



Chapter 5

Causation and Research Design

What is a 'cause'?

- A cause is an explanation for some characteristic, attitude, or behavior of groups, individuals, or other entities (such as families, gangs, police departments) or for events.

What causes people to be violent?

- Types of causes
 - Nomothetic
 - Idiographic

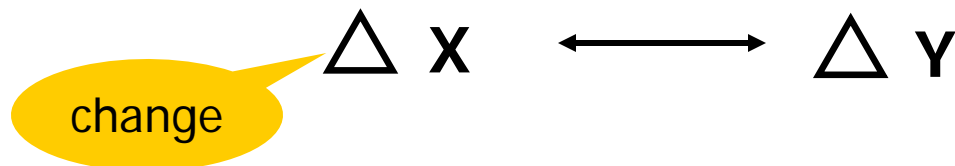
Criteria for Causation

1. Two variables must be empirically correlated with one another for a causal relationship to exist
2. Cause must precede effect in time
3. Observed correlation between two variables cannot be explained away by a third variable
4. Causal relationship strengthened by finding causal mechanism
5. Causal relationship should be considered within context

I. Empirical Association

- Before we can search for a causal relationship between two factors, there must be evidence that they are somehow related
- Relationship must be observable – cannot be only assumed or believed

The independent variable and the dependent variable must vary together.



Empirical Association Example

The more severe an individual's substance abuse problem, the more likely he or she is to commit crimes.



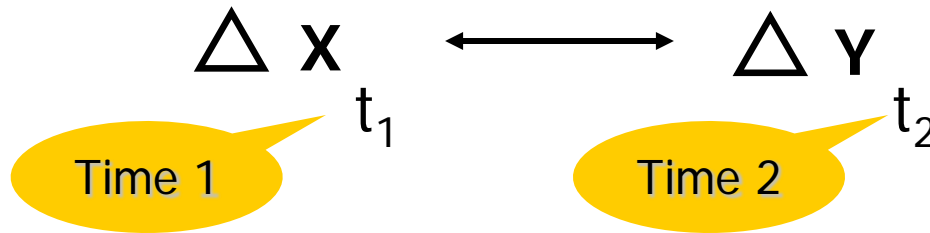
As substance abuse problem increases...



...likelihood of future criminality increases.

2. Cause precedes effect in time

The change in X must occur before the change in Y



Egg ?

It is often difficult to establish cause-effect relationships in social research, because it can be difficult to determine which came first.

Temporal Order Example

The more severe an individual's substance abuse problem, the more likely he or she is to commit crimes.



Began using drugs at 14

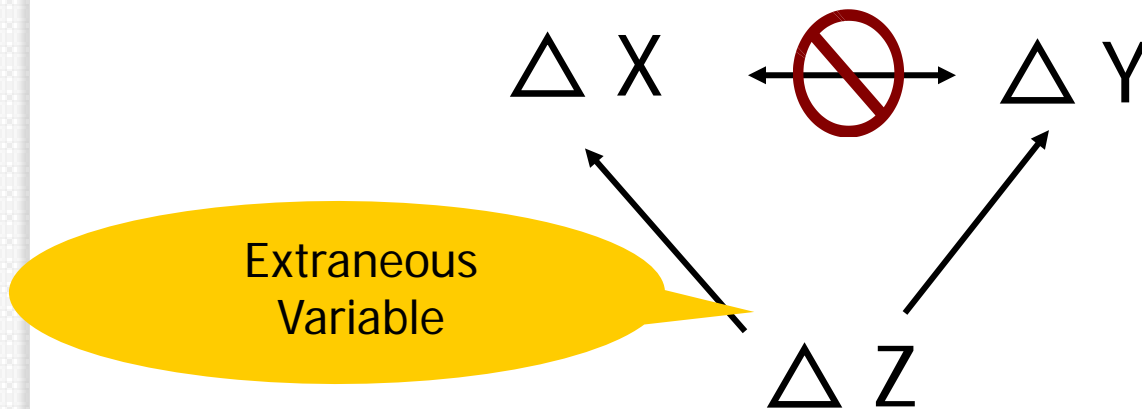


began committing crimes
at 17

3. Nonspuriousness

Just because two factors/variables are related, and one thing comes before the other, the relationship is not necessarily causal! One thing does not necessarily cause the other.

