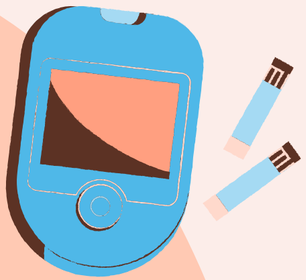
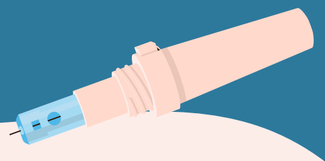
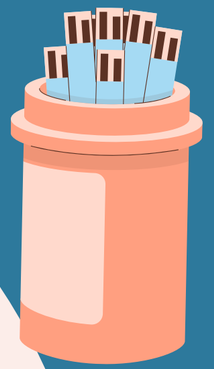
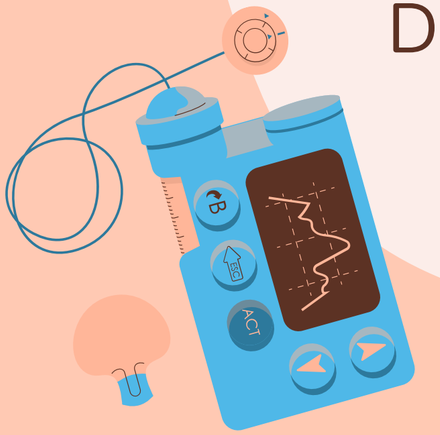






A Study on Drug Effects: Testing the Benefits of Caffeine and Nicotine on Attention

Daphne Hidley, Alex Sapinoso, Hamad Tria, Meiyi Ye



RESEARCH QUESTIONS

- What effects will drug dose and drug type have on the attention test scores of the Islanders?
- How significant are these effects?
- Is there a significant interaction between drug dose and drug type?

THE LITERATURE

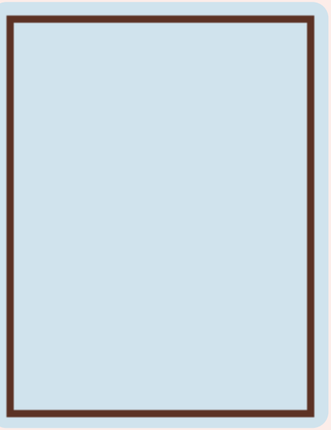
- Drug Metabolism
  - In general, it typically takes approximately 30 minutes for most medications to dissolve (Orlando Clinical Research Center. 2016).
- Caffeine
  - Caffeine is quickly absorbed into the circulatory system after ingestion, with the maximum effect happening between 30 and 60 minutes (Cappelletti et al. 2015).
  - Caffeine improves performance on simple and complex attention tasks (Einother et al. 2012).
- Nicotine
  - Nicotine lasts in the system for approximately 2-3 hours (Electronic Medicines Compendium).
  - Nicotine has cognitive-enhancing effects (Valentine et al. 2018)

DESIGN

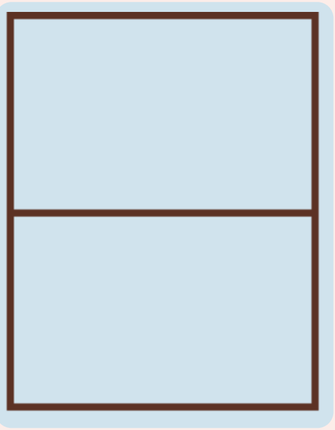
Split Plot / Repeated Measures

$$y_{ijk} = \mu + \alpha_i + \beta_{ij} + \gamma_k + (\alpha\gamma)_{ik} + \epsilon_{ijk}$$

