EXPERIMENTAL DESIGN

Internal Validity

Asks the question: Did, in fact, the experimental treatments make a difference in this specific instance?

Eight classes of extraneous variables which may produce effects that confound the effect of the experimental variable if not controlled by the experimental design are:

1. **History - the specific events occurring between the first and second measurement in addition to the experimental variable**
2. **Maturation - processes within respondents or objects operating as a function of the passage of time *per se* (not specific to the particular event)**
3. **Testing - the effect of testing upon the scores or measures of a second testing**
4. **Instrumentation - changes in the calibration of a measuring instrument or changes in the observers may produce changes in the obtained measurements**

EXPERIMENTAL DESIGN

Internal Validity

5. **Statistical Regression - operates where groups have been selected on the basis of their extreme measures**

6. **Selection - biases resulting from differential selection of respondents or objects for comparison groups**

7. **Experimental Mortality - differential loss of respondents or objects from the comparison groups**

8. **Interaction Effects - results attributed to the experimental variable may be confounded by interaction with unidentified or uncontrolled variables**

EXPERIMENTAL DESIGN

External Validity

Asks the question: To what populations, settings, treatment variables, and measurement variables can the effect(s) be generalized?

Four classes of jeopardizing factors are:

1. **Reactive or Interaction Effect of Testing - an initial measurement (pretest) might increase or decrease the respondent's or object's sensitivity or responsiveness to the experimental variable and thus make the results obtained for a pretested population unrepresentative of the effects of the experimental variable for an unpretested population**

2. **Interaction Effects of Selection Biases and the Experimental Variable(s)**

3. **Reactive Effects of Experimental Arrangements - would preclude generalization about the effect of the experimental variable upon respondents or objects being exposed to it in nonexperimental settings**

4. **Multiple-Treatment Interference - may occur whenever multiple treatments are applied to the same respondents or objects, because the effects of prior treatments may not be erasable**

SOME GENERALIZED TYPES OF EXPERIMENTAL DESIGNS

One-Shot Case Study:

treatment	posttest
X	T2

There are no ways to determine either internal or external validity

One-Group Pretest-Posttest:

pretest	treatment	posttest
T1	X	T2

Primary sources of invalidity include: Internal - History, Maturation, Testing, Instrumentation, and Interactions; External - Several types of interactions

Randomized Control-Group Pretest-Posttest:

group	pretest	treatment	posttest
experimental	T1	X	T2
control	T1		T2

There are no internal sources of invalidity; Primary source of external validity is Interaction of Testing and Treatment

SOME GENERALIZED TYPES OF EXPERIMENTAL DESIGNS

Randomized Solomon Four-Group Design:

group	pretest	treatment	posttest
pretested experimental	T1	X	T2
pretested control	T1		T2
unpretested experimental		X	T2
unpretested control			T2

There are no internal (except possibly Mortality), nor obvious external, sources of invalidity.

Randomized Control-Group Posttest Only Design:

group	pretest	treatment	posttest
experimental		X	T2
control			T2

Given appropriate controls on the experiment itself, this design can be validated reasonably well.

One-Group Time Series Design:

pretest	treatment	posttest
T1 T2 T3 T4	X	T5 T6 T7 T8

Primary sources of invalidity include: Internal - History; External - Interaction of Testing and Treatment

DESIGN OF EXPERIMENTS

- A key objective of what is classically referred to as Design of Experiments (DOE) is the design of an experiment in such a way as to eliminate, or "control for," as many sources of extraneous variability as possible and/or needed

- This process of elimination is referred to as *blocking*

- In order to accomplish blocking, the same random experiment is repeated in *blocks* in which known sources of variability are held fixed in each block, but vary from block to block