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## **Week 3 Lecture - Claims & Validity**

Undergraduate Research Methods in Psychology

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## 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.
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## 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
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- 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  $\chi^2$  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.
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- Stats sidebar: testing for these claims is usually done with some form of correlation test (e.g., Pearson's  $r$ , Spearman's  $\rho$ , Kendall's  $\tau - b$ ) or regression (e.g., linear - OLS, curvilinear)
- 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 two 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!
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## 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.
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- Helpful questions to ask:
  - Did the authors state an  $\alpha$  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 to 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.
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- 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.
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