Lecture 4: Experiments

Four Principles of Experiment Design

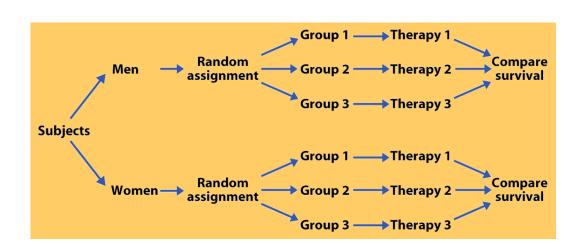
1. Control



2. Randomize

3. Replicate

4. Block



Practice: A study is designed to test the effect of light level and noise level on exam performance of students. The researcher also believes that light and noise levels might have different effects on males and females, so wants to make sure both genders are equally represented in each group. Which of the options below is correct?

- (A) There are 3 explanatory variables (light, noise, gender) and 1 response variable (exam performance)
- (B) There are 2 explanatory variables (light and noise), 1 blocking variable (gender), and 1 response variable (exam performance)
- (C) There is 1 explanatory variable (gender) and 3 response variables (light, noise, exam performance)
- (D) There are 2 blocking variables (light and noise), 1 explanatory variable (gender), and 1 response variable (exam performance)

More Experiment Design Terminology: Eliminating Bias

- Placebo
- Placebo Effect
- Blinding
- Double-Blind

Experiments vs. Observational Studies: A Comparison

			most
ideal	Random	No random	observational
experiment	assignment	assignment	studies
Random sampling	Causal conclusion, generalized to the whole population.	No causal conclusion, correlation statement generalized to the whole population.	Generalizability
No random sampling	Causal conclusion, only for the sample.	No causal conclusion, correlation statement only for the sample.	No generalizability
most experiments	Causation	Correlation	bad observational
			studies

More practice: Choose the option(s) below that describe differences between observational studies and experiments.

- (A) Experiments take place in a lab while observational studies do not need to.
- (B) In an observational study we only look at what happened in the past.
- (C) Experiments use random assignment while observational studies do not.
- (D) Observational studies are completely useless since no causal inference can be made based on their findings.
- (E) Experiments involve active intervention/treatment, while observational studies are passive.