Week 3 Lecture - Claims & Validity

Undergraduate Research Methods in Psychology

Quinton Quagliano, M.S., C.S.P

Department of Psychology

Table of Contents

1 Overview

1.1 Lesson Overview

- Up until now, we have mostly focused on the more _____ and philosophical parts of why we conduct research
- Now, we are going to start to put more _____ names to the many moving parts of a study
- This is going to include talking about variables, claims, and validities - topics which are going to _____ over the remainder of the semester.

2 Variables

2.1 Definition

- Some _____ that can vary, with at least 2 levels/values
  - Contrast this with a _____, which does not vary at all
- Variables are important in both the _____ and the data stages of the theory-hypothesis-data cycle
- Variables (and their definitions within the context of the study) are core, critical parts of a _____ - and will play an important role in the validity of the results

2.2 Scales of Measurement

Likely a review from statistics course

- Every variable has some _____ of how it is measured:
- **Interval/Ratio/Continuous:** A variable has _____, known distances between each level/value, arranged in *known* order.
  - Example: Age, height in centimeters, point score on test.
- **Ordinal:** A variable has _____ distances between each level/value, arranged in a *known* order.
  - Example: Place in a foot race, Class rank
- **Categorical/Discrete:** A variable's levels/values are entirely _____ from one another, arbitrary (no) arrangement of order
  - Example: Experimental group vs. Control group

2.3 Measured vs. Manipulated Variables

- **Measured/Observed Variable:** a measurement of something that is not _____ or *directly* caused by the experimenter (but may be the result of something an experimenter did).
  - Often, due to ethical or _____ constraints, or simply because it is simply impossible to directly change
  - Example: SAT score, hair color, class enrollment
- **Manipulated/Experimental Variable:** a measurement of something that is directly _____ by an experimenter
  - Example: putting an individual in an intervention or control group.
- Some variables *can* be _____, depending on the setup of the study.

2.4 Constructs to Operational Variables

- **Construct/Conceptual/Latent Variables:** Abstract variables usually representing some _____ or notion that cannot be explicitly and directly measured
  - However, these usually *are* the concepts we actually care to draw _____ on.
  - Example: Depression, Academic achievement/aptitude
- **Operational/Measured Variables:** Concrete variables as measured through some _____ or sense
  - This is what we can directly _____ in the study
  - Example: PHQ-9, test score
- In most research, we _____ the construct to some direct measurement tool. However, the focus of our conclusions is *not* the measured variable, but rather, the _____ that it purports to measure.
  - Example: when I assign a test, do I care *only* about the plain number of items correct a student has? NO! I care about the content mastery that the items are representative of.
- Generally, when we talk about theories, we are trying to discuss _____; and when we are talking about study-specific hypotheses, we discuss _____ variables.
- Side note: The gap between operational to latent variables is an extremely important area that deals with _____ validity, which is different from the validity we will be discussing shortly. This area of study deals with Measurement and Test Theories, as well as psychometrics (my favorite).

3 The 3 Types of Claims

3.1 Definition

- A **claim**, simply, is any _____ for some idea, interaction, or relationship between two or more objects.
- Claims can be derived from scientific evidence, or any of the _____ of knowledge we discussed previously
  - But remember the pitfalls of some sources of information, and prioritize _____!
- Claims come in 3 flavors: frequency, _____, and causal

  - All three have varying _____ to be valid, which more strict requirements moving from frequency -> association -> causal
  - Good evidence of any claim is a _____ of the scale of measurement and the design of the study

3.2 Frequency Claims

- A **frequency claim** is one that deals with the rate, percent, or _____ of a certain characteristic or phenomenon.
  - Hint: a _____ sign is oftentimes a dead giveaway for this type of claim - but keep in mind that a "claim" is not necessarily made every time you see a percent.
  - Example: "roughly 25% of college students report feeling stressed about an upcoming assessment"
- These claims are usually only made upon some single observed and _____ variable or measurement, and often describes a yes-no proposition.
  - Example: 20 of 50 students like the dining hall food -> 20 students say yes to liking the food, 50 said no to the same question
- These claims are _____ dealing with a categorical scale of measurement
  - Stats sidebar: testing for claims of frequency are normally done with tests such χ^2 or Fisher's exact tests
- _____ represented by pie charts or bar charts

3.3 Association Claims

- An **association claim** is made regarding _____ or more variables, attempting to describe or quantify the relationship between them, *without* explaining which one might _____ the other
  - Hint: look for words like "correlate", "predict", "associated with", and/or "covary" to identify these claims
  - Example: I think that people who are more extroverted tend to be friendlier
- An association between two variables can either be described as *positive*, *negative*, or *non-existent/zero:*
  - _____ -> as one variable increases, so does the other
  - Negative -> as one variable increases, the other _____
  - Non-existent/zero -> both variables do not consistently _____
- Variables in this claim usually have to be at least _____, but are more commonly continuous in nature. In most cases, variables in this sort of study would only be _____ or measured.

