

PS 211: Introduction to Experimental Design

Fall 2025 · Section C1

Discussion 3: Lectures 4–5 and Poster Brainstorming

Outline for Today

- Attendance – please sign the sheet at the front
- Important packages for knitting R Markdown to PDF
- Recap of Lectures 4–5
- Worksheet and icebreakers
- Brainstorming research ideas
- Discussion poster project

Important packages for knitting R Markdown to PDF

- I will give you time to do this later during our worksheet
- Copy and paste these two lines into the Console (the bottom left window), and then press enter:

```
install.packages(c("rmarkdown", "tinytex"))
```

```
tinytex::install_tinytex()
```

After running these two lines, you should now be able to Knit your Homework 1 Rmd file to PDF.

Lecture 4: Central Tendency

- Central tendency = “center” of dataset
- **Mean**: arithmetic average; sensitive to outliers
- **Median**: middle score; 50th percentile; robust to outliers
- **Mode**: most common score; can be unimodal, bimodal, multimodal
- In normal distribution → mean = median = mode
- In skewed distributions → mean, median, mode differ
- Outliers distort mean; median less affected

Lecture 4: Variability

- Variability = spread of scores
- **Range**: highest – lowest
- **Interquartile Range (IQR)**: $Q3 - Q1$, middle 50%
- **Variance**: average squared deviation from mean
- **Standard deviation (SD)**: square root of variance
- Boxplots: show median, quartiles, IQR, outliers

Lecture 5: Sampling

- Populations: entire group of interest
- Samples: subset used to estimate population
- **Random sample:** equal chance of selection; representative but hard
- **Convenience sample:** easier, common in psychology; less representative
- **Random assignment:** within experiments, ensures comparability of groups

Lecture 5: Probability

- Probability = likelihood of outcome (0 to 1)
- Trial = repetition (e.g., dice roll); outcome = result; success = outcome of interest
- Independent trials: outcomes don't affect each other (coin flips)
- Experimental probability: based on repeated trials
- Theoretical probability: based on known outcomes
- Common errors: gambler's fallacy, overestimating rare events, confirmation bias

Lecture 5: Hypothesis Testing

- Descriptive stats: summarize samples
- Inferential stats: generalize to populations
- Hypothesis testing uses probability to judge if sample result is likely under null hypothesis

Worksheet for Today

1. Central Tendency & Variability: Your group has these exam scores — 70, 80, 90, 100.

- What are the **mean** and **median**? If we add an outlier of 0, how do the mean and median change?
- Which class shows higher **variance**: (Class A: 79, 80, 81) or (Class B: 60, 80, 100) ?

2. Sampling & Assignment: A researcher wants to study BU students' sleep habits.

- Is recruiting from Psych 101 **random** or **convenience** sampling?
- Suppose you flip a coin to assign students to two tasks. How would you use the coin to assign them?
- What does random assignment accomplish? How is it different from random sampling?

3. RStudio checklist: Copy and paste these two lines into the Console (the bottom left window), and then press enter:

```
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```

```
tinytex::install_tinytex()
```

After running these two lines, you should now be able to Knit your Homework 1 Rmd file to PDF. Try this now!

4. Wrap-up: Which concept from Lectures 4–5 feels most important for the exam?

- Imagine your sleep schedule as a histogram. What does it look like now vs. ideally? Who in your group is the most "normal" and who's the outlier?

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.

Discussion poster project

- In small groups, you will come up with a research hypothesis, conduct a literature review, and write hypothetical methods, results, and discussion sections to be presented on a poster at the end of the semester.
- **This week**, we will form groups of 3-4 and brainstorm research ideas
- Attend discussion! → much easier to coordinate
 - Goal is no work outside of discussion section

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/>

The Effect of Positive Affirmations on Self-Esteem and Well-Being in College Students

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Introduction

- Spontaneous other- and self-affirmation have been associated with greater levels of happiness, hopefulness, and more health benefits (Emanuel et al., 2016).
- Past research has shown that self-esteem can be **strengthened** through positive regard from others (Rogers, 1961 as cited by Maxwell & Backhaus, 2010).
- Well-being theorists believe that it is important to examine if people can **intentionally enhance their resiliency** by using happiness-enhancing strategies such as **affirmations** (Lyubomirsky & Della Porta, 2010 as cited by Howell, 2017).
- Delivering virtual messages through a mobile phone is a **widely accessible method in facilitating behavior changes** through the support and immediate feedback (Sharifi et al., 2015).

Method

This study had a sample of 38 students from a small liberal arts university in the Bay Area, 25 of which completed the study (21 females and 2 males aged 18-22 years old; mainly of Asian descent).

Participants were asked to complete an online survey consisting of the three measures listed below:

- Rosenberg Self-Esteem Scale** (Rosenberg, 1965) measuring positive and negative feelings about the self using a 4-point Likert scale.
- Flourishing Scale** (Diener & Biswas-Diener, 2009) measuring self-perceived success in key areas of life using a 7-point Likert scale.
- Satisfaction with Life Scale** (Diener, Emmons, Larner, & Giffin, 1985) measuring cognitive judgments of the self-perceived life satisfaction aspect of subjective well-being using a 7-point Likert scale.

For two weeks, participants in both conditions received affirmations twice daily for the hour of 10am and 10pm, then asked to take a post-test survey.

Pre-test Survey
Daily Affirmations
Post-test Survey

Dr. "Happiness in yourself, this is the secret to happiness: your goals!"

Results

When comparing pre- and post-test scores, there were significant increases in: Estem ($t(23) = -4.447, p < 0.001$), Flourishing ($t(23) = -3.574, p < 0.005$), and SWLS ($t(23) = -3.759, p < 0.005$).

When comparing score changes for each condition, there were no significant changes in: Estem ($t(22) = -1.511, p > 0.05$), Flourishing ($t(22) = 0.723, p > 0.05$), and SWLS ($t(22) = 0.674, p > 0.05$).

Conclusions

Key findings


- No significant differences were found between pre-test and post-test scores for self-esteem, flourishing, and satisfaction with life.
- No significant differences were found between changes in scores of the test and mobile app conditions.
- One variable had greater change in one condition, while the other two had greater change in the other condition.

Future directions

- Replicate this study with a different population
- Follow up after 4-6 weeks to see if these benefits last beyond the intervention

Implications

- Virtual positive affirmations have a statistically significant beneficial impact on reported self-esteem and well-being
- There are simple things people can do to better the lives of others



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[illegible]

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!