Research Methods in Psychology — Stacey Morales

Lesson Plan: Understanding Correlational vs Causational Relationships (~2 hours.)

Reading Prior to Class
Cuttler, C., Jhangiani, R.S., & Leighton, D.C. (2019). Chapter Thirteen: Inferential Statistics. *Research Methods in Psychology*. 4th edition. Kwantlen Polytechnic University.

Relevant Course Learning Objective:
- Collaboratively collect, analyze and interpret data, revise, and communicate results effectively using APA style in a small group of your peers.

Lesson Learning Objectives:
- Students will be able to construct a hypothesis based on a research question.
- Students will learn how to conduct a correlation on JASP.
- Students will be able to identify the results of a correlational data analysis.
- Students will be able to identify the differences between a correlational and causational relationship.

Teaching Plan:
- Mindfulness Activity (*5-minutes*)
  - Body Scan:
    - Scan body for pain, tension, or anything out of the ordinary. Take a deep breath.
- Warm-Up Activity (15-*minutes*)
  - Minute Paper — What type of information can a correlational analysis give us? What type of information can an independent samples T-test give us?
    - Think-Pair-Share
- Review Quiz (*20-minutes*)
  - Students will be divided into groups of four where they will collaboratively complete a review quiz on the following topics from the reading:
    - How to conduct and interpret correlational analyses
      - P-values and r-values
      - Scatterplots
    - Correlational vs. causational claims
    ** Please create your own quiz for your students
- Mini-Lesson on Correlations (*50 minutes*)
  - Materials needed: Personal devices for Google Forms, JASP/SPSS on computer, Projector, Chalkboard, Chalk, Handout (see bottom of page).
  - Intro: "So at this point, we have learned about correlational analyses, the information they give us, and how to interpret statistical significance using a p-value. Today, we will be turning this knowledge into skills that we will then be using in the latter half of class to run group analyses for your next lab paper."
  - Instructors will present the research question: Is there a relationship between the hours of sleep you get and feeling anxious in the morning?
  - Students will use their electronic devices to anonymously answer two questions on Google Forms (5 minutes). https://www.google.com/forms/about/

- - ■ First question: How many hours of sleep did you get last night?
      - ● Coding: insert exact number of hours
    - ■ Second question: On a scale of 1-5, 1 being not anxious at all and 5 being the most anxious ever you've felt, how anxious do you feel at the present moment?
      - ● Coding: 1-5 response
  - ○ Instructor will export data into a Google Sheet, download as an Excel sheet, and import data into JASP on computer, projector on with narration for students to follow. https://jasp-stats.org/

  - ○ Instructor will ask students to think-pair-share and come up with the possible hypotheses (e.g., relationship or no relationship) and provide a visual of this hypothesis and their reasoning (15 minutes).
    - ■ Wording: "So before we input the responses to run the analyses, we wanted to ask you all: from what you remember from the reading and lecture portion of the class, what could the correlation analysis tell us about the relationship between these two variables? What possibilities are there? What would this look like on a plot?"
    - ■ Each pair of students is then asked to share, instructor writes hypotheses on the board and invites students to draw their accompanying plots on the board.
      - ● "So we could say 'when hours of sleep goes up, level of tiredness goes down,' what is this an example of?"
        - ○ Negative correlation
      - ● Poll class to see if they agree with the answers already shared, check in for any alternative viewpoints to the answers that have been shared.
  - ○ Instructor walks students through how to conduct correlation in JASP on classroom computer (projected for students to follow along) (10 minutes)
    - ■ Explain how data is entered, walk through how to conduct the correlation, and make sure to check off scatterplot to have a visual of the data. Make sure to zoom into the output or make it larger for all students to be able to see it properly!
  - ○ Students are grouped into three to discuss and answer four questions (10 minutes):
    - ■ Write down the p-value and the r-value. What does this information tell us?
    - ■ Given these values, what do the results of the correlation indicate?
    - ■ Why is this a correlational relationship instead of a causal one?
      - ● Can provide some guidance by saying "you may find it helpful to answer all questions together one-by-one or to assign each group member a question and then come together to see if everybody agrees"
  - ○ Each pair will share their answers, which will be written down on the board (10 minutes).
    - ■ Poll class to see if they agree with the answers already shared, check in for any alternative viewpoints to the answers that have been shared.
  - ○ Takeaway: now we have all generated hypotheses, conducted data collection, analyzed data, and interpreted/reported results while also identifying the difference between correlation and causation!

- BIO Break! (*5-minutes*)
- Group Analyses (30-*minutes*)
  - Students will return to the data they have been working with in the course and, guided by the instructor, will run both correlational analyses and independent samples t-tests.
  - Instructor will be available to check students' work and address any questions or issues students run into while conducting analyses.
  - Once students have all completed their analyses, the class will work together to interpret results and write up APA-style sentences that describe their results.
- Review Homework Expectations (*5-minutes*)

Homework

In today's class, you learned about how to analyze and interpret data using correlations and independent samples t-tests. You also ran correlations and t-tests for your human experiments lab, and interpreted the results. Now, your task is to write your results and discussion sections for the next class to be peer-reviewed. Be sure to include the APA-style sentences in your results section, and feel free to reference the class resources for constructing an APA-style paper (e.g., refer to this resource for constructing a discussion section: https://apastyle.apa.org/instructional-aids/discussion-phrases-guide.pdf) or reach out via email if you feel stuck on how to structure these section. Kindly submit on Blackboard before the next class.

Correlation vs Causation: Sleep & Anxiety

Part 1:

How do you hypothesize that sleep and anxiety might be related? Do they both go up together or does one go up as the other goes down?

Assume we find a significant correlation between hours of sleep and anxiety - could we say from this data that sleep deprivation causes anxiety? What would be some other possible explanations?

Part 2:

Write down the p-value and the r-value. What does this information tell us?

What do the results of the correlation show?

Why is this a correlational relationship instead of a causal one?

Bonus: How could we change this design to test a causal claim?