  - Stats sidebar: testing for these claims is usually done with some form of correlation test (e.g., Pearson's r, Spearman's ρ, Kendall's $\tau - b$) or regression (e.g., linear - OLS, curvlinear)
- Graphically represented by _____ (one variable on x-axis, other on y-axis)

3.4 Causal Claims

- Similar to an association claim, with the added caveat that these claims make some _____ on which of two or more variables causes another.
  - This claim requires the most _____ and substantial evidence of all three claim types. Whereas a claim of association or frequency are largely *descriptive*, a causal claim is more *inferential*.
  - Example: I think eating more carbs makes me run better in the morning
- Similar to associative claims, a causal claim is likely to describe the movement of one variable in _____ to another, but must meet three additional criteria:
  - The two variables are correlated (valid _____ claim)
  - One variable clearly came before the other (_____ precedence)
  - The relationship or change cannot be _____ by some other factor/confound (internal validity - more on this later)
- For solid causal claims, _____ are really the most (and maybe only) acceptable design (but we will cover that later as well)
- In causal claims, we are most likely to encounter observed _____ data as our outcome, and some form of _____ experimental/manipulated variable.
  - Stats sidebar: because of the scale of measurement just described, we are usually thinking about some sort of t-test or _____, to test means between tow or more groups.

3.5 Claims Are Not Always Research

- Claims can appear in personal experience, appeals to _____, and intuition; just because a claim is made, does not mean that they are based in research
  - *Example:* "I swear this happens to me every day", "This all happened because [insert reason here]"
  - What types of claims are those two above?
- If a claim is made, ask yourself, "what is the _____ of the claim?" Hopefully an empirical article!

4 Assessing Claims with 4 Types of Validity

4.1 Overview

- Alongside the theory-hypothesis-data framework we discussed early in the semester, and the reading strategy I offered for empirical articles - these 4 _____ will make up the backbone on how you approach critiquing scientific claims.

4.1.1 Construct Validity

- **Construct validity** is all about how well the variables under study are _____, manipulated, and measured. This is often closely related to the operational measures one chooses to capture the latent/construct variables.
- Faults in _____ validity imply a failure to properly represent the constructs under study, and will lead to a disconnect between the study and the _____ under study
- We will discuss more about "good" measurement _____ in week 5

4.1.2 External Validity

- **External validity**, also sometimes called _____, is all about how well the claims and results of a study/hypothesis apply to the broader _____ and other contexts. This tends to be primarily determined by how tightly controlled a study is (more control = less generalizable to daily life) and how individuals were _____ for a study (more on this in week 7).
- Faults in external validity lead to _____ in how well a claim can be extrapolated and abstracted outside the context of a study.
- Example: Is a tightly-controlled clinical study on mice in a lab cage readily applicable to the average person in their daily life? No!

4.1.3 Statistical Validity

This will be covered further in-depth in PSY-350

- **Statistical Validity** is all about whether the _____, p-values, effect sizes, and _____ methods support the hypothesis in question.

- Helpful questions to ask:
  - Did the authors state an α level in the methods?
  - Did the paper report adequate statistical information to assess significance? (e.g., p-values, _____ intervals, effect sizes - ideally all 3)
  - Did the authors themselves actually _____ this information correctly?
  - Was the analysis _____ enough to detect an effect? (e.g., big enough sample)
- Failures in this type of validity _____ the conclusions made in the discussion, which comes from the results.

4.1.4 Internal Validity

- **Internal validity** is most closely related to how well confounds are _____ for and noted in a study. Researchers may use a combination of _____ controls (which we will discuss in this class) and statistical controls (which are more relevant to PSY-350).
- Failure to properly address these will result in _____ on the actual causation/association mechanism between two or more variables.
- This tends be be one of the _____ validities to fully meet, and one that many people fail to account for in intuition and personal experience. This is where the famous phrase comes from: "Correlation does not equal _____" - because people fail to account for all the necessary 3 components for causal claims.

4.2 Claim Types and Validity

- In my opinion, the validities don't necessarily need a tailor-made application to each type of claim. The one exception is that internal validity is not really applicable to _____ claims, and only very little to association claims.

4.3 How to Prioritize Certain Validities

- As we have discussed before, no study can be so well-made that it satisfies all validities and answers all questions about a _____. Instead, it is our goal to balance _____ and our available resources to create a reasonably good study that provides evidence for a part of a broader question.

  - This is important to remember both as we create research (research _____) and as we read and assess existing research (research _____)!
- I propose 4 areas to consider when choosing how to prioritize:
  - Type of _____ to be made (frequency, association, causal) - see previous sections for discussions on those.
  - Practicality: time, resources, funding
  - Ethics: sampling method, interventions, _____ of populations
  - Impact: how important and _____ are our findings
- But, there is no one panacea or perfect solution to balance these all - we often do research understanding the natural _____ of our work.