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***Social Science  
Research Methods***

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# *Overview*

- The story so far . . .
- Quasi-Experimental Designs
- Time Designs
- Single Subject Designs
- Nonexperimental Research
- Laboratory and Field Work
- On Ignoring a Research Education

# *The Story So Far . . .*

- Philosophy, Metaphysics, Epistemology
- Truth, knowledge, belief, necessity, analytic v. synthetic
- Scientific method, resolution and composition, first and second prerogatives, instances of the fingerpost, positivism, falsifiability, paradigm shifts, scientific research programmes, scientific progress
- The problem of induction
- The pessimistic meta-induction
- Constant conjunction, causality, INUS conditions, Bayesianism
- Laws of nature, covering laws, D-N, I-S
- Explanation, prediction, manipulation, control
- Emergence, supervenience, reductionism, special sciences, social science issues
- Theory-ladenness of observations, underdetermination of theory by data, incommensurability of theories

# *The Story So Far . . .*

- Scientific approach, hypothetico-deductive method, theory building, constructs, propositions, hypotheses
- Paradigmatic assumptions
- Null and alternative hypotheses, Type I and type II errors, alpha and beta risk
- Research, theories and models
- Normative, descriptive, prescriptive models
- Constitutive and operational definitions (measured or manipulated)
- Nominal, ordinal, interval, ratio, Likert scales
- Active and attributive, dependent and independent variables
- Measurement, reliability, validity, attenuation
- Internal, external, construct and statistical conclusion validities
- Threats to validity

# *Quasi-Experimental Designs*

- “. . . one of the major goals of science is to find causal relations” (K&L p. 535)
- “The true experiment is the strongest approach used to meet this goal.” (ibid.)
- “. . . it can provide the researcher with a *cause-and effect* statement . . . ” *WHY?*
- “This is generally considered the highest form of experimentation.” (ibid.)

# *Quasi-Experimental Designs*

- The true experiment requires
  - ★ Manipulation of at least one independent variable
  - ★ Random assignment of participants to groups
  - ★ Random assignment of treatments to groups
- If any of these is missing, we have a *compromise* design or *quasi-experimental* design
- According to Cook and Campbell, two main types of these can be interpreted
  - ★ Nonequivalent control group designs
  - ★ Interrupted time series designs

# *Quasi-Experimental Designs*

- Nonequivalent control group designs
  - ★ No-treatment control group designs
  - ★ Nonequivalent dependent variable designs
  - ★ Removed treatment group designs
  - ★ Repeated treatment group designs
  - ★ Reversed treatment nonequivalent control group designs
  - ★ Cohort designs
  - ★ Posttest only designs
  - ★ Regression continuity designs

# *Quasi-Experimental Designs*

## ■ Design 22.1: No-Treatment Control Group

★  $Y_b$      $X$      $Y_a$     (Experimental)  
       $Y_b$      $\sim X$      $Y_a$     (Control)

- ★ No randomized assignment, and no matching (cf. Design 20.3)
- ★ So how do we know groups are equivalent?
- ★ Check 'control' variables for similarity
- ★ Check means, standard deviations, distributions of pretests

