

Basic Methods I

The nature of causes

Basic Methods

- I. Goal of Science
- II. Definition of Causality
- III. Types of Causal Relations
- IV. Inferring Causal Relations

I. Goal of Science

Understanding:

Understanding involves knowledge of the full set of causal relationships that underlie a phenomenon.

II. Definition of Causality

A. Under what conditions changes in one observation will be followed by changes in a second observation.

Example:

The moon causes the changes in tides.

Light switch causes the lights to go on and off.

II. Definition of Causality

B. Importance of :

“all other things equal”

Ruling out rival hypotheses

III. Types of Causal Relationships

A. Ultimate (final)
versus
Proximate (immediate)

III. Type of Causal Relationships

B. Four levels of causal connections:

1. Necessary and sufficient causes:

X is requires and will alone lead to Y

Examples: trisomy of the 21st chromosome causes Down's syndrome.

B. Four levels of causal connections:

2. Necessary but not sufficient causes:

X will, under the right circumstances, lead to Y

Examples:

Early exposure to language in will lead to language development in children.

B. Four levels of causal connections:

3. Sufficient but not necessary cause:

X will lead to Y, but so will other things.

Examples:

An ice storm will lead to school closings.

Frustration-Aggression Hypothesis.

Counting backwards and STS forgetting.

B. Four levels of causal connections:

4. Contributory Causes:

X is neither a necessary nor sufficient cause of Y, but changes the likelihood that Y occurs.

Examples:

Smoking and Lung disease

Viewing T.V. violence and aggressive behavior

IV. Inferring Causal Relations

A. Correlational (observational) Method: (method described by Bacon)

1. Definition:

Look for natural occurrences of X and see if Y is present.

Examples:

- Praise and children's school grades.
- Viewing violent T.V. and aggressive behavior in children.

Correlational Method (cont)

2. Francis Bacon: Table of More or less.

Tabulate all observation so that one can identify the conditions that increase and decrease the the co-occurrence of events.

		Heat	
		Present	absent
Motion:	Present	many	0
	Absent	0	many

Correlational Method (cont)

- 3. Strengths of the Correlational Method:
 - a. Observations are made in Natural settings
 - b. Observations are directly tied to the hypothesis.

Correlational Method (cont)

4. Weaknesses of the Correlational Method

A) Directionality Problem:

$$X \rightarrow Y \quad \text{or} \quad Y \rightarrow X$$

Example: Viewing violent TV causes aggressive behavior?

or

Do aggressive children like to watch violent TV?

Correlational Method (cont)

4. Weaknesses of the Correlational Method

B) Third variable problem:



Example: Aggression in the home leads to both the viewing of violent TV and the aggressive behavior of children.

IV. Inferring Causal Relations (cont)

B. Experimental Method:

Intentionally manipulate some variable (X),
and look for changes in another (other)
variable(s) (Y).

B. Experimental Method (cont)

2. John Stuart Mills:

Method of Agreement:

see if whenever we see X we see Y
and, whenever we see Y we see X

Method of Difference:

If whenever we don't see X we also
don't see Y.

John Stuart Mills (cont)

Joint Method of agreement and difference:

Systematically vary the occurrence of X and
look for changes in Y.

This is necessary to rule out alternative
explanations.

B. Experimental Method (cont)

- 3. Strengths of the Experimental Method
 - a) can identify casual relations
 - b) Can insure that “all else is equal”

B. Experimental Method (cont)

- 4. Weaknesses of the the Experimental Method
 - a) Experiments are often conducted in artificial settings, so the result my not generalize to the “real world”
 - B) Manipulations may be unreasonably potent

4. Weaknesses of the the Experimental Method

- C) The manipulation may not be the same as in the real world.
- D) It may not be ethical to manipulate the important variable.

IV. Inferring Causal Relations

C. Inferring causal relations may require some combination of observational and experimental methodology.
