PS 211: Introduction to Experimental Design

Fall 2025 · Section C1

Discussion 10: Poster analysis plan, reporting results, & one-way ANOVA

Outline for Today

- **Attendance:** please sign your name at the front within the first 2 minutes.

- **Lecture 11–13 Review:**

  - Report results in APA style

  - One-way ANOVA - logic, F-ratio, and effect size

- **Quick Worksheet Practice**

- **Poster Work:** Begin your **analysis plan** and **limitations** section

  - Update your Google Doc from last week in **Slack** so I can comment on it.

  - Include both your Introduction and Methods sections.

- In-class quiz game

Review – APA style is a consistent way to present stats

- Always include:
  1. **Test statistic** (t, z, F, r, etc.)

  2. **Degrees of freedom (df)**

  3. **Test value and p-value**

  4. **Descriptive stats** (M, SD for each group)

- Typically also include:

  - **Effect size** (e.g., Cohen's d, η^2)

  - **Confidence interval (CI)**

- Example from One-Sample t Test: The sample's mean reaction time (M = 312 ms, SD = 28) was significantly faster than the population mean of 350 ms, $t(14)$ = −5.68, $p < .001$, d = 1.47, 95% CI −50.1, −21.9.

- Symbols (t, p, M, SD, F, r) are italicized per APA 7th Edition.

From t to F: Why ANOVA?

- **t-test**: compares **two means**

- **ANOVA (Analysis of Variance)**: compares **3+ means** in one test

- Running many t-tests inflates Type I error (false positives).

- ANOVA controls α-level by testing all group differences simultaneously.

- **Logic:**

  - *Between-groups variance* → effect of IV

  - *Within-groups variance* → random noise

  - Large *F* → stronger evidence that not all means are equal

- **F** = MS_B/MS_W

Understanding the F Statistic

- **Between-Groups Variance (SS_Between)**

  - How far apart group means are from the overall mean

  - Captures systematic variance (signal)

- **Within-Groups Variance (SS_Within)**

  - How spread out individual scores are within each group

  - Captures random noise

- **Degrees of freedom:**

  - ($df\_B = k - 1$) (number of groups minus one)

  - ($df\_W = N - k$) (total participants minus number of groups)

Reporting ANOVA in APA Style

- Example:
  "Driving performance differed across phone-use conditions,
  $F(3, 36) = 54.0$, $p < .001$, $\eta^2 = .60$."

- Report in this order: $F(df\_B, df\_W)$ = value, p, η^2

- Include descriptive stats (means & SDs) for each group in text or table.

- For significant effects, follow up with **post-hoc tests**:

  - Tukey HSD, Bonferroni, or Scheffé

  - Clarify which groups differ, not just that there's a difference.

Worksheet: Reporting ANOVA Results in APA Style

Scenario: Researchers test the effect of **study environment** on quiz performance.

A one-way ANOVA is conducted with three conditions: (1) Quiet room, (2) With music, (3) In café

ANOVA summary:

Source	SS	df	MS	F	p	η^2
Between groups	204.4	2	?	?	.003	.53
Within groups	140.0	12	?			
Total	344.4	14				

1. Write the **null** and **alternative** hypotheses.

2. Find the values of MS_B, MS_W, and F

3. Using the table above, report the results in **APA format**. p and η^2 are already provided for you. Include F(df_B, df_W), p, and η^2 in a single concise sentence and italicized properly.

4. Add a brief interpretation: what do these results tell us about study environments and quiz performance?

5. What do we still not know from this test? What could we do to find this out?

Poster Project: Methods → Analysis plan

- Your poster should now have a complete **Introduction** and **Methods** section.

- Next step: **Analysis Plan** — describe how you would analyze your data.
  1. What is your **dependent variable**?

  2. What statistical test(s) will you use (t-test, ANOVA, correlation, etc.)?

  3. What result pattern would support your hypothesis?

  4. Include how you would report hypothetical results that fully address your research questions and hypotheses (APA-style phrasing).

> **Example:** "An independent-samples t-test will be conducted to compare reaction times on an object recognition task between participants who slept 8 hours and those who slept fewer than 5 hours.
>
> If the results are significant, then reaction times are faster for the 8-hour group than the sleep-deprived group, t(df) > t_crit (find this for your hypotheses!), $p < \alpha$ (choose this!), $d \approx$ (what value shows a large effect?). These results would suggest that adequate sleep improves object recognition performance during speeded tasks.
>
> If the results are not significant, then we fail to reject the null hypothesis that reaction times are the same between both groups, t(df) < t_crit, $p > \alpha$, $d \approx$ (a small effect). These results would suggest that adequate sleep does not improve object recognition performance during speeded tasks."

- Use this as a **template** to describe how you would report your own expected results.

Goals for Today

- Finish your Intro, Methods, and Analysis Plan

- Keep working on your actual poster layout and begin drafting limitations section

- Complete the worksheet for APA-reporting practice for your poster and for Exam 3