We say that a relationship between two variables is spurious when it is due to variation in a third variable; so what appears to be a direct connection is in fact not.



4. Causal Mechanism

- Process that creates the connection between variation in an independent variable and the variation in the dependent variable it is hypothesized to cause
 - In other words, it's the **reason** why the relationship is causal
- Not necessary for demonstrating a causal relationship, but it helps !

Causal Mechanism Example

The more severe an individual's substance abuse problem, the more likely he or she is to commit crimes.



Began using drugs at 14



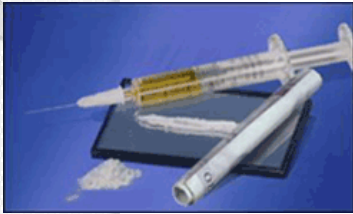
began committing crimes
at 17

Causal mechanism: Drug user needs to buy drugs.

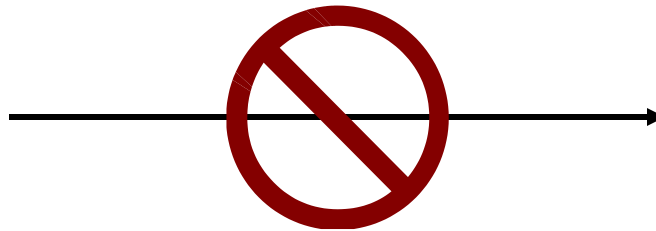
5. Context

- Context = set of circumstances surrounding an event or situation
- No cause has its effect apart from some larger context involving other variables
 - When, for whom, and in what conditions does this effect occur?
- A cause is really one among a set of interrelated factors required for the effect

Context



**Chronically unemployed,
lives in high crime area, in a
gang**



**Uses legal drug, access to
sufficient funds to obtain
drugs**



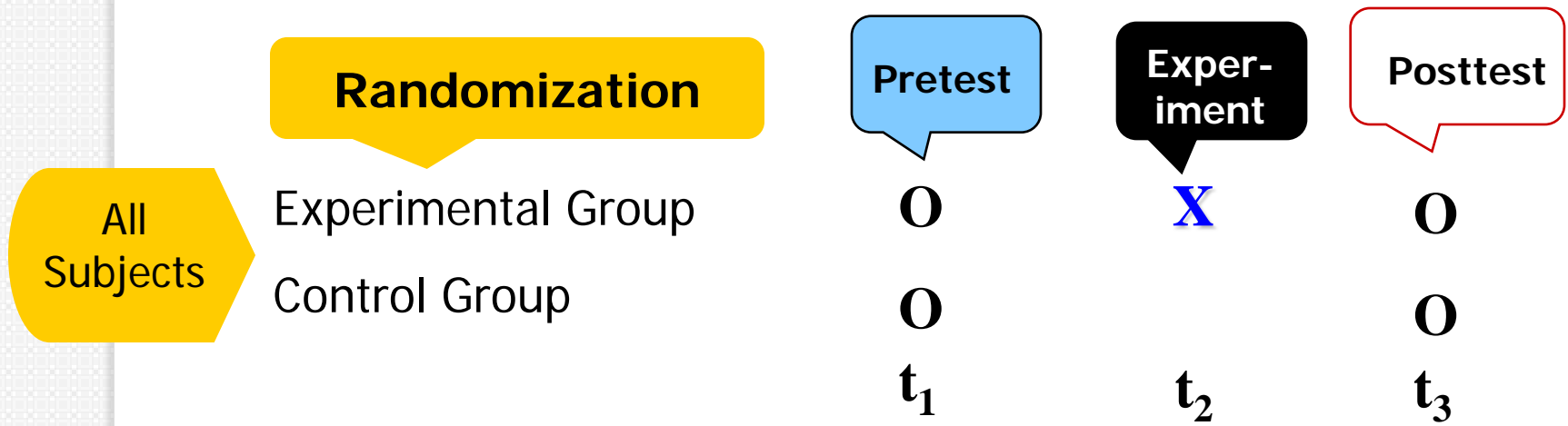


Requirements for True Experiments

- Two comparison groups (in the simplest case, an experimental and a control group)
- Random assignment to the two (or more) comparison groups
- Assessment of change in the dependent variable in both groups after the experimental group receives the experimental condition

