BOSTON UNIVERSITY

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PS 211: Introduction to Experimental Design

Fall 2025 · Section C1

Discussion 5: Lectures 6-7 Review & Finalizing Poster Hypotheses

Outline for Today

- Attendance – please sign the sheet at the front
- Lectures 6 and 7 review
- Worksheet
- Finalize poster hypotheses

Lecture 6: The Normal Curve & Z Scores

- Normal distributions: bell-shaped, symmetric, unimodal
- Outliers/deviations from normal → can flag anomalies (e.g., fraud detection)
- Standardization: convert raw scores → **z scores** (SDs from mean)
- Z distribution: mean = 0, SD = 1
- Compare across scales: z tells us relative standing
- Percentiles: proportion of scores below a given z

Lecture 7: Central Limit Theorem & Standard Error

- **Central Limit Theorem (CLT):** distribution of sample means ≈ normal if n is large
- Even if raw scores aren't normal, sample means will be
- Distribution of means = less variable than raw scores
- **Standard Error (SE):** SD of sample means
  - Formula: SE = s / √n
  - Larger samples → smaller SE → more precise estimates

Worksheet for Today

1. Z Scores: A test has M = 70, SD = 10. You got an 85.
   - What is the z score?
   - Is it above/below average?
2. CLT & SE: We have two samples from same population: n = 9 vs. n = 100.
   - Which has smaller SE? Why?
3. Normal Curve
   - If z = 1, what % of scores are below it?
   - If z = −1, what % are above it?
4. Hypothesis Testing
   - Suppose $\mu = 50$, $\sigma = 8$.
   - Sample (n = 16): M = 46.
     - Compute SE.
     - Compute z.
5. Wrap-up
   - Share one real-life case where you'd want to compare two groups (IV levels).
   - How could you phrase it as H_0 vs. H_1?

Last week: broad topics -> testable hypotheses

- Hypothesis = specific, directional prediction that connects your IV & DV
- Must be **measurable**, **clear**, and **feasible**
- Stuck? Think of hypotheses as "If..., then..." statements. *If (change in IV), then (change in DV)*
- Always specify the IV levels you're comparing
  - For >2 levels, describe the expected pattern (e.g., "Performance decreases as noise increases")
- E.g., "If students drink coffee before class, then their reaction times will be faster on a simple task compared to students who don't."
- E.g., "If people listen to upbeat music, then they will complete puzzles more quickly than when listening to calm music."
- E.g., "Students who study in quiet settings will recall more words than those who study with music."
- During class, check in with me so we can workshop your group's hypothesis

This week: Refine topic and compile references

- Use Google Scholar or BU Library databases to search your topic
- Start with **review articles** → they summarize many studies at once
- Look for peer-reviewed journal articles, not blogs or random websites
- Skim the abstract & conclusion first: does it clearly connect to your hypothesis?
- Collect at least **3–5 solid references** this week to support your poster
- Keep track of them in a shared doc (include citation info!) and show me
  - You may use any citation style as long as it is consistent
  - That said, I am most familiar with APA
- Tip: “cited by” on Google Scholar helps you find more recent follow-ups

How to Brainstorm Research Ideas

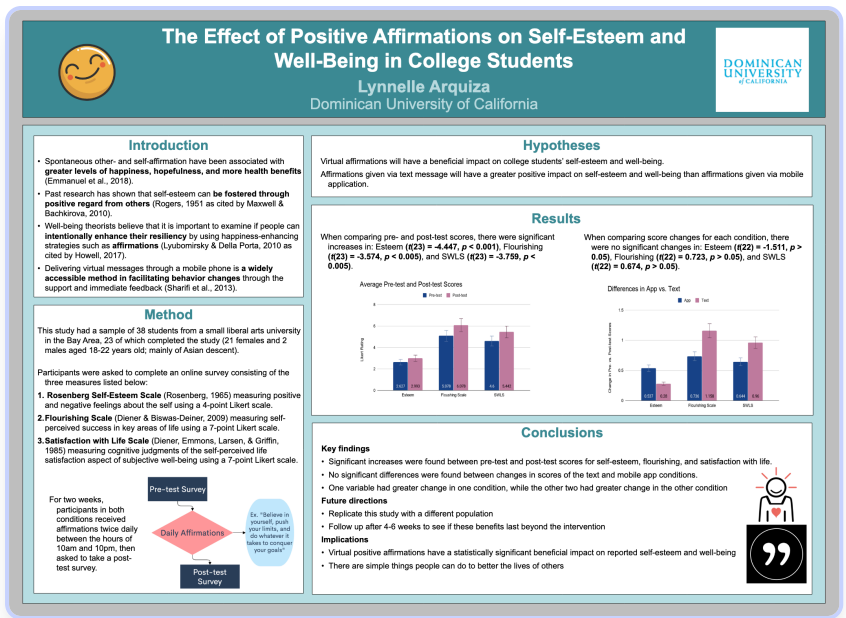
- Start with **broad psych topics** that interest you (e.g., sleep, stress, social media, learning).
- Ask: *What variables could we measure or manipulate?*
  - IV = what we change (e.g., study environment, type of task)
  - DV = what we measure (e.g., accuracy, reaction time, mood)
- Look for **connections to everyday life** or current issues.
- Keep it **simple and testable** within the scope of this class.
  - Although we will not be conducting experiments ourselves, our hypothetical study should still be attainable, understandable, and clearly tied to measurable variables.
- Be creative — but ground your ideas in **experimental design concepts** we've learned so far, so you can connect them directly to your poster.

Checklist – what should my poster have?

- Introduction
  - Current literature
  - Research question
  - Hypothesis
- Methods
  - Participants
  - Independent variable
  - Dependent variable
  - Analysis
- Results
  - Descriptive statistics
  - Inferential statistics
- Figures (1-2)
- Conclusion
- Limitations
- References (choose a citation style)

Design your figures and posters to be easily understood!

Good: https://scholar.dominican.edu/ug-student-posters/101/



Not so good: https://colinpurrington.com/2012/02/example-of-bad-scientific-poster/

Discussion poster project outline

- Discussion 3: Form groups and brainstorm research ideas
- Discussion 4: Research poster topics and form hypotheses
- Discussion 5: Refine topic and compile references
- Discussion 6-7: Introduction section
- Discussion 8-9: Methods section
- Discussion 10-11: Analysis plan and limitations section
- Discussion 12: Finalize poster
- Discussion 13: Group poster presentations!