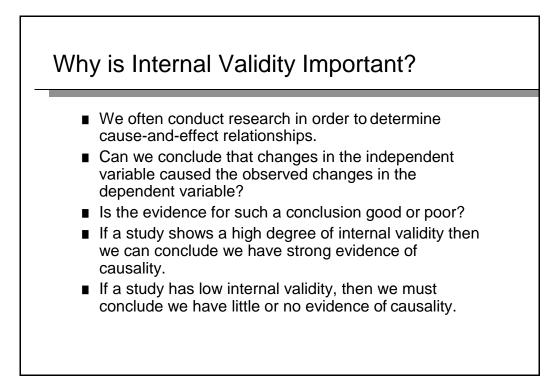
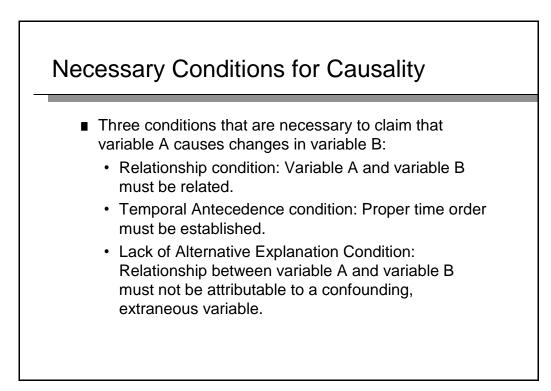


- Is the investigator's conclusion correct?
- Are the changes in the independent variable indeed responsible for the observed variation in the dependent variable?
- Might the variation in the dependent variable be attributable to other causes?



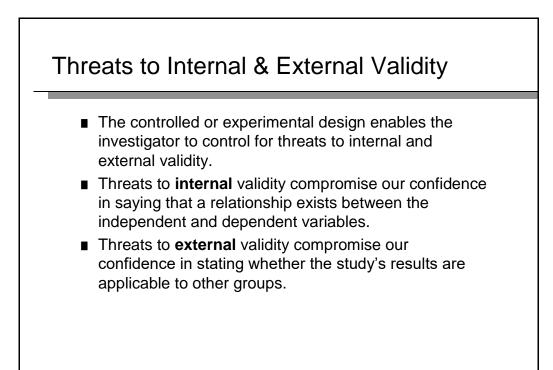


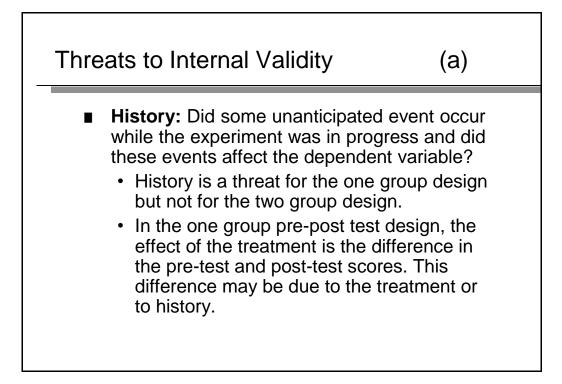
- Extraneous variables are variables that may compete with the independent variable in explaining the outcome of a study.
- A confounding variable is an extraneous variable that does indeed influence the dependent variable.
- A confounding variable systematically varies or influences the independent variable and also influences the dependent variable.
- Researchers must always worry about extraneous variables when they make conclusions about cause and effect.

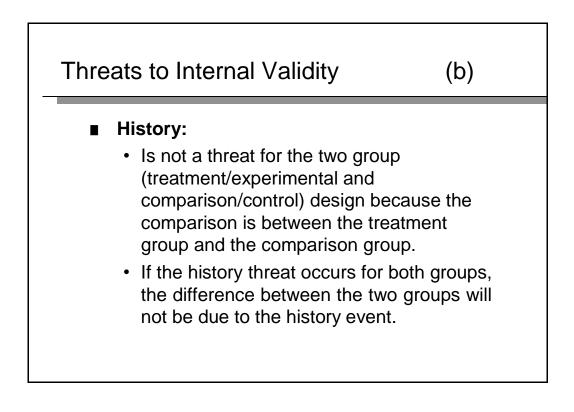


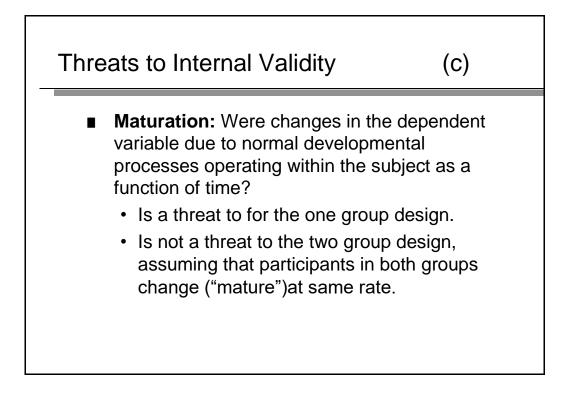
Example: Necessary Conditions for Causality