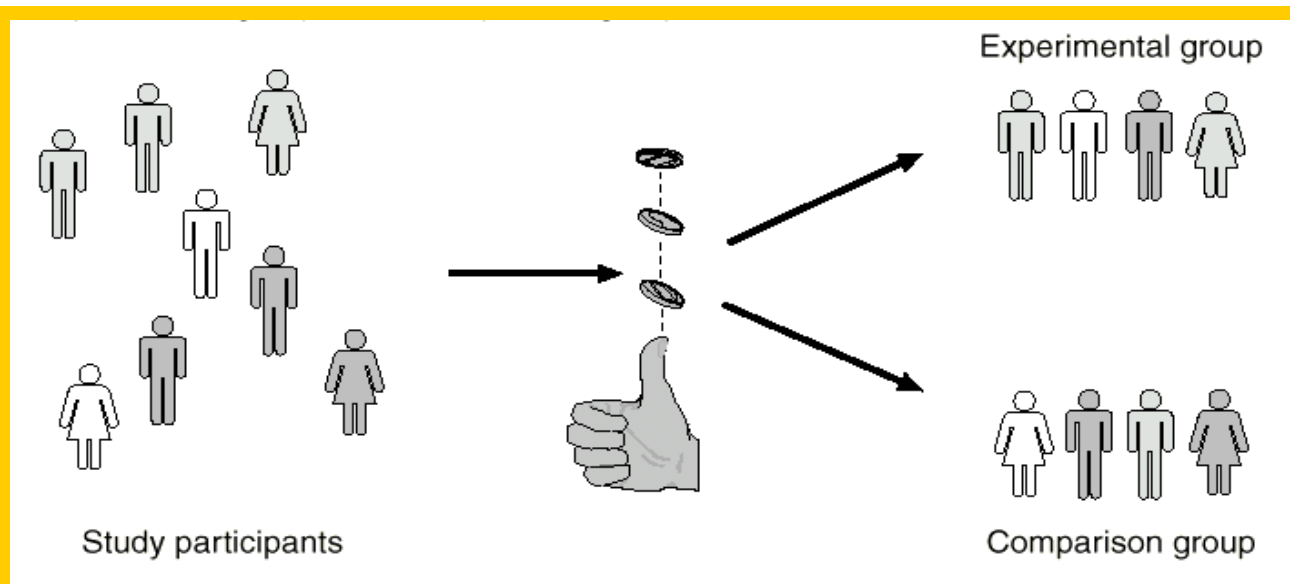
I. Two Comparison Groups

True experiments must have at least one **experimental group** (subjects who receive some treatment) and at least one **comparison group** (subjects to whom the experimental group can be compared).