bench
df = 1

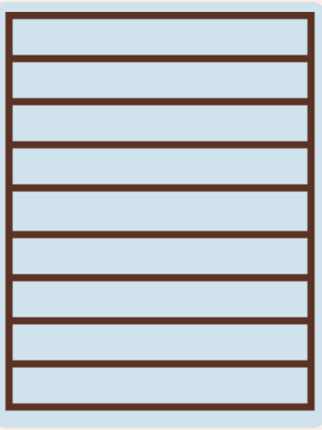


between factors
df = 1

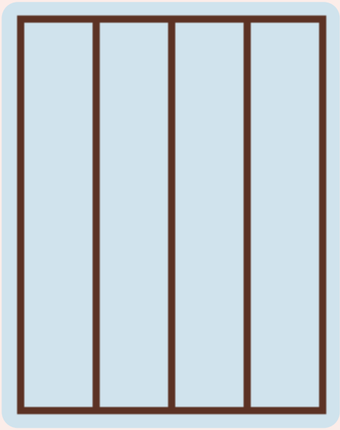


caffeine, nicotine

blocks
df = 106

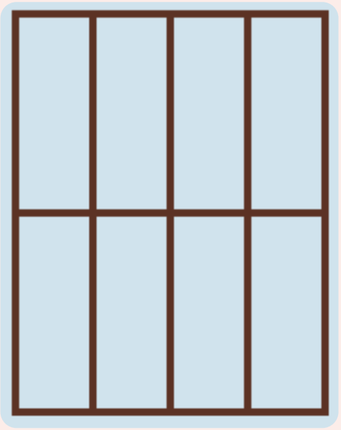


within factors
df = 3

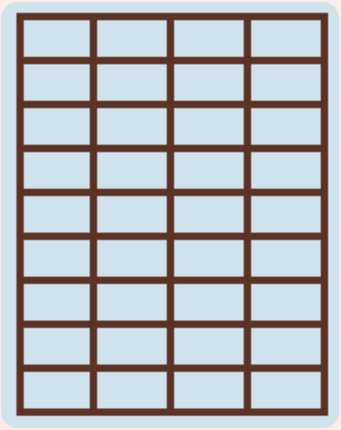


0, 1, 2 or 3 doses

interaction
df = 3



error
df = 101



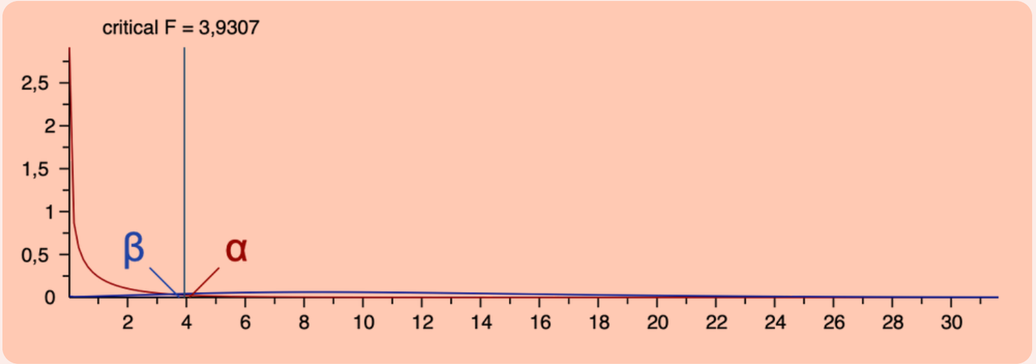
SAMPLING & METHODS

How we sampled:

- "Randomly" sampled islanders aged 15+ from each island
- Randomly assign drug tablet (caffeine/nicotine)
- Randomly assign order of dosage over four days (0 - 3 tablets)

Sample size determination:

- Using G*Power
- Power of 90%
- Effect size of 0.25
- Total sample size determined to be 108
- 54 caffeine, 54 nicotine



SAMPLING & METHODS

How we conducted the expirement:

