



Polit and Beck Chapter 9

Enhancing Rigor in Quantitative Research

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Threats (challenges) to research



Key Research Challenges

- Designing studies to support **inferences** that are:
 - ✓ **Reliable** and **valid** (quantitative studies)
 - ✓ **Trustworthy** (qualitative studies)




Criteria for Evaluating Quantitative Research

- **Reliability**

- ✓ The accuracy and consistency of obtained information

- **Validity**

- ✓ The soundness of the evidence—whether findings are convincing, are well-grounded, and support the desired inferences



Characteristics of Good Quantitative Research Design

- **Statistical conclusion validity:** the ability to detect true relationships statistically
- **Internal validity:** the extent to which it can be inferred that the independent variable caused or influenced the dependent variable هل النتائج حقيقية؟
- **External validity:** the generalizability of the observed relationships across samples, settings, or time
- **Construct validity:** the degree to which key constructs are adequately captured in the study



Content Validity

- The degree to which an instrument has an appropriate sample of items for the construct being measured
- Content validity is relevant for affective and cognitive measures
- Key issues:
 - ✓ 1. Individual items are **relevant and appropriate** in terms of the construct
 - ✓ 2. Whether the items are **adequately** measure all dimension of the construct
- Evaluated by expert evaluation, often via a quantitative measure the **content validity index (CVI)**



Construct validity

- The **adequacy** of measuring key constructs
- Concerned with the questions:
 - ✓ What is this instrument really measuring?
 - ✓ Does it adequately measure the construct of interest?



Threats to Construct Validity

- Is the intervention a good representation of the underlying construct?
- Is it the intervention or awareness of the intervention that resulted in benefits?
- Does the dependent variable really measure the intended constructs?



Reliability

- The ability of a measurement tool to yield **consistent results** over time or under similar conditions
- Error
 - ✓ **Random error:** unknown and unpredictable
 - ✓ **Systematic error:** usually come from the measuring instruments



Threats to Internal Validity



Threats to Internal Validity

- **History threat**

- ✓ Occurrence of external events that take place concurrently with the independent variable that can affect the dependent variables

- **Selection threat**

- ✓ Preexisting differences between groups
- ✓ (interaction with other biases e.g history)

- **Maturation threat**

- ✓ Refers to process occurring within subjects during the course of the study as a result of the passage of time rather than as a result of a treatment or independent variables
- ✓ (e.g Ageing, development as well as wound healing, post operative recovery)



Threats to Internal Validity-cont'd

- **Testing**

- ✓ Refers to the effect of taking a pretest on subjects' performance on a posttest.
- ✓ Testing problems (not a major concern in biophysiologic data)

- **Instrumentation**

- ✓ This bias reflect changes in measuring instrument or methods of measurement between two points of data collection.

- **Mortality threat**

- ✓ Often a result of differential **attrition** from groups being compared
- ✓ 20% ???



Threats to External Validity



External Validity

- Relates to the extent to which findings can generalize beyond the actual study participants
- “How valid are these results for a different group of people, a different setting, or other conditions of testing, etc.?”



Threats to External Validity

- Concerns inferences about the extent to which relationships observed in a study hold true for different people, conditions, and settings
- Generalized
- Inadequate sampling of study participants
- Unfortunately, enhancing internal validity can sometimes have adverse effects on external validity



Threats to External Validity (cont.)

- Expectancy effect (Hawthorne effect)
- Novelty effect: Alteration of behavior because of new treatment



Threats to Statistical Conclusion Validity

- Low statistical power (e.g., sample too small)
- Weakly defined “cause”: independent variable not powerful



Threats to Statistical Conclusion Validity-con'd

- **Unreliable implementation of a treatment**
 - ✓ Lack of standardization of intervention/treatment (affect variability)
 - ✓ Lack of monitoring
- (protocols, treatment, need enough training and monitoring of personnel to ensure implementation of intervention as planned)



