

Topic 3: Experiments

Four Principles of Experiment Design

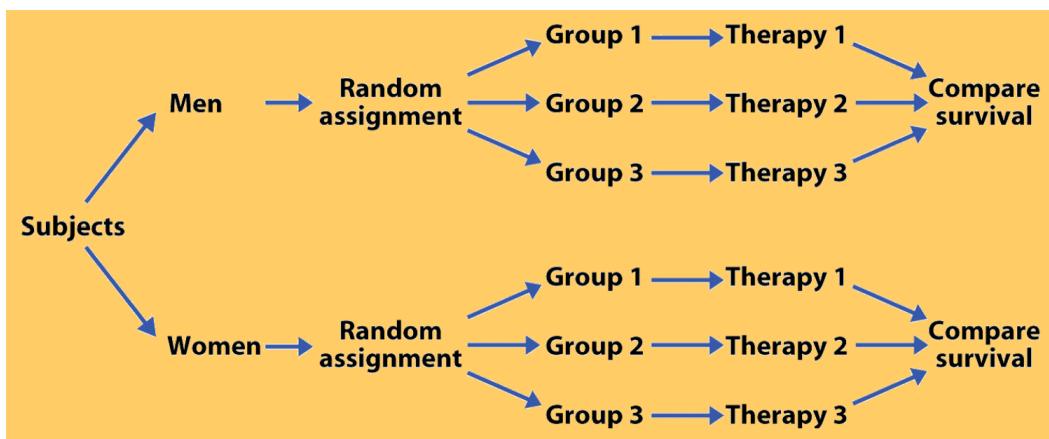
1. Control



2. Randomize

3. Replicate

4. Block



Practice: A study is designed to test the effect of light level and air quality on the growth rate of corn. The researcher also believes that light level and air quality might have different effects on corn grown in soil with different acidity levels, so wants to make sure varying soil acidity levels are equally represented in each group. Which of the options below is correct?

- (A) There are 3 explanatory variables (light, air, soil) and 1 response variable (corn growth)
- (B) There are 2 explanatory variables (light and air), 1 blocking variable (soil), and 1 response variable (corn growth)
- (C) There is 1 explanatory variable (soil) and 3 response variables (light, air, corn growth)
- (D) There are 2 blocking variables (light and air), 1 explanatory variable (soil), and 1 response variable (corn growth)

More Experiment Design Terminology: Eliminating Bias

- Placebo

- Placebo Effect

- Blinding

- Double-Blind

Experiments vs. Observational Studies: A Comparison

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

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.