Nonexperimental & Quasi-Experimental Strategies

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Nonexperimental & Quasi-Experimental Research Strategies

▶ sometimes it can be impossible to meet the requirements for an experiment
  ▶ when there are confounding variables
▶ nonexperimental studies can minimize threats to internal validity by changing them to become quasi-experimental studies
▶ **nonexperimental research strategies** and **quasi-experimental research strategies** differ by quasi-experiments limiting confounding variables and attempts to control threats to internal validity
  ▶ both compare group differences on your outcome of interest

Nonexperimental & Quasi-Experimental Research Strategies

Nonexperimental & Quasi-Experimental Research Strategies

- groups are usually created that cannot be randomly assigned
  - college graduate vs no college
  - boys vs girls
  - cat owners vs dog owners vs other animal owners
- two methods for defining groups using these methods
  - between-subjects design: nonequivalent group designs
  - within-subjects design: pre-post designs

Examples of Both Methods

- ▶ Nonequivalent Group Designs
  - ▶ compares preexisting groups
    - ▶ differential research designs
    - ▶ posttest-only nonequivalent control group design
    - ▶ pretest-posttest nonequivalent control group design
    - ▶ cross-sectional developmental design

Examples of Both Methods

- ▶ pre-post designs
  - ▶ compares two or more scores for all participants
    - ▶ pretest-posttest design
    - ▶ time-series design
    - ▶ longitudinal developmental design

Between-Subjects: Nonequivalent Group Designs

▶ when you can't randomly separate into groups and you need to make comparisons between groups
  ▶ Book: comparisons in test performance between schools that are comparing students who can use electronic devices vs those that cannot use electronic devices

▶ **nonequivalent group design** is when there is no way you can separate groups using experimental strategies
  ▶ groups are considered nonequivalent because the groups could be different from one another and the researcher cannot control for that
  ▶ How would your study and the expected findings be different if you had two preexisting groups to compare?

Between-Subjects: Nonequivalent Group Designs

▶ Threats to Internal Validity
  ▶ nonequivalent group designs always have threats to internal validity
    ▶ cannot have cause-effect relationship
  ▶ **individual differences** are going to be one of the largest contributors to internal validity threat
    ▶ since we can't use methods to minimize individual differences (randomization, matching, etc.) we have to assume that the groups could already potentially be different from one another
    ▶ there are many confounding variables that could be different, from the book example above, what are some potential confounding variables?

Nonexperimental Designs with Nonequivalent Groups

- **differential research designs** is a nonexperimental design (no manipulation) where you are interested in if there are differences betweeen the groups
  - What is an example of a differential research design, that cannot be an experimental design
    - Book: Comparing children from single-parent households and two-parent households in their self-esteem
  - JP: The book talks about how nonexperiments and correlations are different because nonexperiments split continuous variables into groups, while correlational designs use continuous data

Nonexperimental Designs with Nonequivalent Groups

▶ **nonequivalent control group design** use preexisting groups, where one group is used as a control and the other group is used as a treatment condition
  ▶ Ex: comparing this class to a philosophy class in math knowledge

▶ **posttest-only nonequivalent control group design** also seen as a static group comparison
  ▶ one or more groups gets a treatment, while another group is seen as the control, only one point of gathering data (posttest)
    ▶ no randomization

Quasi-Experimental Design With Nonequivalent Groups

▶ **pretest-posttest nonequivalent control group design** involves gathering data before treatment/control and then after the treatment/control condition
  ▶ allows researchers to have a baseline and can compare groups at baseline to see if the groups are similar
  ▶ accounts for time-related threats to internal validity because both conditions are experiencing the same threats
▶ What is history? How does it affect participants?
▶ **differential effects** are differences between the conditions/groups that could be explained by different histories

Within-Subjects: Pre-Post Designs

▶ **pre-post designs** are slightly different from the pretest-posttest nonequivalent control group designs, because this is a within-subjects design
  ▶ one group of participants are experiencing the same treatment and are being tested before and after the treatment
  ▶ What is missing between the pre-post design and pretest-posttest nonequivalent control group design?

Within-Subjects: Pre-Post Designs

▶ Threats to internal validity for pre-post designs
  ▶ history
  ▶ instrumentation
  ▶ order effects
  ▶ maturation
  ▶ statistical regression

▶ Similar to a within-subjects experimental design, however; it lacks _____ to address the threats to internal validity
  ▶ Why is _____ blank not able to be used in a pre-post design

Within-Subjects: Pre-Post Designs

▶ nonexperimental pre-post design
  ▶ pretest-posttest design is the simplest nonexperimental pre-post design where you recruit a representative sample and test them before your treatment and then after your treatment
  ▶ Ex: examining test scores before and after a pandemic

Within-Subjects: Pre-Post Designs

▶ quasi-experimental pre-post design
  ▶ **time-series design** is a series of observations for each participant before a treatment followed by a series of observations after the treatment
    ▶ Ex: I ask you what your stress level is –> give you a pop quiz worth half your grade and tell you there will be more pop quizzes –> then never give you another pop quiz
    ▶ google trends
  ▶ **interrupted time-series design** is when the treatment is not caused by the researcher
    ▶ Ex: COVID cases as a new variant comes out
    ▶ What could be another interrupted time-series?

