Types of Research Designs

- Experimental
- Quasi Experimental
- Observational

All Hypothesis Testing Designs are Comparative!

All designs can not be understood independent of analysis.

Experimental or Manipulative Designs

- The goal is to avoid systematic error and minimize random error. In other words, maximize the validity of the study.
- Comparison groups: Controls and Treatments
- Controlling for all extraneous factors varying only one factor of interest.
- Random assignment of units to groups; produces homogeneous groupings thus controlling for unknown or unmeasured extraneous effects.
- This is the gold standard of designs.
- It is the only design that allows for an assessment of cause and effect.
- High internal validity, lower external validity.

- Observational or Mensurative Designs

Quasi-Experimental Designs

- Like an experiment but without random assignment of units to comparison groups.
- Creates problems for both the assessment of internal and external validity.

Types of Internal Threats

TABLE 2

Threats to Internal Validity in Quasi-Experimental Designs

History—Change due to unmeasured or unobserved factors

Testing—Change resulting from experience gained by subjects as a consequence of measurement

Instrumentation—Change resulting from varying the way study participants are tested

Regression—When selection of participants are atypical or extreme on a given measure, subsequent measures will become less extreme and there will be regression toward the mean

Mortality—Changes due to participants dropping out of the study

Maturation—Change in study participants over time due to factors unrelated to expected effects

Selection—Observed effects due to nonrandom assignment of members and nonequivalence of groups

Selection by Maturation Interaction—Predisposition of selected group members to grow apart

Ambiguity about Causal Direction—When time-order and causal direction is ambiguous

Diffusion of Treatment—Change due to one group receiving all or a portion of treatment meant for another group

Compensatory Equalization of Treatments—Tendency toward giving all groups the same treatment

Compensatory Rivalry—Participants' perceptions (for example, threats) that affects performance not a part of the treatment

Types of External Threats

TABLE 3

Threats to External Validity

Selection—Problems with generalizing due to the selection process for study subjects (e.g., nonrepresentative)
Setting—Problems with generalizing due to the nature of the study setting (e.g., setting atypical)
History—Problems with generalizing to either the past or the future

Examples of Quasi-Experimental Designs

Quasi-Experimental Designs

One group posttest only design

Design: Pretest observations are made on a single group. The group receives a treatment of some type and posttest observations are made.

Posttest only nonequivalent groups design

Design: Experimental and comparison or control group are determined without random allocation of group members. Experimental group receives treatment while the control group does not. Posttest observations are made and groups are compared.

Pretest/posttest nonequivalent groups design

Design: Experimental and comparison or control group is determined without random allocation of group members. Pretest observations are made on both groups. Experimental group gets the treatment while control group does not. Posttest observations are made and groups are compared.

Interrupted time series design

Design: One experimental group in which a series of observations is made both prior to some treatment and after the treatment.

Other Observational Designs

- Retrospective: Backward in time
- Prospective: Forward in time
- Cross-Sectional: At one point in time
- Least control of extraneous factors
- Difficulty in establishing causality
- Generally, although not always, involves random sampling

Examples of Observational Designs

Observational Designs

Cohort Study

Design: Often referred to as a panel study, this is a longitudinal design where individuals are followed through time. May involve comparison groups subjected to different treatments or exposed to different conditions.

Cross-Sectional Study

Design: Often referred to as a survey study, it generally involves a random sample of a target population. Stratified sampling is often used to ensure adequate sampling of comparison groups. Although study factors are not controlled directly, designs of this type allow for the statistical control of variables during analysis.

Case-Control Study

Design: For some study factor (like an outcome variable), compares a group of cases in which members have some characteristic of interest with one or more groups in which the characteristic of interest is absent. It is assumed that both groups come from the same underlying population. Often, members of the groups are matched on one or more variables.

Static-Group Comparison

Design: A variant of the cross-sectional design in which a treatment group(s) (that is, members exposed to some variable of interest) is compared with a comparison or control group whose members are not exposed to the variable of interest.