01

- Administer 0, 1, 2 or 3 doses: caffeine 100 mg, nicotine 2 mg

02

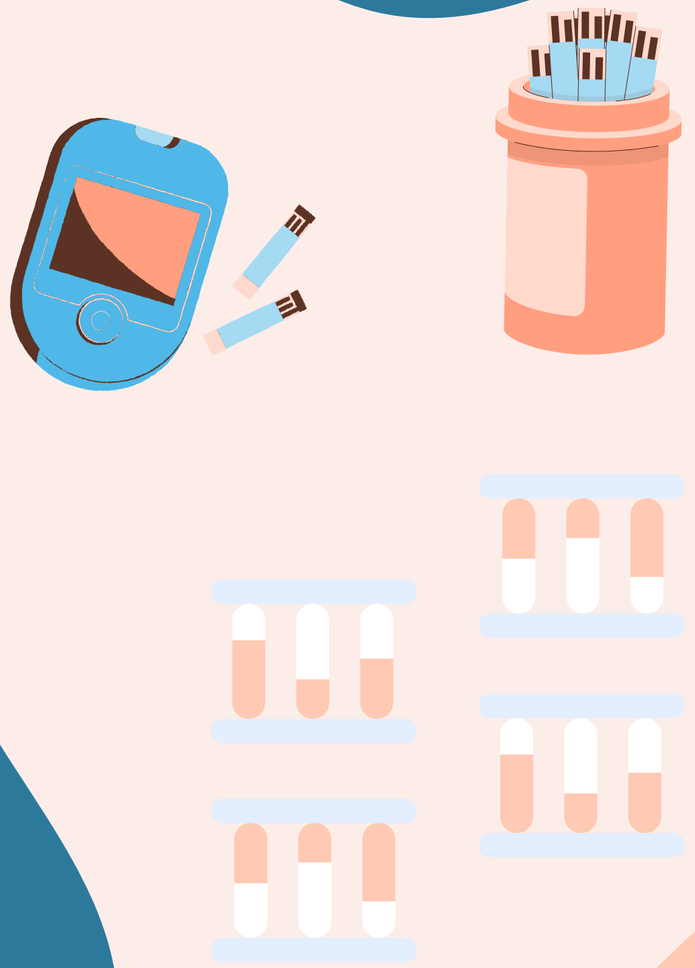
- Wait 1 hour for the drug to reach max effect