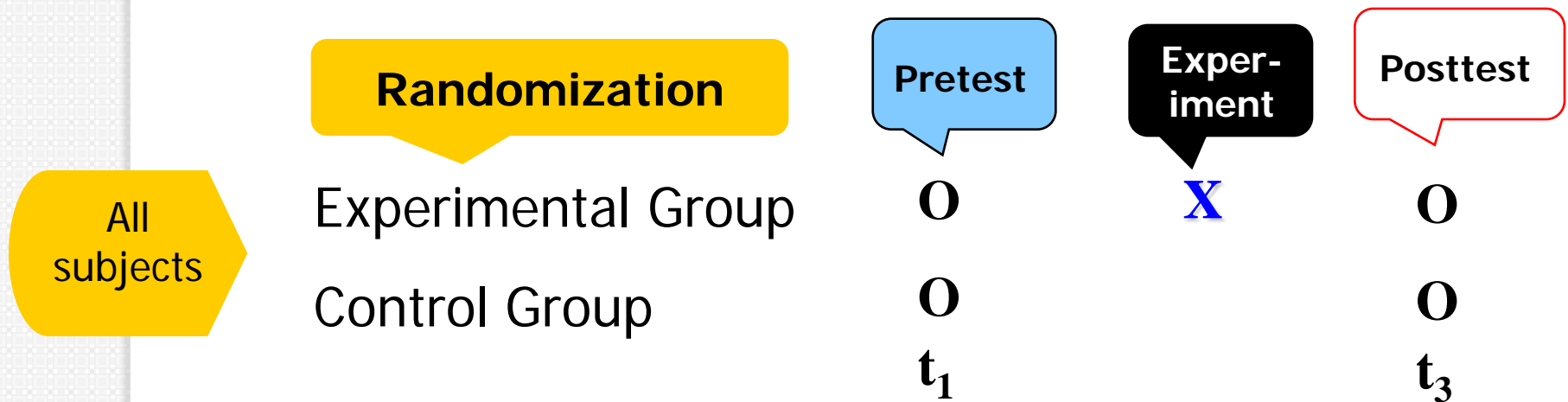
2. Random Assignment

- Makes the comparison group in a true experiment a powerful tool for identifying the effects of the treatment
- How? By providing a good estimate of the counterfactual—the outcome that would have occurred if subjects exposed to the treatment actually had not been exposed



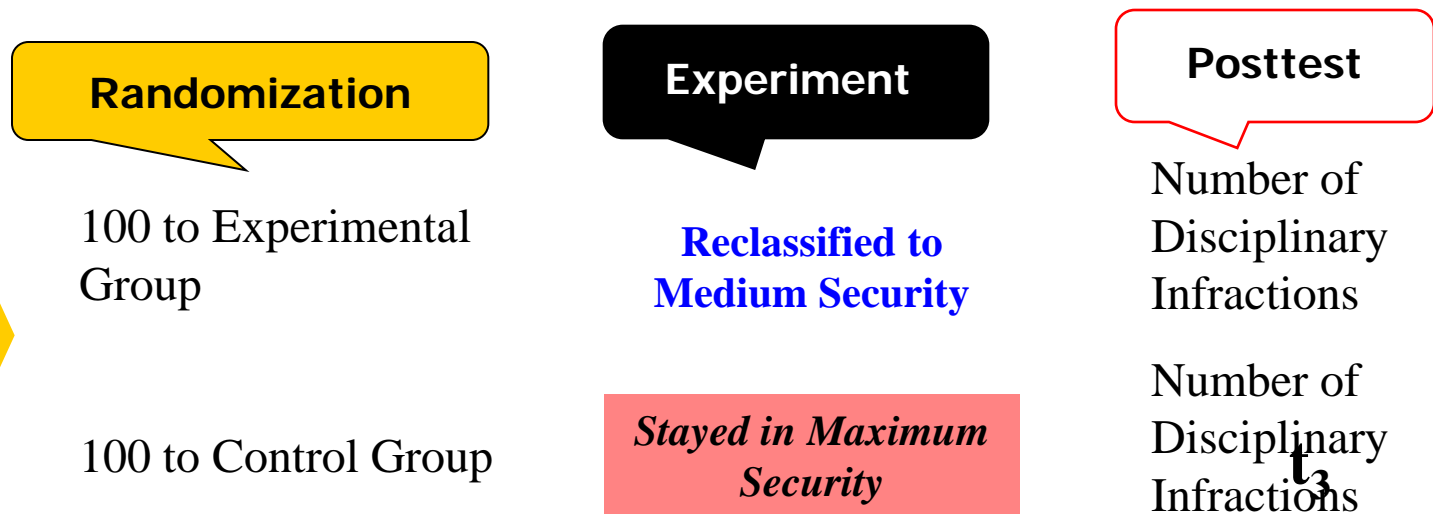
3. Pretest and Posttest

- **Pretest** – measurement of dependent variable prior to experimental intervention
 - Identical to posttest, but administered at different time
- **Posttest** – measurement of outcome (dependent variable) in both groups after experimental group has received treatment