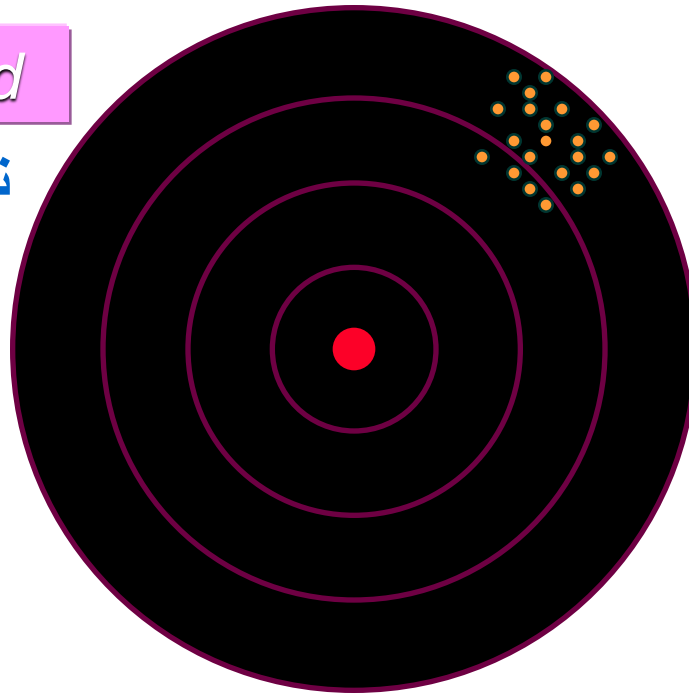
Achieving Study Validity

- When there is a conflict between internal and external validity, it is often preferable to opt for stronger internal validity.
- Whenever compromise is necessary repetition of the study is critical.

Reliability and Validity

Reliable but not valid

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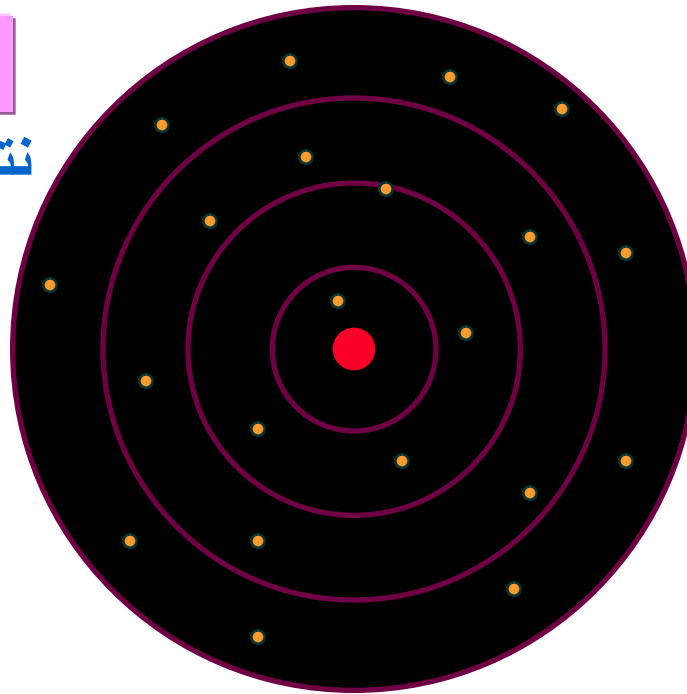


When measurements are consistent (clustered), but they don't hit the target they are reliable but not valid.