03

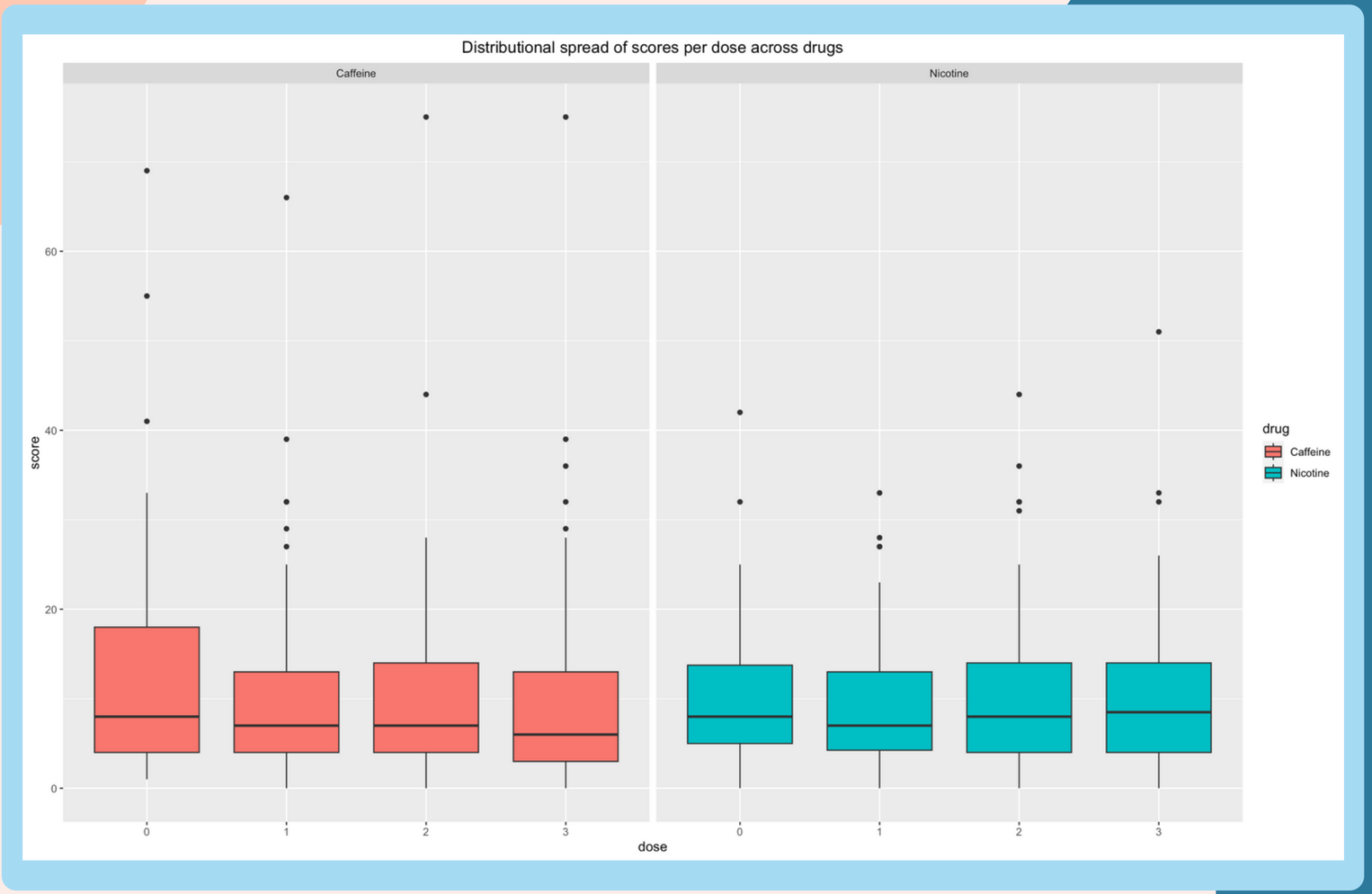
- Conduct a 10 mins long attention test (response: attention score)

