
 - b. Describe
 - c. Predict
 - d. Explain
- C. Theories often use **Intervening Variables** (Abstract Constructs/Concepts or Scientific Rules) to explain the relationship between the cause (Independent Variable) and the effect (Dependent Variable).
-Also known as **Mediating Mechanisms**

D. Good theories are...

- 1) Precise (clear and understandable)
- 2) Parsimonious/Occam's Razor – the shortest and simplest explanation possible are the considered the most likely.
- 3) Disconfirmable / Falsifiable (stated so that it can be tested)
- 4) Useful : they can be applied to real problems
- 5) Internally Consistent: no contradictory explanations
- 6) Based on as few Intervening Variables as possible
- 7) Heuristically Valuable: lead to new research and new discoveries.
- 8) Have more of its hypotheses supported than competing theories.

V. Process of Research

1. Develop an Idea

-Source of Ideas

- a. Observation
- b. Experts
- c. Lit Search
- d. Theory Driven (Basic)
- e. Problem Driven (Applied)

2. Develop Testable Hypotheses

- a. State variables of interest
- b. Operationalize the Variables : State how variables will be measured (every operationalization is limited)
- c. State relationship between variables (IV causes change in DV)

3. Review Literature

1. Psychological Abstracts
2. PsychInfo
3. Reference List of relevant articles
4. Text Books (but always refer back to primary source)

5. Revise your original hypotheses

4. Design Methodology (write proposal including intro, methods, & results)

a. General Methods

- Observational Methods
 - Case Studies
 - Naturalistic Observation
 - Structured Observation
- Correlational Studies
- Survey Studies
- Experimental Studies
 - Lab Experiments
 - Quasi-Experimental Studies
 - Field Experiments

b. Internal Validity (Control) and External Validity (Generalizability to Population, & Realism) Tradeoffs.

c. Subject to institutional review (human subjects approval)

5. Conduct Pilot Research (n = 10 -15)
6. Collect Data in ethical & unbiased manner
 1. Human Subjects Approval (provides ethical review)
 2. Control researcher effects (Uniform treatment of participants/Double blind methodology)
7. Analyze Data > Statistical Procedures > Interpret Results
8. Report Results - Publish in peer reviewed journal or invited book chapter
 1. Report in a clear and replicable manner