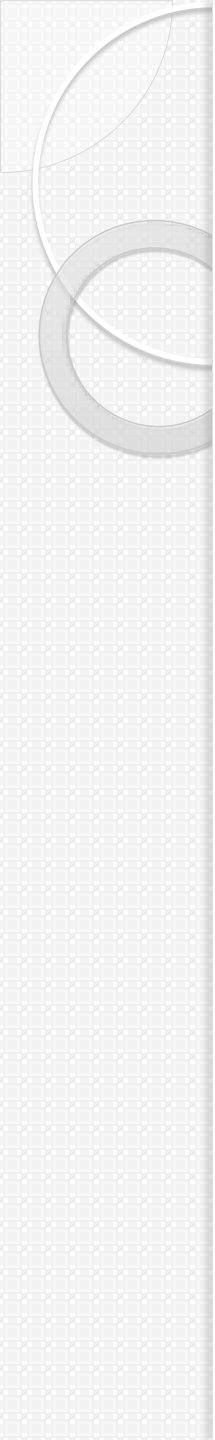


Example: Prison Classification and Inmate Behavior

- Bench & Allen (2003) hypothesized that prisoners classified to medium security will have fewer disciplinary infractions than those classified to maximum security
- Labeling theory → classification to maximum security gives inmates image of being hard to handle, prone to fight, high risk for escape
- Note that experiment had no pretest



Both groups received about same number regardless of security classification



Quasi-Experimental Designs

- *Quasi* – Latin word meaning “resembling” or “having some, but not all of the features of”
- Quasi-experiments do not use random assignment
 - Usually because random assignment is not feasible given topic or population being studied
- Have less explanatory power and more problems with validity (we’ll talk about experimental validity soon)
- Three major types
 - Nonequivalent control group designs
 - Before-and-After designs
 - Ex post facto control group designs

Nonequivalent Groups Designs

- Because control (comparison) and experimental (treatment) groups are not selected through random assignment, they are considered nonequivalent
- Comparison group serves same function as control group
- Comparison group is selected to be as similar as possible to group that receives the experiment

Matching in Quasi-Experiments

- Individual matching
 - Determine a few (3-4 max.) key characteristics *likely to affect the result*
 - Select an individual for experimental/treatment group
 - Select an individual with ‘identical’ set of key characteristics for control/comparison group
- Aggregate matching
 - General characteristics of control group match general characteristics of experimental group on characteristics *that are known to likely affect the result*
- Control group must be “similarly situated” to the experimental group

Before-and-After Designs

- Technically, there is no comparison group. The comparison is “within-group”
- Often used when all people in population receive intervention
 - New law is passed
 - New policy is implemented
- Weakest type of design because cannot draw conclusions about effectiveness of ‘treatment’ from results

Comparing Quasi-Experimental Designs

Non-equivalent Control Groups

Experimental/Treatment Group

Control/Comparison Group

Pretest

Exp/Intv

Posttest

O

X

O

O

O

t₁

t₂

t₃

Before-and-After

Experimental/Treatment Group

No comparison group

O

X

O

t₁

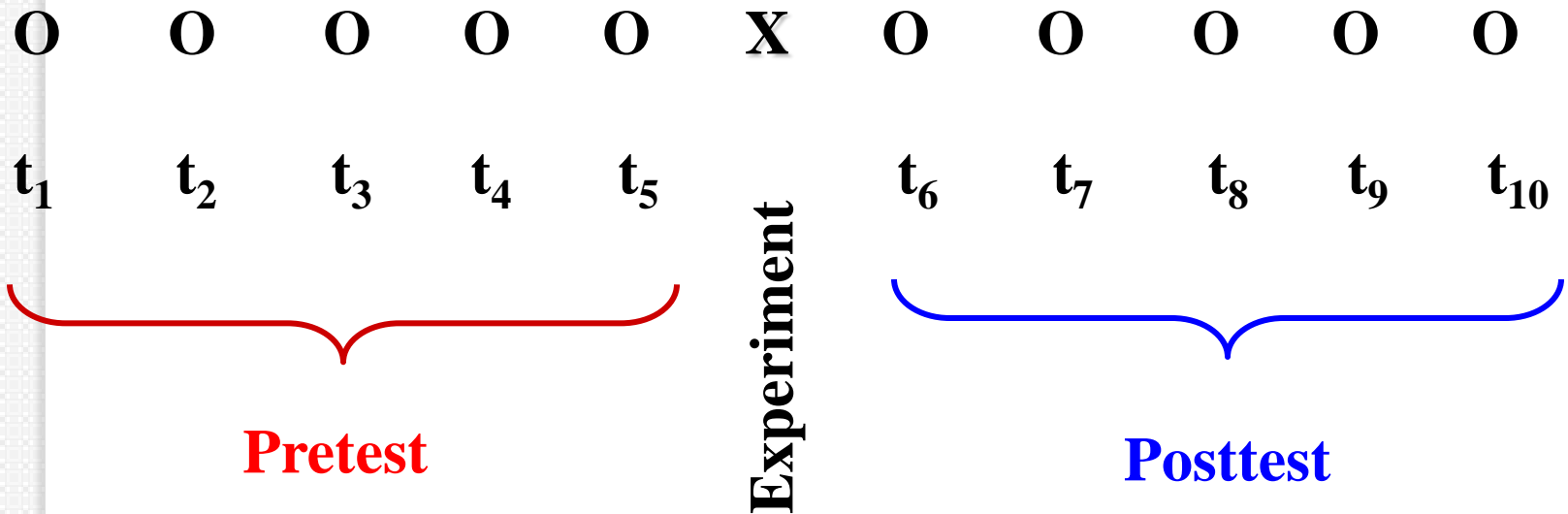
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Time-Series Designs