04

- Repeat steps 1,2 and 3 the next day, four days in a row



COMPARISON BETWEEN DOSAGE

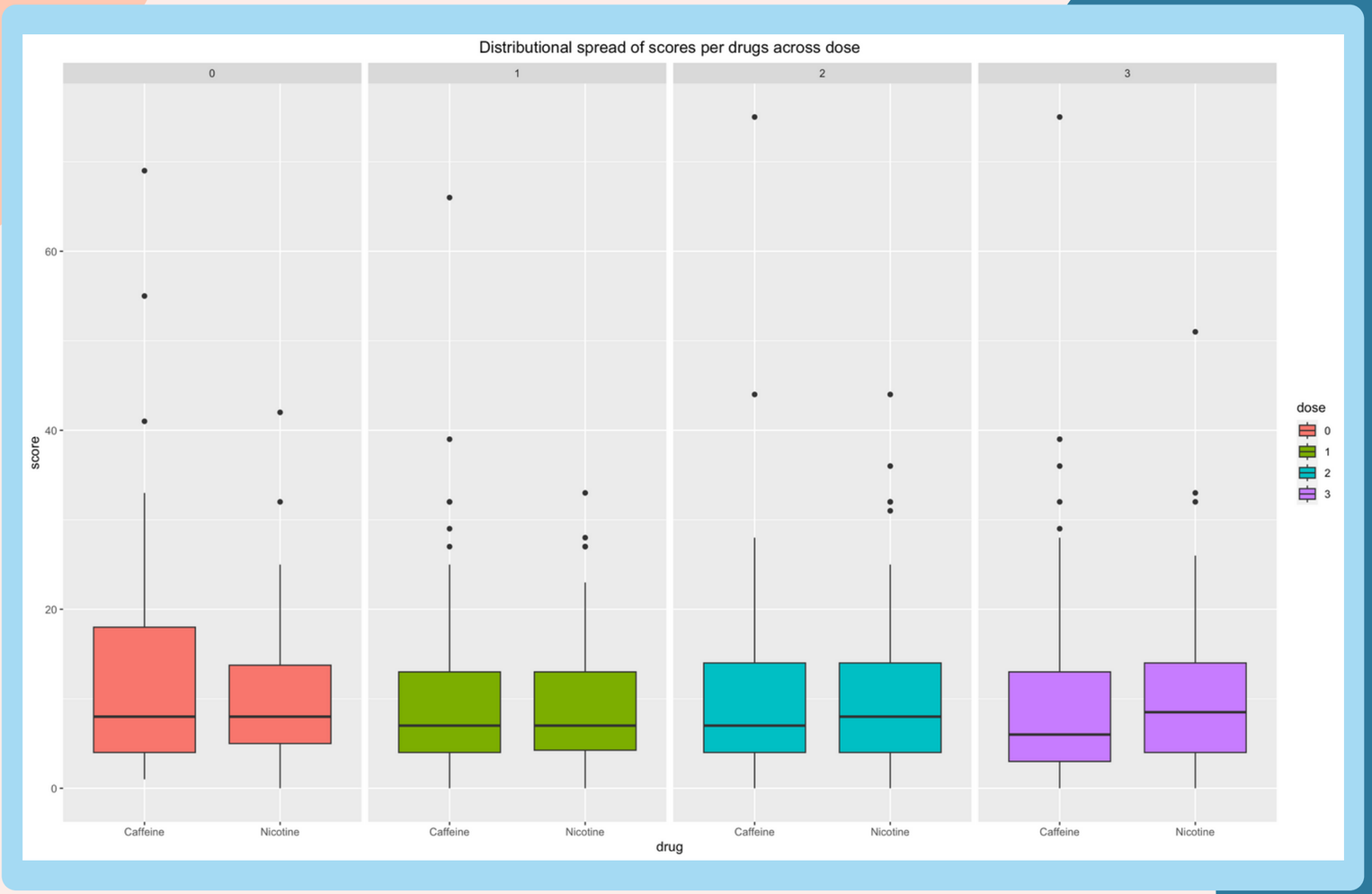


Caffeine

Nicotine

- Mean scores are the same across doses
- Similar results for the two drugs

COMPARISON BETWEEN DRUG TYPE



- Mean scores are the same for caffeine and nicotine
- Similar results for different doses

