Threats to Internal Validity

(Shadish, Cook, & Campbell, 2002)

1. *Ambiguous temporal precedence*. Based on the design, unable to determine with certainty which variable occurred first or which variable caused the other. Thus, unable to conclude with certainty cause-effect relationship. Correlation of two variables does not prove causation.
2. *Selection.* The procedures for selecting participants (e.g., self-selection or researcher sampling and assignment procedures) result in systematic differences across conditions (e.g., experimental-control). Thus, unable to conclude with certainty that the "intervention" caused the effect; could be due to way in which participants are selected.
3. *History.* Other events occur during the course of treatment that can interfere with treatment effects and could account for outcomes. Thus, unable to conclude with certainty that the "intervention" caused the effect; could be due to some other event to which the participants were exposed.
4. *Maturation*. Natural changes that participants experience (e.g., grow older, get tired) during the course of the intervention could account for the outcomes. Thus, unable to conclude with certainty that the "intervention" caused the effect; could be due to the natural change/maturation of the participants.
5. *Regression artifacts*. Participants who are at extreme ends of the measure (score higher or lower than average) are likely to "regress" toward the mean (scores get lower or higher, respectively) on other measures or retest on same measure. Thus, regression can be confused with treatment effect.
6. *Attrition* (mortality). Refers to dropout or failure to complete the treatment/study activities. If differential dropout across groups (e.g., experimental-control) occurs, could confound the results. Thus, effects may be due to dropout rather than treatment.
7. *Testing.* Experience with test/measure influences scores on retest. For example, familiarity with testing procedures, practice effects, or reactivity can influence subsequent performance on the same test.
8. *Instrumentation.* The measure changes over time (e.g., from pretest to posttest), thus making it difficult to determine if effects or outcomes are due to instrument vs. treatment. For example, observers change definitions of behaviors they are tracking, or the researcher alters administration of test items from pretest to posttest.
9. *Additive and interactive effects of threats to validity.* Single threats interact, such that the occurrence of multiple threats has an additive effect. For example, selection can interact with history, maturation, or instrumentation.

Reference

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton-Mifflin.