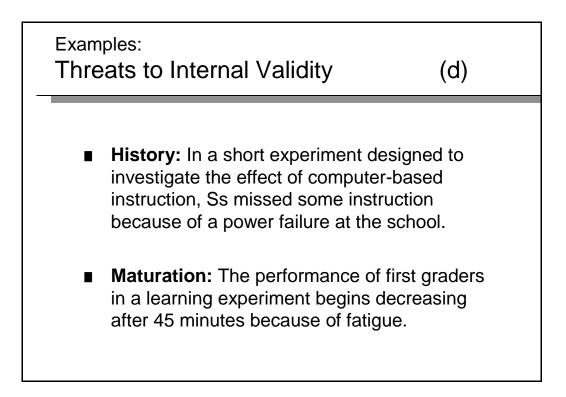
- A correlation (aka, relationship) exists between coffee drinking and the likelihood of having a heart attack.
- Are we justified in concluding that coffee drinking causes heart attacks?
- Cigarette smoking is related to both of these variables. Individuals who drink little coffee are less likely to smoke cigarettes than are people who drink a lot of coffee.
- The observed relationship between coffee drinking and heart attacks might be the result of the third variable of smoking.
- A researcher must control the effect of smoking in order to determine if this rival explanation accounts for the original relationship.

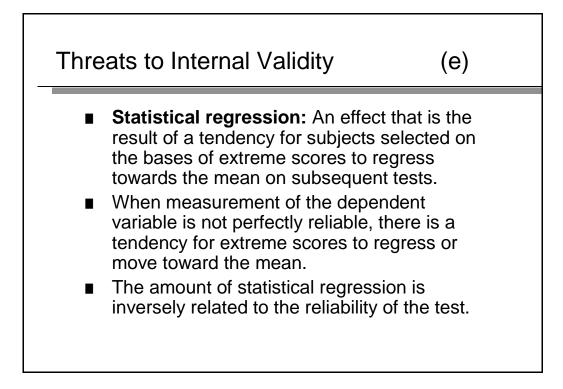


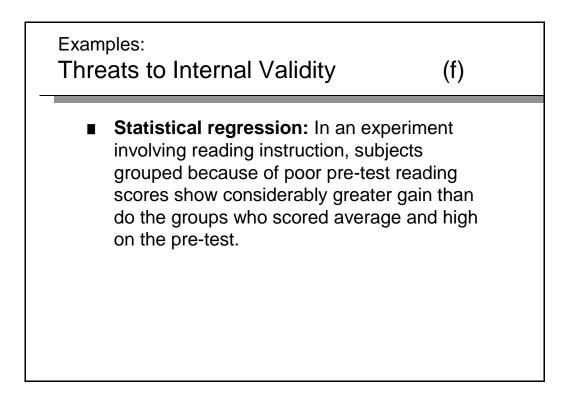


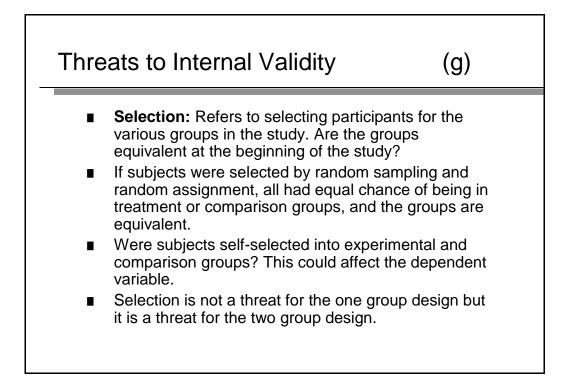


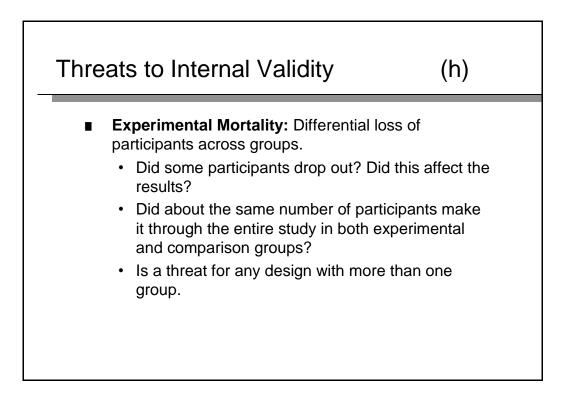


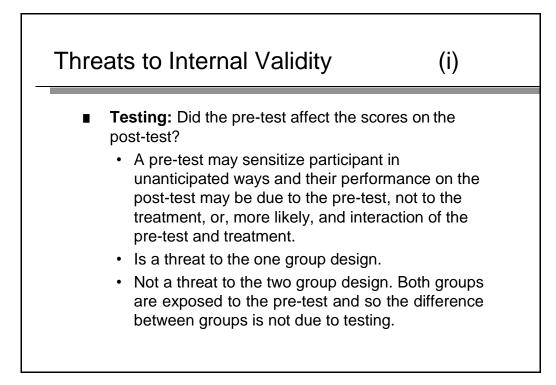


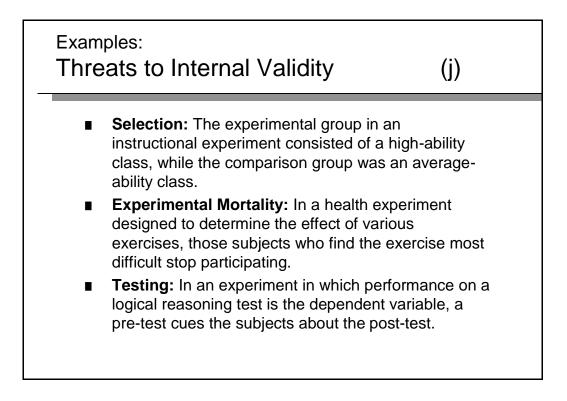


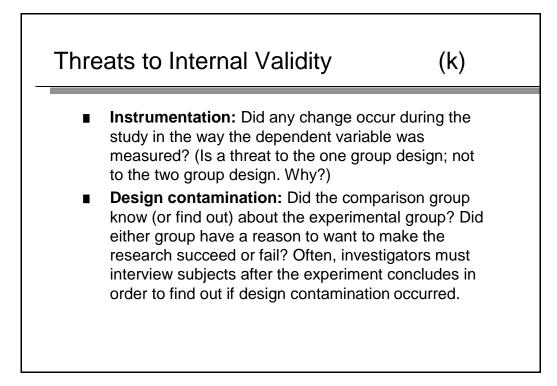


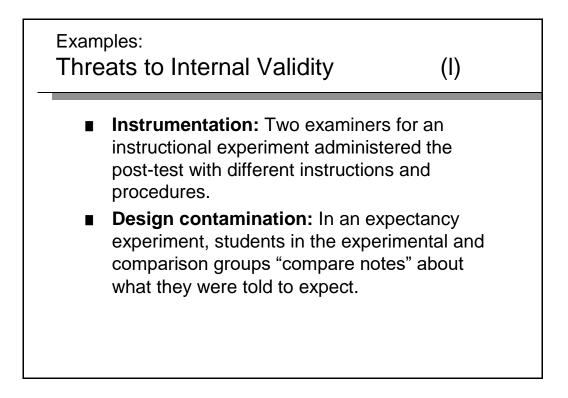


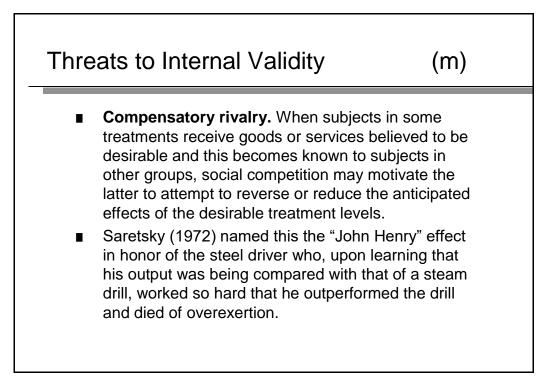


