

PSY 501: More Non-experimental Designs

Week 14

Non-experimental designs

- ▶ Sometimes you just can't perform a fully controlled experiment
 - ▶ Because of the issue of interest
 - ▶ Limited resources (not enough subjects, observations too costly, etc.)
 - ▶ Surveys
 - ▶ Correlational
 - ▶ Quasi-experiments
 - ▶ Developmental designs
 - ▶ Small-*N* designs

Note: non-experimental \neq bad design!

Quasi-experiments

Quasi-experiments

- ▶ What are they?
 - ▶ Almost “true” experiments, but with an inherent **confounding variable**
- ▶ General types
 - ▶ An event occurs that the experimenter does NOT manipulate
 - ▶ e.g., flashbulb memories for traumatic events
 - ▶ Interested in **subject variables**
 - ▶ high vs. low IQ, males vs. females
 - ▶ Time is used as a variable

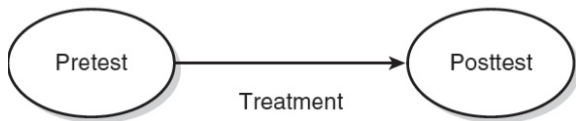
Quasi-experiments

Definition: a **quasi-experiment** is a type of research design where a comparison is made, but **no random assignment** occurs

Pretest-Posttest Designs

A behavior is measured **twice**

- ▶ once before treatment/condition is implemented (pretest)
- ▶ once after treatment/condition is implemented (posttest)

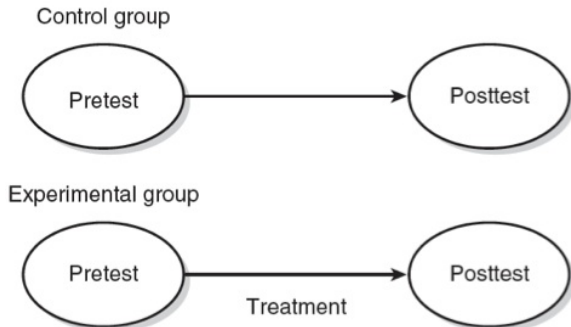


But...

- ▶ **History effects** – events that occur during the course of a study that can result in bias

Pretest-Posttest Designs

Better: Pretest-posttest design with nonequivalent groups



But...

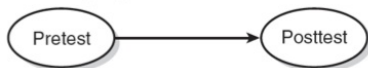
- ▶ **Testing effects** – occur when participants are tested multiple times and each subsequent test is affected by the previous tests.

Pretest-Posttest Designs

Even better: Solomon Four-Group Design

Group Set 1

Control group



Experimental group



Group Set 2

Control group



Experimental group



Method: compare posttest scores across group sets

- ▶ if no differences between Group Set 1 and Group Set 2, then no testing effects have occurred

Quasi-experiments

- ▶ Advantages
 - ▶ Allows **applied research** when experiments not possible
 - ▶ Threats to internal validity can be assessed (usually)
- ▶ Disadvantages
 - ▶ Threats to internal validity still exist
 - ▶ Designs more complex than traditional experiments
 - ▶ Statistical analysis can be difficult
 - ▶ Most stat analyses assume random assignment!

Developmental designs

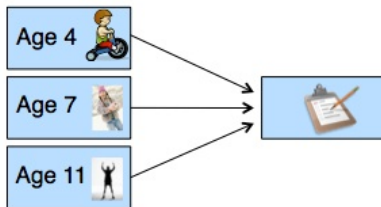
Developmental Designs

- ▶ Used to study changes in behavior that occur as a function of age changes
 - ▶ e.g., age = quasi-independent variable
- ▶ Three major types
 - ▶ Cross-sectional
 - ▶ Longitudinal
 - ▶ Cohort-sequential

Developmental Designs

Cross-sectional design

- ▶ Groups are pre-defined on the basis of a pre-existing variable
- ▶ Study groups of individuals of different ages at the same time
 - ▶ Use age to assign participants to group
 - ▶ Age is treated as **between-subjects** variable



Developmental Designs

Cross-sectional design

- ▶ Advantages
 - ▶ Can gather data about different groups (i.e., ages) **at the same time**
 - ▶ Participants are not required to commit for an extended period of time

Developmental Designs

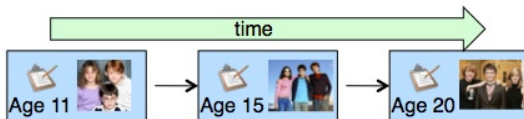
Cross-sectional design

- ▶ Disadvantages
 - ▶ Individuals are **not followed over time**
 - ▶ **Cohort effect**: individuals of different ages may be inherently different due to factors in the environment
 - ▶ Does not reveal **development** of individuals
 - ▶ Cannot infer causality due to lack of control