Within-Subjects: Pre-Post Designs

▶ All of these tests are useful in examining trends before something happens and seeing how it may affect an outcome over time
  ▶ while there are threats to internal validity, if the data is stable before treatment, you may assume it is fine
▶ possible there may be a trend already that is not contributed by your treatment/manipulation
▶ can also only examine a single participant over time
  ▶ single-case applications of time-series designs called **single-subject designs** or **single case** are the examination of a single participant for a extended period of time
    ▶ it does not have to be an individual, it could be a single entity
 ▶ What are other entities that can be examined over time?

FIGURE 10.5

How Data in a Time-Series Study Might Be Affected by an Outside Event

(a) The event occurs and influences scores before the treatment is introduced.

(b) The event occurs and influences scores after the treatment.

(c) The event and the treatment occur simultaneously, and it is impossible to determine which is influencing the scores.
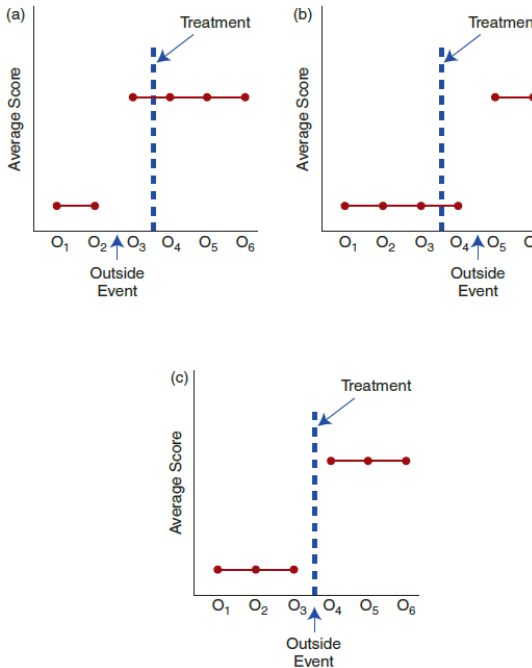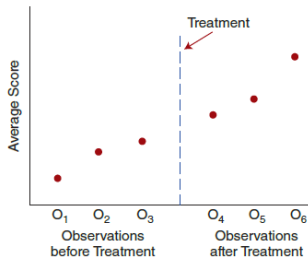
Example

Example

FIGURE 10.6

A Time Series Study with Multiple Observations before and after Treatment

The series of observations makes it possible to see the trend in the data that existed before the treatment was administered and that continues after the treatment.

Developmental Research Designs

▶ **developmental research designs** are used to examine changes in behavior in relation to participants' age

▶ What is a construct that would be useful for examining through a developmental research design?

▶ there are two types of developmental research designs
  ▶ cross sectional (measured once) and longitudinal (measured multiple times)

Developmental Research Designs

▶ **cross-sectional developmental research design** use different groups of individuals, each representing a different age
  ▶ these groups are examined at one time point and then compared
  ▶ What type of design do cross-sectional developmental research designs fall under?
  ▶ JP: cross sectional term is often used in correlational designs where you test a sample once
    ▶ JP: can be expanded on, where you then look at a relationship between IV and DV but separate this relationship by age group
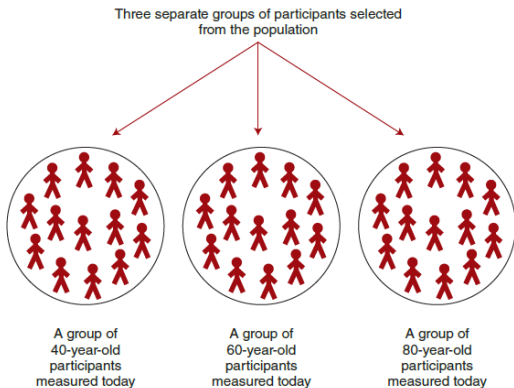
Developmental Research Designs

- strengths & weaknesses
  - strengths include being able to make comparisons between developmental periods
  - data can be collected in short period of time
  - does not require researcher to follow or track participants
  - limited in conclusions that are drawn (can't say for certain these trends/patterns/relationships due to differences in age)
  - **cohorts** are participants that are of the same age (or are grouped together by some characteristic)
  - What is a cohort that you belong to?
  - Age cohorts may experience different situations/issues/benefits
  - What are some things that you face that your parents/grand parents/great-grand parents did not have to face?
  - these environmental differences in age groups are called **cohort effects** or **generation effects**

Example

FIGURE 10.7

The Structure of a Cross-Sectional Developmental Research Design

Three separate groups of participants are selected to represent three different ages.