- Most ‘powerful’ type of Before-and-After design
- Often called “Interrupted Time-Series” design
 - Make before and after measures of some phenomenon
 - Then “interrupt” time by implementing an intervention
- Usually does not have separate comparison group (but may)

Basic Interrupted Time-Series Design Model



Ex Post Facto Control Group Designs

- *Ex post facto* - another Latin term, meaning ‘from what is done afterward’, after the fact, retrospectively, looking back
- Identify treatment and comparison groups after the fact – after results have already occurred
- Not really an experimental design ...
 - ...but often can identify comparison groups that are reasonable

Internal Validity

- Conclusions reflect what actually occurred in the experiment
- Ability to yield valid conclusions is determined by comparability of experimental and control groups
 - This is why random assignment is best: the only difference is the intervention/experiment

Causal (Internal) Validity

- Typically understand validity by examining sources of invalidity (also called ‘threats to validity’)
- Five basic sources of invalidity
 - Selection bias
 - Endogenous change
 - External events (history effects)
 - Contamination
 - Treatment misidentification

I. Selection Bias

- Treatment and comparison groups are different at beginning or end of study
 - Random assignment solves this problem at beginning of study IF it is done properly
 - In the end groups can differ based on differential attrition:
 - if some types of people are more likely to drop out of the study
 - also called experimental mortality

2. Endogenous Change

- Endogenous (internal, within the person)
- Maturation
 - Special problem with juveniles & long-term experiments
- Testing
 - Being involved in experiment & pre/posttest will influence behavior
- Regression (regression towards the mean)
 - Changes in person may affect scores (having a bad day influences test performance)
 - Special problem when people are chosen for study because of a very high or low 'score'
 - Sometimes things just get better on their own, regardless of any intervention

3. External Events

- External events –
 - Also called
 - Exogenous Events
 - History Effect
 - Things happen in environment that changes results of experiment
 - Example: 9-11

4. Contamination

- Experimental and Control groups communicate and Control group gets some of the intervention, or groups otherwise affect each other
 - Also called diffusion
- Can be intentional or unintentional and may result in
 - Compensatory rivalry = control group member works harder to make up for not having the intervention
 - Demoralization = control group member feels left out and becomes worse than they would have been without the study

5. Treatment Misidentification

- Treatment does not cause outcome, but rather the outcome is caused by something that went on during the experiment
- Expectancies of experimental staff
 - Researcher wants study to be success
 - Problem in social programs where success measures can be subjective
 - Double-blind - common in medical research, but difficult in social research
- Two major types
 - Placebo effect - People improve because they think they are getting something that will make them improve
 - Hawthorne effect - People may change because more attention is being paid to them

Generalizability

- Sample generalizability - Are results of experiment generalizable to the population of interest
 - The sample of the population used in the study may not be representative of the population of interest
 - Are Psych 101 students representative of all undergraduates at this university?
 - Are they representative of all undergraduates in colleges and universities throughout the state or nation?
- External validity
 - Do results of experiment hold true in other populations