Developmental Designs

Longitudinal design

- ▶ Follow the same individual or group over time
- ▶ Age is treated as a **within-subject** variable
- ▶ Changes in dependent variable likely to reflect changes **due to aging process**



Developmental Designs

Longitudinal design

- ▶ Advantages
 - ▶ Can see developmental changes clearly
 - ▶ Can measure differences within individuals
 - ▶ Avoid some cohort effects

Developmental Designs

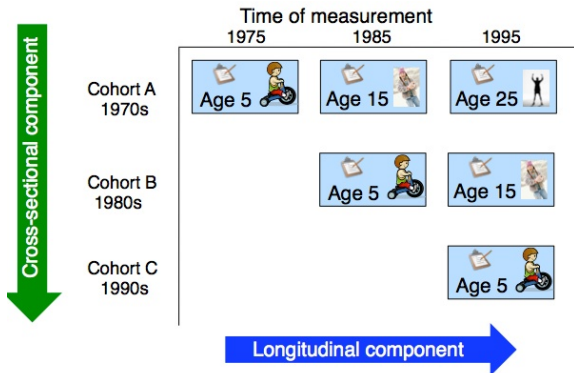
Longitudinal design

- ▶ Disadvantages
 - ▶ Can be very time-consuming
 - ▶ Can have **cross-generational effects**
 - ▶ Conclusions based on members of one generation may not apply to other generations
 - ▶ Numerous threats to internal validity
 - ▶ Attrition/mortality
 - ▶ History
 - ▶ Practice effects
 - ▶ Cannot determine causality

Developmental Designs

Cohort-sequential design

- ▶ Measure groups of participants as they age
- ▶ Combine best parts of cross-sectional and longitudinal designs



Developmental Designs

Cohort-sequential design

- ▶ Advantages
 - ▶ Get more information
 - ▶ Can measure generation effect
 - ▶ Less time-consuming than longitudinal (maybe)
- ▶ Disadvantages
 - ▶ Still time-consuming
 - ▶ Need lots of groups of participants
 - ▶ Still cannot make causal claims!

Small N Designs

Small N Designs

What are they?

- ▶ Historically, these were the typical kind of design used until 1920s when there was a shift to using larger sample sizes
- ▶ Even today, in some areas, using small N designs is common
 - ▶ Psychophysics
 - ▶ Clinical settings
 - ▶ studies in expertise

Small N Designs

- ▶ One or a few participants
- ▶ Data are not analyzed statistically; rather, rely on visual interpretation of data
- ▶ Observations begin in the **absence** of treatment (BASELINE)
- ▶ Once treatment is implemented, changes in frequency/magnitude/intensity of behavior are recorded

Small N Designs

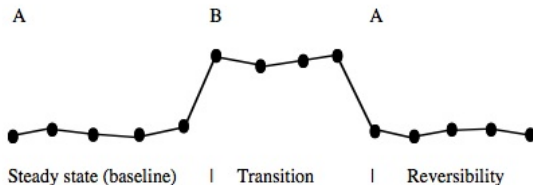
- ▶ Baseline experiments – the basic idea is to show:
 - ▶ when the treatment occurs, you get the effect
 - ▶ when the treatment is removed, you don't get the effect (reversibility)
- ▶ Before introducing treatment, baseline needs to be stable
- ▶ Measure **level** and **trend**

Small N Designs

- ▶ **Level** – how frequent (how intense) is behavior?
 - ▶ Are all the data points high or low?
- ▶ **Trend** – does behavior seem to increase/decrease?
 - ▶ Are data points “flat” or on a slope?

Small N Designs

ABA design (baseline / treatment / baseline)



Reversibility is necessary...otherwise, something else may have caused the effect other than the IV (e.g., history, maturation, etc.)

Small N Designs

- ▶ Advantages

- ▶ Focus on individual performance, not fooled by averaging effects
- ▶ Focus is on **big effects** (small effects typically cannot be seen without using large groups of participants)
- ▶ Great way to study rare types of subjects (amnesiacs, lesions, etc.)

Small N Designs

- ▶ Disadvantages
 - ▶ Some effects are by definition between subjects
 - ▶ Treatment leads to lasting change, so you don't get reversals
 - ▶ Difficult to determine how generalizable the effects really are