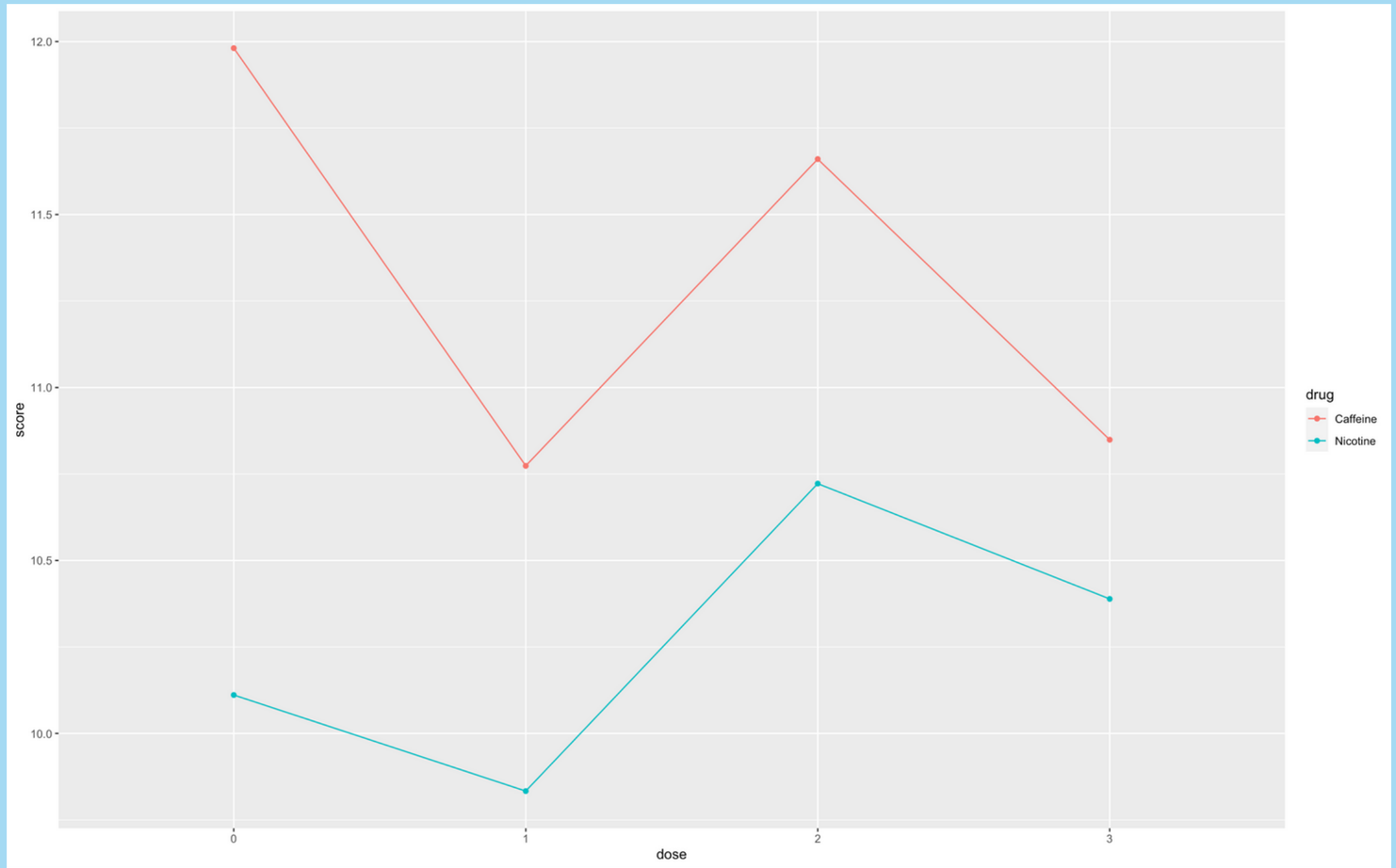
0 dose
(Control)

1 dose

2 dose

3 dose

INTERACTION PLOT BETWEEN DOSE AND DRUG



- The two drugs seem to follow the same general pattern with slight deviation in slope
- Seems to suggest little to no interaction
- Investigate further with ANOVA

ANOVA TABLE

Error: Between

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
drug	1	118.44	118.440	0.266	0.607
Residuals	106	46797.78	445.693		

