The Hypothetico-Deductive Method

And Experiments in Psychology
Induction and Deduction

- Induction- Making generalizations from facts.
- Deduction- Drawing conclusions from specific facts and rules.
Induction
Induction
Induction

Flowers are red!
Inductive Logic

• Based on observation of details
• The more observations the better the induction
• Used extensively in making statistical inference
• Insufficient alone
• All A are B.
• Particular individual “a” is A
• Conclusion
  Particular individual “a” is B
Deductive Logic

- Premise: Flowers are Red
- Premise: Tulips are flowers
  - Deduction
  - Tulips are red
**Deductive Logic**

- Premise: Flowers are Red
- Premise: Daffodils are flowers
- Deduction
- Daffodils are red

Faulty premise leads to faulty conclusion!
Deductive Logic

- Premises must be correct
- Logic must also be correct
  - Tulips are flowers
  - Tulips are red
  - Therefore all flowers are red

Faulty logic leads to faulty conclusion!
Theory-Definitions (Webster’s New World Dictionary of the American Language)

- a mental viewing, contemplation
- a speculative idea or plan as how something might be done
Theory-Definitions (Webster’s New World Dictionary of the American Language)

- a systematic statement of principles involved
- a formulation of apparent relationships or underlying principles of certain observed phenomena that have been verified to some degree
Theory-Definitions

- the branch of an art or science consisting in a knowledge of its principles and methods rather than its practice
- popularly, merely conjecture
Attributes of a Good Theory

• Breadth
• Significance
• Utility
• Verifiability
• Parsimony
• Coherence
Hypotheses (Webster’s New World Dictionary of the American Language)

- groundwork, foundation, supposition
- an unproved theory, proposition, supposition, etc., tentatively accepted to explain certain facts or to provide a basis for further investigation, argument, etc.
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Experimental Hypothesis

- **Cause leads to the Effect**
Experimental Hypothesis

- Cause leads to the Effect
- More specific than theory
- Narrower than theory
- Used to test deductions from theory
Mill’s Canons of Proof

- Method of Agreement
- Method of Difference
- Joint Method of Agreement and Difference
- Method of Concomitant Variation
Mill’s Canons of Proof

- Method of Agreement
  - If hypothesized Cause is present
  - Hypothesized Effect must be present
Mill’s Canons of Proof

- **Method of Difference**
  - If hypothesized cause is absent
  - Hypothesized effect must be absent
Mill’s Canons of Proof

- **Joint Method of Agreement and Difference**
  - When cause is present effect is present
  - AND
  - When cause is absent effect is absent
Mill’s Canons of Proof

- Method of Concomitant Variation
  - A change produced in the cause
  - Is followed by a change in the effect
Mill’s Canons of Proof

• Method of Concomitant Variation
• Method of Difference
• Joint Method of Agreement and Difference
• Method of Concomitant Variation
Hypothetico-Deductive Method
Hypothetico-Deductive Method

Induction

Facts
Hypothetico-Deductive Method

Induction

Facts

Hypothesis
Hypothetico-Deductive Method

- Hypothesis
- Deduction
- Induction
- Facts

Research Methods and Analysis
Hypothetico-Deductive Method

- Hypothesis
- Induction
- Facts
- Deduction
- Experiment

Research Methods and Analysis
Hypothetico-Deductive Method

- Hypothesis
  - Induction
    - Facts
  - Deduction
    - Experiment
      - New Facts
Hypothetico-Deductive Method

- Hypothesis
- Deduction
- Induction
- Experiment
- Facts
- New Facts

Research Methods and Analysis
Experimental Hypotheses

- $H$: $X$ causes $Y$
- $H$: IV causes DV
Independent Variable

- Manipulated by the Experimenter
- The Hypothesized Cause
Dependent Variable

- Measured by the Experimenter
- The Hypothesized Effect
Control Variables

• Controlled by the Experimenter
• Not in the Hypothesis
Hypotheses

• Repeated association of a stimulus with another will produce a conditioned response.
Hypotheses

- Students who receive rewards for practicing good study habits will increase the performance of those study habits.
Hypotheses

• Taste discrimination between solutions varying in sugar content will be better when the tip of the tongue is used rather than the top.
Hypotheses

• Caffeine speeds up neural transmission.
Hypotheses

- Thinking causes cortical activation.
Hypotheses

• Reaction time is reduced by alcohol consumption.
Hypotheses

• More positive mood is produced by a faster tempo.
The Experimental Method

- Hypothesis
- Design Experiment
- Collect Data
- Analyze Data
- Interpret Results
- Publish Results
- New Hypotheses
The Experimental Method

An informed guess

Independent Variable
- Control Group
- Treatment Group

Dependent Variable
- Measured Behavior

Controlled Conditions

Statistics

Application

Intervening Variables, Theory

Start Again!

Research Methods and Analysis
Research Methods and Analysis

The Experimental Method

Habit strength increases response speed

H: Meaning interferes with perception

IV: Colors, Words, Word Colors
DV: Response Speed

Within Subjects Design
Between Subjects Design

Mean:
Colors
Words
Word Colors

Why?

Implications?
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