Three separate groups of participants selected from the population

A group of 40-year-old participants measured today

A group of 60-year-old participants measured today

A group of 80-year-old participants measured today

Longitudinal Developmental Research Design

- **longitudinal developmental research design** are when researchers follow groups/cohorts over an extended period of time
  - Ex: the 1970 British Cohort Study
  - it is a within-subjects nonexperimental design
    - one-group pretest-posttest design where treatment is age
- Book: well-being of a group of adolescents before and after parents' divorce
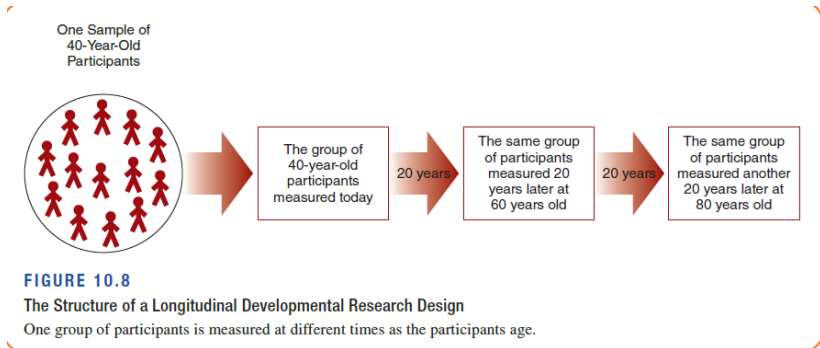 - Is this a time-series question or a longitudinal design?

Longitudinal Developmental Research Design

- strengths & weaknesses
  - accounts for cohort effects
    - same people are not different from themselves
  - more conclusive because researchers can see how a behavior/other construct changes over time
  - expensive
    - need a lot of money to keep people interested for months/years/decades
  - high dropout rates
    - **participant attrition** or **participant mortality**
    - these dropouts may influence how representative your sample is of the given population
  - same participants being tested using the same measures

Longitudinal Developmental Research Design

▶ cross-sectional designs can be somewhat comparable to longitudinal designs by examining cross-sectional relationships for several time points

  ▶ has been referred to as **cross-sectional longitudinal designs**

Example

One Sample of 40-Year-Old Participants

The group of 40-year-old participants measured today

20 years

The same group of participants measured 20 years later at 60 years old

20 years

The same group of participants measured another 20 years later at 80 years old

FIGURE 10.8

The Structure of a Longitudinal Developmental Research Design

One group of participants is measured at different times as the participants age.

Comparing Cross-sectional and Longitudinal Designs

- cross-sectional
- longitudinal

Comparing Cross-sectional and Longitudinal Designs

- ▶ cross-sectional
  - ▶ strengths
    - ▶ time-efficient
    - ▶ no long-term cooperation required
  - ▶ Weaknesses
    - ▶ individual changes not assessed
    - ▶ cohort/generation effects
- ▶ longitudinal
  - ▶ strengths
    - ▶ no cohort effects
    - ▶ assess individual behavior changes
  - ▶ weaknesses
    - ▶ time consuming
    - ▶ attrition
    - ▶ potential for practice effects

Applications, Statistical Analysis & Terminology

- ▶ application & analysis
  - ▶ quasi-experimental and experimental designs tend to use the same statistical analyses
- ▶ comparing means between two groups/conditions
  - ▶ t-test (independent or dependent)
- ▶ multiple groups
  - ▶ ANOVA
- ▶ multiple conditions
  - ▶ repeated-measures ANOVA
- ▶ non-numerical outcome
  - ▶ chi-square (not going to focus on this concept for this class)
- ▶ If you are using a longitudinal study with more than 3 time points then none of these analyses are helpful
  - ▶ these all treat time points (month, year, decade) as categorical variable
    - ▶ comparing time point 1 to time point 2 and time point 3
    - ▶ more appropriate analyses treat time as a continuous variable

Applications, Statistical Analysis & Terminology

▶ pretest-posttest nonequivalent control group design
  ▶ multiple time points and multiple groups
    ▶ mixed-design ANOVA
    ▶ making comparisons between time points
    ▶ making comparisons between groups
    ▶ examining interaction between time points and groups

Applications, Statistical Analysis & Terminology

- **quasi-independent variable** = independent variable
- **dependent variable** = outcome
- time-series analyses compares values before treatment and after treatment