

2.4: Threats to Validity

To understand the pros and cons of various designs and to be able to better judge specific designs, we identify specific **threats to internal and external validity**. Before we do so, it is important to note that a (perhaps the) primary challenge to establishing internal validity in the social sciences is the fact that most of the phenomena we care about have multiple causes and are often a result of some complex set of interactions. For example, X may be only a partial cause of Y or X may cause Y, but only when Z is present. Multiple causation and interactive effects make it very difficult to demonstrate causality, both internally and externally. Turning now to more specific threats, Table 2.1 identifies common threats to internal validity and Table 2.2 identifies common threats to external validity.

Figure 2.4.1: Common Threats to Internal Validity

Threat	
History	Any event that occurs while the experiment is in progress might be an alternation; using a control group mitigates this concern.
Maturation	Normal changes over time (e.g., fatigue or aging) might affect the dependent variable; using a control group mitigates this concern
Selection Bias	If randomization is not used to assign participants, the groups may not be equivalent
Experimental Mortality	If groups lost participants (e.g., due to dropping out of the experiment) they may not be equivalent.
Testing	A pre-test may confound the influence of the experimental treatment; using a control group mitigates this concern
Instrumentation	Changes or difference in the process of measurements might alternatively account for differences
Statistical Regression	The natural tendency for extreme scores to regress or move towards the mean

Figure 2.4.2: Common Threats to External Validity

Threat	
Testing	Pre-testing or multiple measures may influence subsequent measurement
Interaction with Testing	A pre-test may sensitize subjects to the effects of the experimental treatment
Sample Representation	An unrepresentative sample will limit the ability to draw inferences about the population
Interaction of Selection Bias and Experimental Treatment	A bias in selection may produce subjects that are more or less sensitive to the experimental treatment
Experimental Setting	The finding may not be transferable to a natural setting; knowledge of participation may produce a Hawthorne effect

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