Two-Way ANOVA Pt2

Jonathan A. Pedroza, PhD

Interpretation of Findings

- we're going to talk about what the findings mean for your factorial design
- we will have three things to check
  - main effect (relationship) between your first IV/factor and your DV (while ignoring everything else)
    - this will also be in the F test for this one IV
  - main effect 2 (relationship 2) between your second IV/factor and your DV (while ignoring everything else)
    - this will also be in the F test for this one IV
  - interaction (combination of IV1 and IV2) between your IVs on your DV (while ignoring the main effects)
    - this will also be in the F test for the interaction

Main Effect 1 Interpretation

- the F value for this main effect will tell us if there is a significant relationship between your first IV and your outcome
  - essentially is there a difference between the levels/conditions/groups in your first IV in their average outcome values
  - Ex: Is there a significant difference in average depression levels of your 3 BMI categories/groups?
- It is important to note that we are only looking at the relationship between BMI category and depression WHILE ignoring/controlling/adjusting for your second IV
  - Ex: There is a significant relationship between BMI category and depression while adjusting for race/ethnicity
  - Ex: There are differences in depression levels between BMI categories while adjusting for race/ethnicity

Main Effect 2 Interpretation

- same thing as the first main effect but now with your second IV
- F value tells you if there are differences in the levels/conditions of your second IV in its relationship with the DV
  - Ex: Are there differences in average depression levels between your participants based on their identified racial/ethnic groups?
- Similar here, we are ignoring/adjusting/controlling for IV1 and only talking about the unique relationship between IV2 and the DV

Interaction Interpretation

- this is what makes this a two-way ANOVA rather than a one-way ANOVA (one variable) or a ANCOVA (one variable and covariates [variables being controlled])
- we look at the relationship between IV1 and DV based on a specific condition/group from IV2
  - Ex:

Interaction Interpretation

```
    vars  n  mean   sd median trimmed mad  min  max range sk
X1     1 18 23.97 4.98  22.15   23.74   4 17.8 33.9  16.1 0.
```