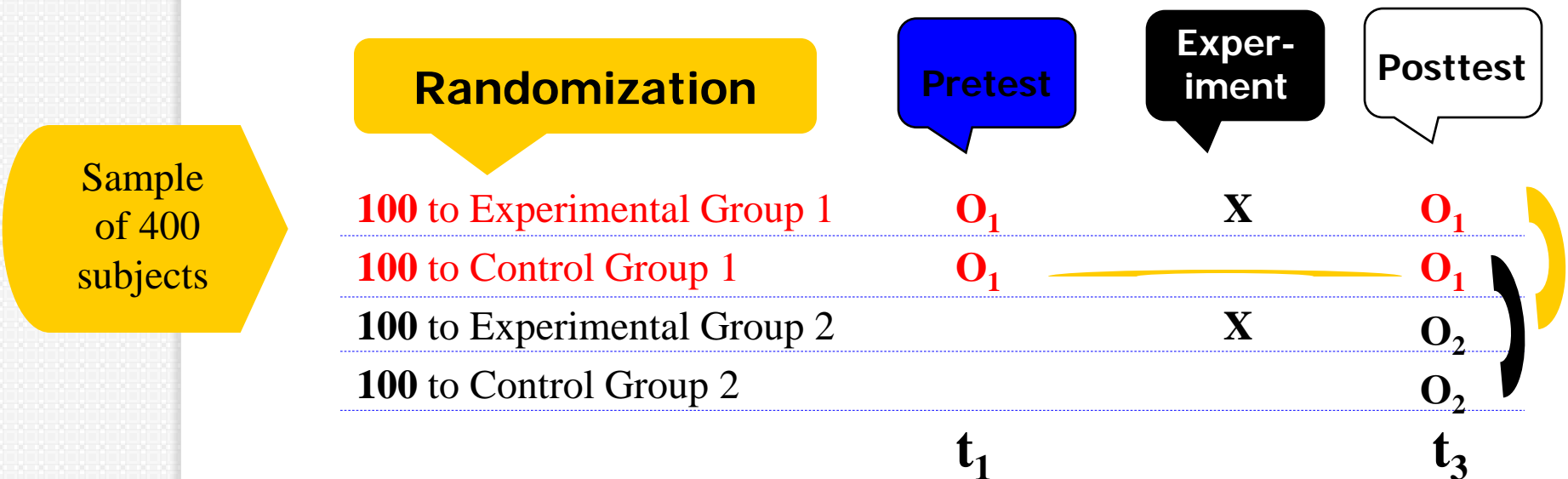


Enhancing Internal Validity

- Factorial Surveys
 - Used to study attitudes and beliefs
 - Uses vignettes on topic of interest
 - Vignettes are randomly distributed across respondents and along characteristics of the vignettes
 - Respondents are then asked for likely responses to vignettes about different hypothetical situations
 - The 'treatment' is the different types of vignettes

Enhancing External Validity

- Interaction of Testing and Treatment
 - Experiment is effective only when conditions created by the experiment occur
 - Often occurs when studying attitudes and subjects become sensitized to issues by their involvement in the study
 - Problem: cannot determine how much change in the dependent variable was due to the experiment, and how much was due to being sensitized by involvement in the study
- Solomon Four-Group Design
 - Assigns subjects to at least 2 experimental groups and at least 2 comparison groups, but not all have both pretest and posttest