Reliability and Validity

Valid but not reliable

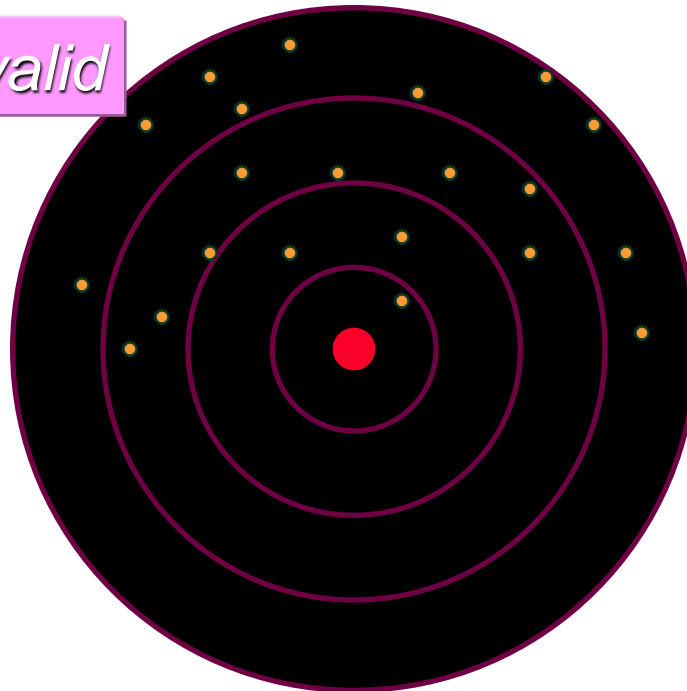
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When measures are scattered widely around the target but they are not tightly clustered they valid, but not reliable. This wide spread indicates that the indicators are not focused on the core concepts.

Reliability and Validity

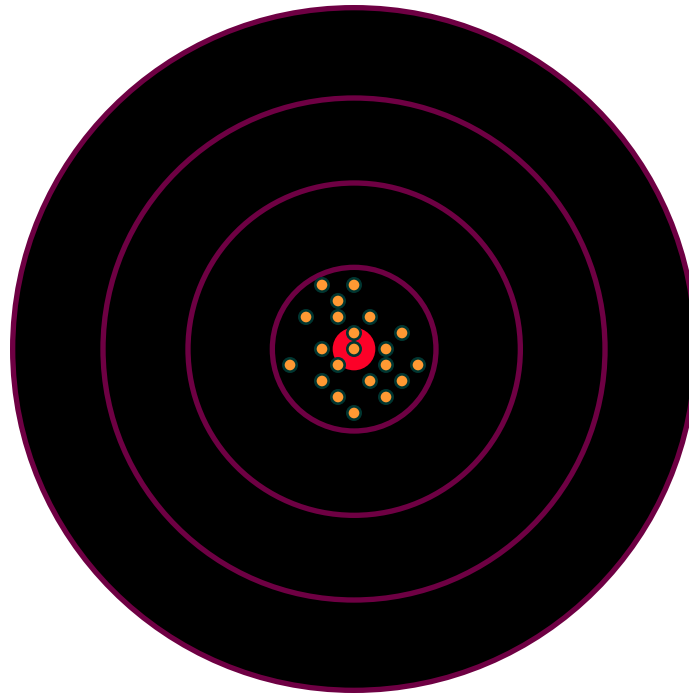
Neither reliable nor valid



When measures are scattered but not focused around a core concept they are neither valid nor reliable. This missing the target without clustering indicates that the entire tool needs to be rethought.

Reliability and Validity

Reliable and valid



The measurements are consistent and tightly focused around the core concept. This indicates that the tool is a solid measure of the concept.



Enhancing Rigor in Qualitative Research



Evaluative Criteria in Qualitative Studies

- **Trustworthiness** الثقة
 - ✓ The overall integrity of the study's evidence



Dimensions of Trustworthiness

- ✓ **Credibility** مصداقية: confidence in the 'truth' of the findings
- ✓ **Confirmability**: a degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest.

Dimensions of Trustworthiness (cont.)

- ✓ **Dependability** **جدارة** : showing that the findings are consistent and could be repeated
- ✓ **Transferability**: showing that the findings have applicability in other contexts **امكانية نقلها**
- The extent to which qualitative findings can be transferred to other settings
- Measures External Validity



Triangulation

- **Triangulation** is the use of multiple sources or referents to draw conclusions about what constitutes the truth
 - ✓ Triangulation can contribute to **credibility**
 - ✓ Triangulation is a useful strategy in both qualitative and quantitative research.



End