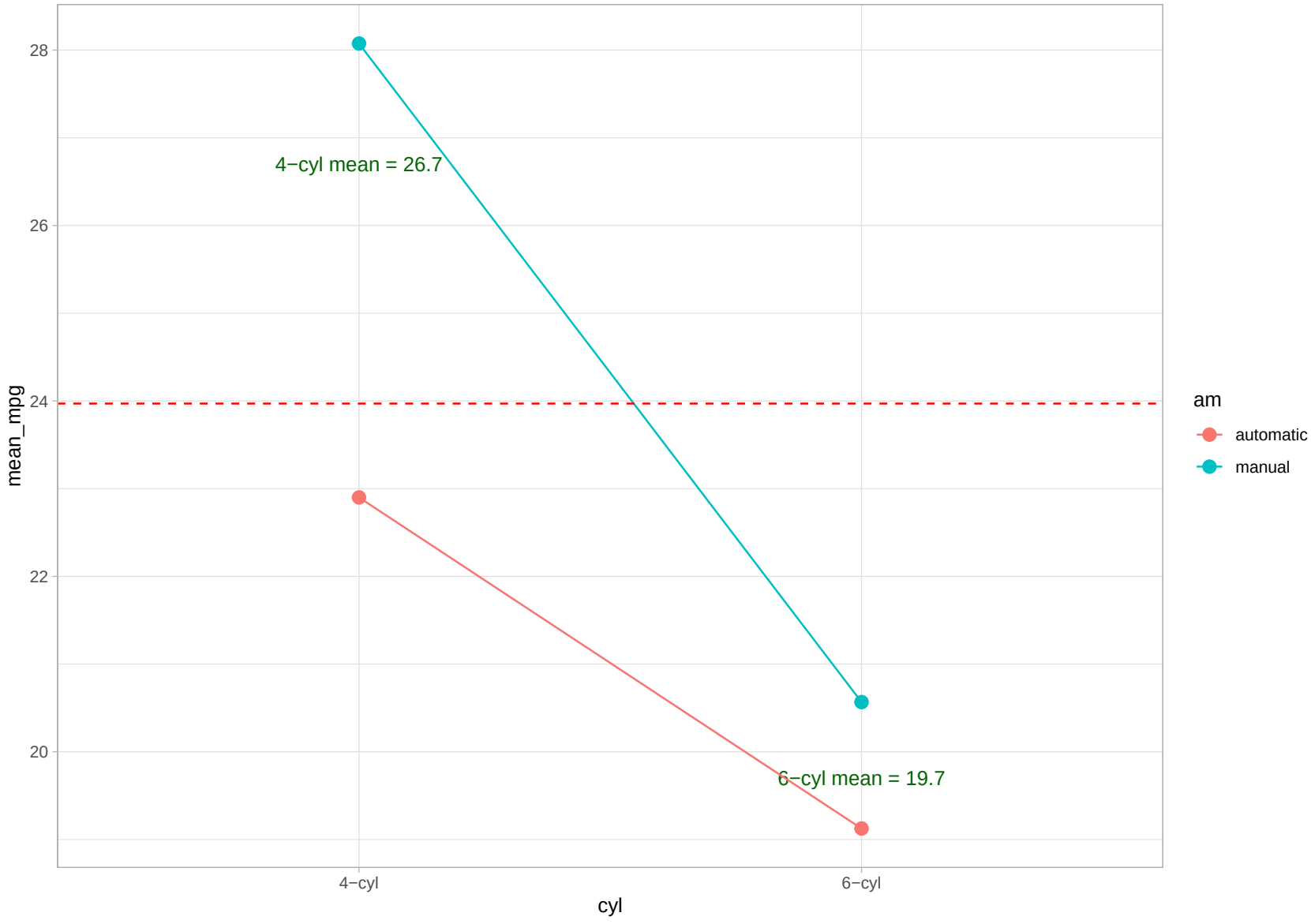
Interaction Interpretation

```
lm(formula = mpg ~ as.factor(cyl) * as.factor(am), data = s
                                coef.est coef.se t value Pr(
(Intercept)                      22.90     1.92   11.96    0.
as.factor(cyl)1                  -3.78     2.53   -1.49    0.
as.factor(am)1                    5.18     2.25    2.30    0.
as.factor(cyl)1:as.factor(am)1   -3.73     3.39   -1.10    0.
---
n = 18, k = 4
residual sd = 3.32, R-Squared = 0.63
```

Interaction Interpretation

```
# A tibble: 4 x 4
  cyl   am        mean_mpg sd_mpg
  <fct> <fct>        <dbl>  <dbl>
1 4-cyl automatic     22.9  1.45
2 4-cyl manual        28.1  4.48
3 6-cyl automatic     19.1  1.63
4 6-cyl manual        20.6  0.751
```

Interaction Interpretation



Reporting Findings

- We first talk about the interaction
  - There was a significant interaction found between number of cylinders and transmission type on MPG; $F(1, 14) = 1.22$, $p = XX$
  - There was no evidence of a significant interaction between number of cylinders and transmission type on MPG; $F(1, 14) = 1.22$, $p = .29$
- Then the main effects
  - There was evidence of a significant main effect of number of cylinders on MPG; $F(1, 14) = 18.62$, $p < .001$
  - There was no evidence of a significant main effect of transmission type on MPG; $F(1, 14) = 4.42$, $p = .05$

Reporting Findings

- Post-hoc tests
  - A Tukey HSD test was run and found significant differences between some groups. For instance, there was a significant difference between XX and XX (p = XX)
- Simple-effects analysis
  - Simple effects analysis revealed that only in the 4-cylinder group, manual transmissions had higher average MPG than automatic transmissions; F(XX, XX) = XX, p = XX
    - if more than two groups, you'd talk to each of these differences