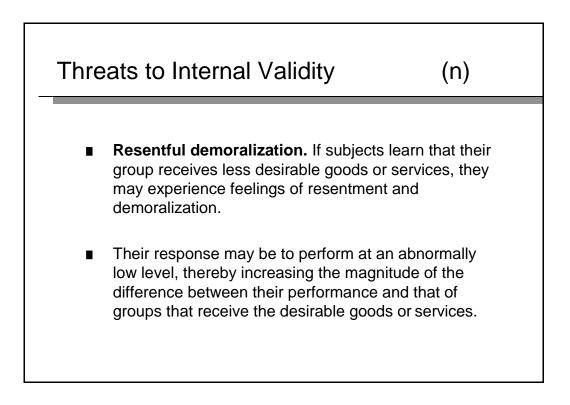












External Validity

- External validity refers to the degree to which the results of an empirical investigation can be generalized to and across individuals, settings, and times.
- External validity can be divided into
 - · Population validity
 - · Ecological validity

External Validity

Population validity:

How representative is the sample of the population? The more representative, the more confident we can be in generalizing from the sample to the population.

• How widely does the finding apply? Generalizing across populations occurs when a particular research finding works across many different kinds of people, even those not represented in the sample.

External Validity

- Ecological validity is present to the degree that a result generalizes across settings. Types include:
 - · Interaction effect of testing
 - Interaction effects of selection biases and experimental treatment
 - · Reactive effects of experimental arrangements
 - Multiple-treatment interference
 - Experimenter effects