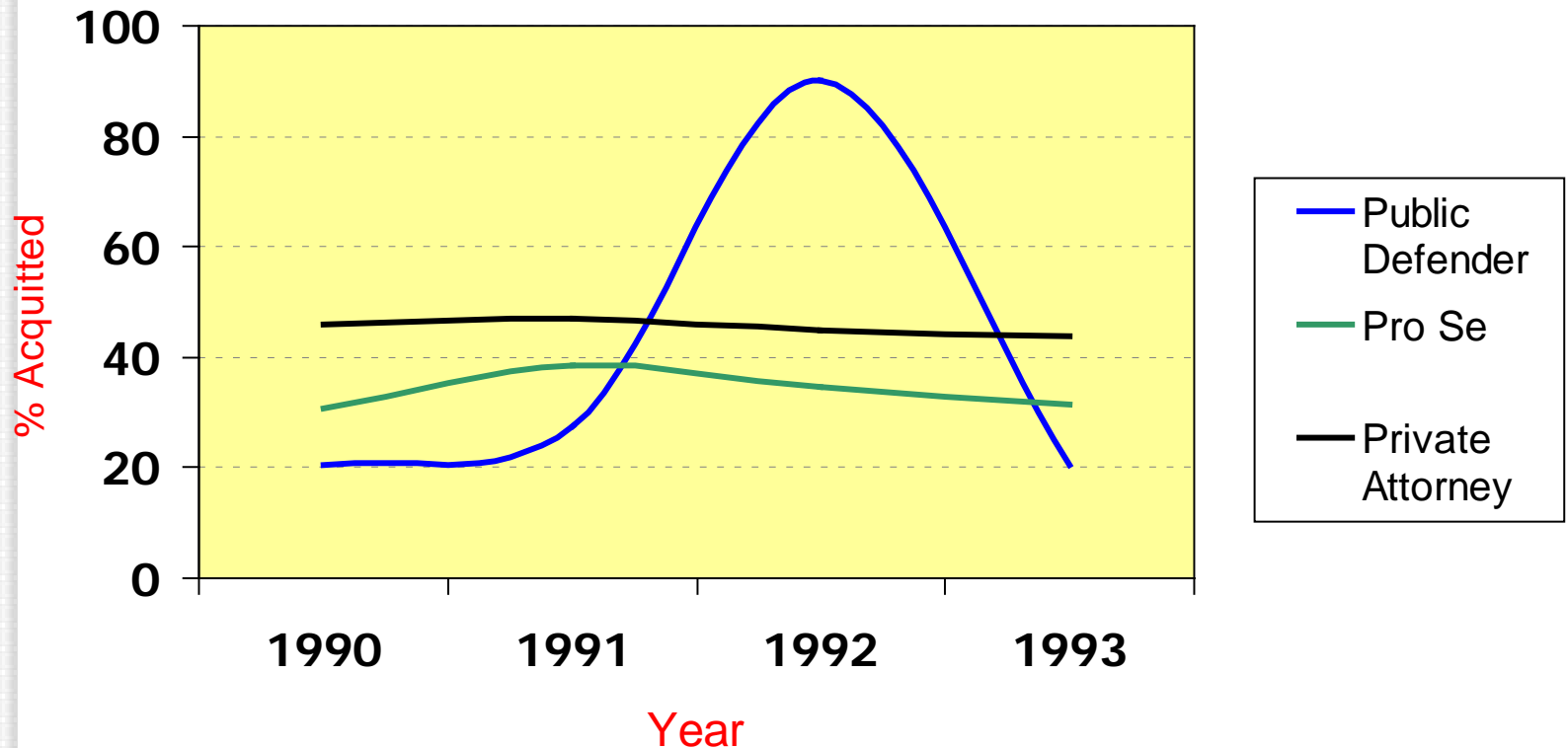


Classical Experiments are Not Common in Criminological Research

- Tradition
 - Criminology and Criminal Justice fields are not based on laboratory science
 - Not part of social science paradigm with strong experimental history
- Due process concerns
- Not amenable to many issues of interest
 - Lack of control over study sample
 - Issues not appropriate to type of measurement required in experiments

What is Longitudinal?

Acquittals by Attorney Type



Repeated Cross-Sectional (Trend) Designs

- Data are collected at 2 or more points in time from a different sample selected from the same population
- Measures general changes in population
 - usually not detailed information
- Produces several snapshots strung together
 - Slideshow
 - Like example on previous slide: acquittal rate for each year

Fixed-Sample Panel Designs

- Study same group of people at several intervals
 - Collect data from sample at time 1
 - Collect data from same people at time 2, etc.
- Very expensive
- Rarely done
 - Expensive
 - Attrition, especially in long studies
 - Subject fatigue (drop out or don't provide valid information)

Event-Based Designs

- Group of individual units who enter or leave defined population during specified time period
 - Common starting point
- Study this group over some period of time
 - Example: College students who all enter a 4-year university at the same time (i.e., freshman who are followed until they graduate)