# *Quasi-Experimental Designs*

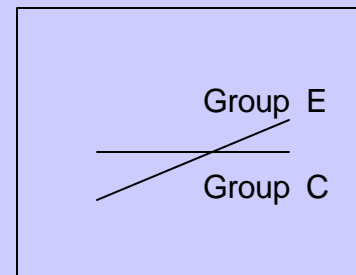
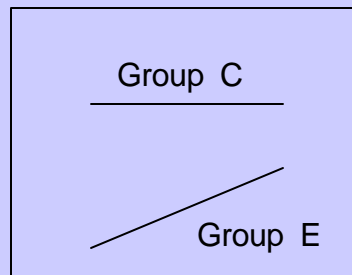
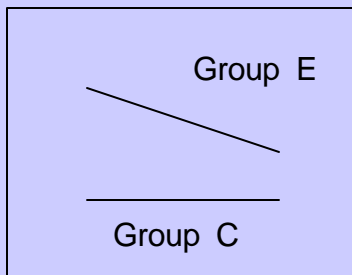
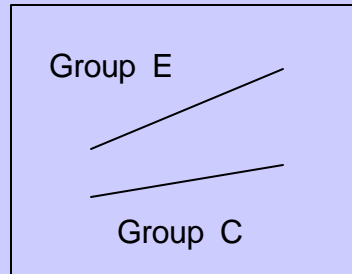
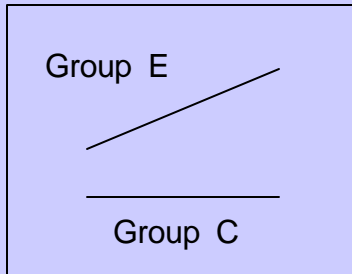
- Many difficulties remain, of which the most important is *selection*
- Need to consider all threats to internal validity and account for them
- We need to eliminate alternative hypotheses

# *Quasi-Experimental Designs*

- Most likely threat is *selection-maturation* interaction
  - ★ Groups initially different
  - ★ Mature at different rates
- Also possible
  - ★ Instrumentation
  - ★ Statistical regression
  - ★ Selection-history interaction

# Quasi-Experimental Designs

## ■ Five possible outcomes



# *Time Designs*

## ■ Design 22.2: A Longitudinal Time Design

\*  $Y_1$     $Y_2$     $Y_3$     $Y_4$     $X$     $Y_5$     $Y_6$     $Y_7$

- \* Maturation is a problem
- \* Plot data over time
- \* ARIMA

# *Time Designs*

## ■ Design 22.3: A Multiple Time Series Design

★	$Y_1$	$Y_2$	$Y_3$	X	$Y_4$	$Y_5$	$Y_6$	(E)
	$Y_1$	$Y_2$	$Y_3$		$Y_4$	$Y_5$	$Y_6$	(C)

# *Single Subject Designs*

- One (or a few) subjects
- Repeated trials
- Randomization hardly ever used
- Baseline observations
- Popular in psychological work
- Averages can be misleading . . .
- External validity problems

# *Single Subject Designs*

- Establishing a stable baseline is important
- Designs using withdrawal of treatment
  - ★ **ABA Design**
    - ◆ But is intervention reversible?
  - ★ **ABAB Design**
  - ★ **ABCB Design**
  - ★ **etc.**

# *Single Subject Designs*

- Multiple Baselines
  - ★ Across behaviors
  - ★ Across participants
  - ★ Across environments

# *Nonexperimental Research*

- “*Post hoc, ergo propter hoc*”
- Nonexperimental research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables.
- The essential difference from true experiments is the lack of direct control of independent variables

# *Nonexperimental Research*

- Self-selection is a problem
  - ★ Self-selection into samples
  - ★ Self-selection into comparison groups
  
- ★ Suppose we suspect poor examination performance is caused by smoking. We test a number of candidates, and discover that most high performers do not smoke, while most poor performers do
  - ◆ What if smoking and poor performance are both caused by nervousness?
  - ◆ We can find the statistical association – but not the cause

# *Nonexperimental Research*

## ■ Testing Alternative Hypotheses

- ★ Eliminating alternative explanations improves internal validity
- ★ Particularly important in nonexperimental studies
  - ◆ One of the only ways to control the independent variables

# *Nonexperimental Research*

## ■ Limitations

- ★ Inability to manipulate independent variables
- ★ Lack of power to randomize
- ★ Risk of improper interpretation
  
- ★ “Nonexperimental research that is conducted without hypotheses, without predictions, research in which data are just collected and then interpreted, is even more dangerous in its power to mislead” (K&L p. 568)

# *Nonexperimental Research*

## ■ Value

- ★ Much nonexperimental research must be done because many research problems do not lend themselves to experimental inquiry
- ★ “Replication is always desirable, even necessary.” (K&L p. 570)