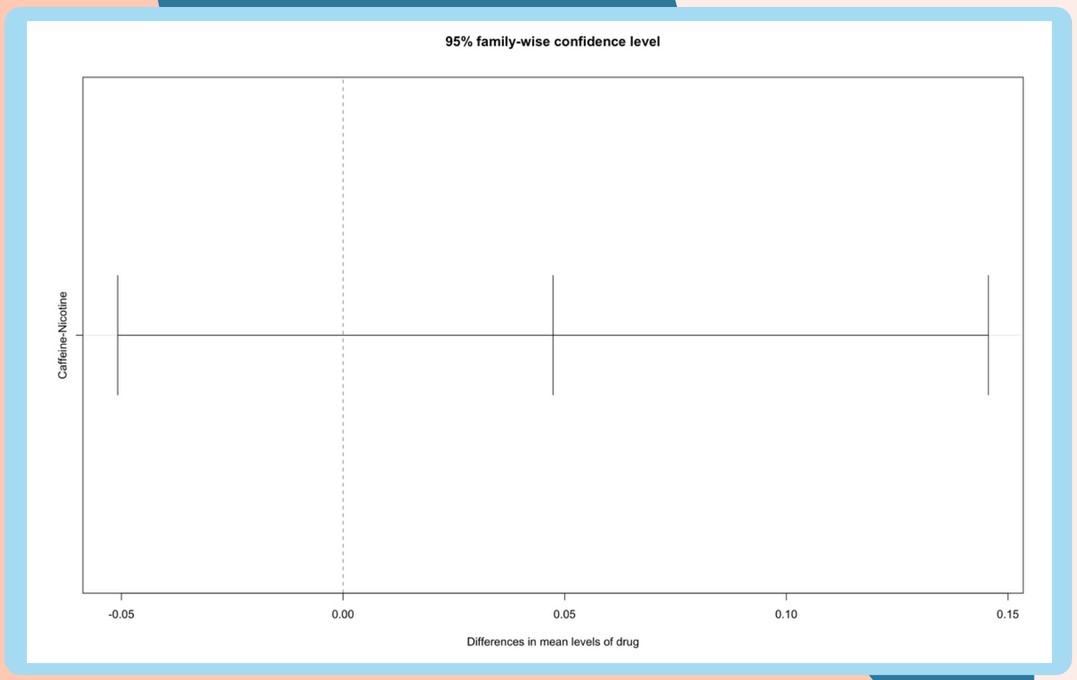
Error: Within

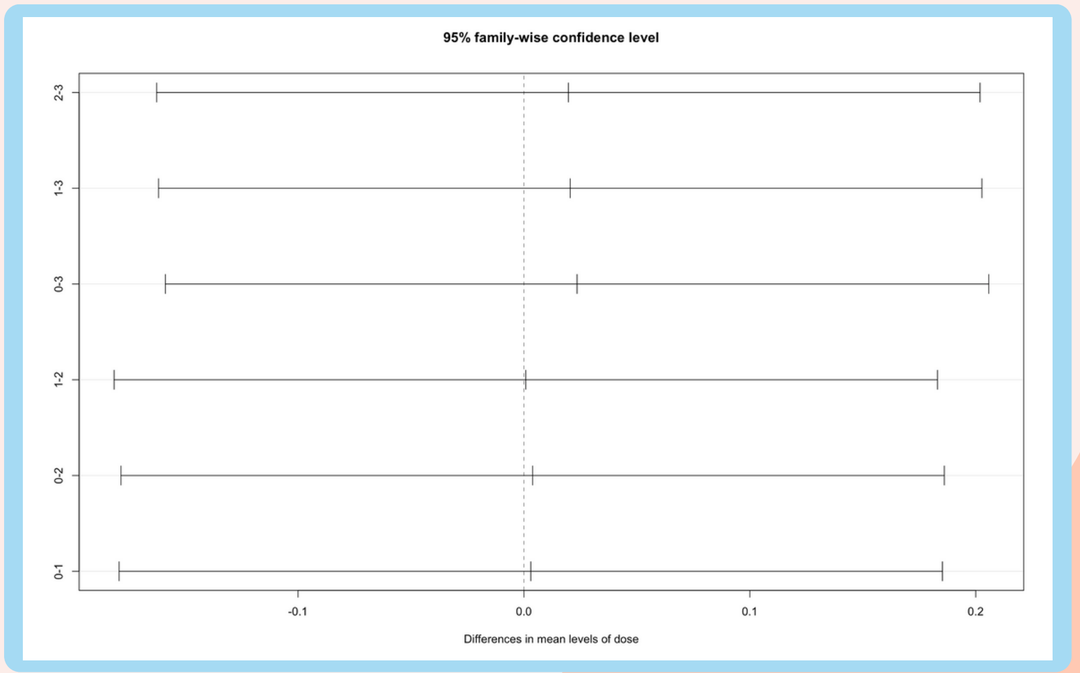
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
dose	3	52.393	17.464	1.144	0.331
drug:dose	3	27.948	9.316	0.610	0.609
Residuals	317	4807.660	15.262		

None of the p-values appear to be significant

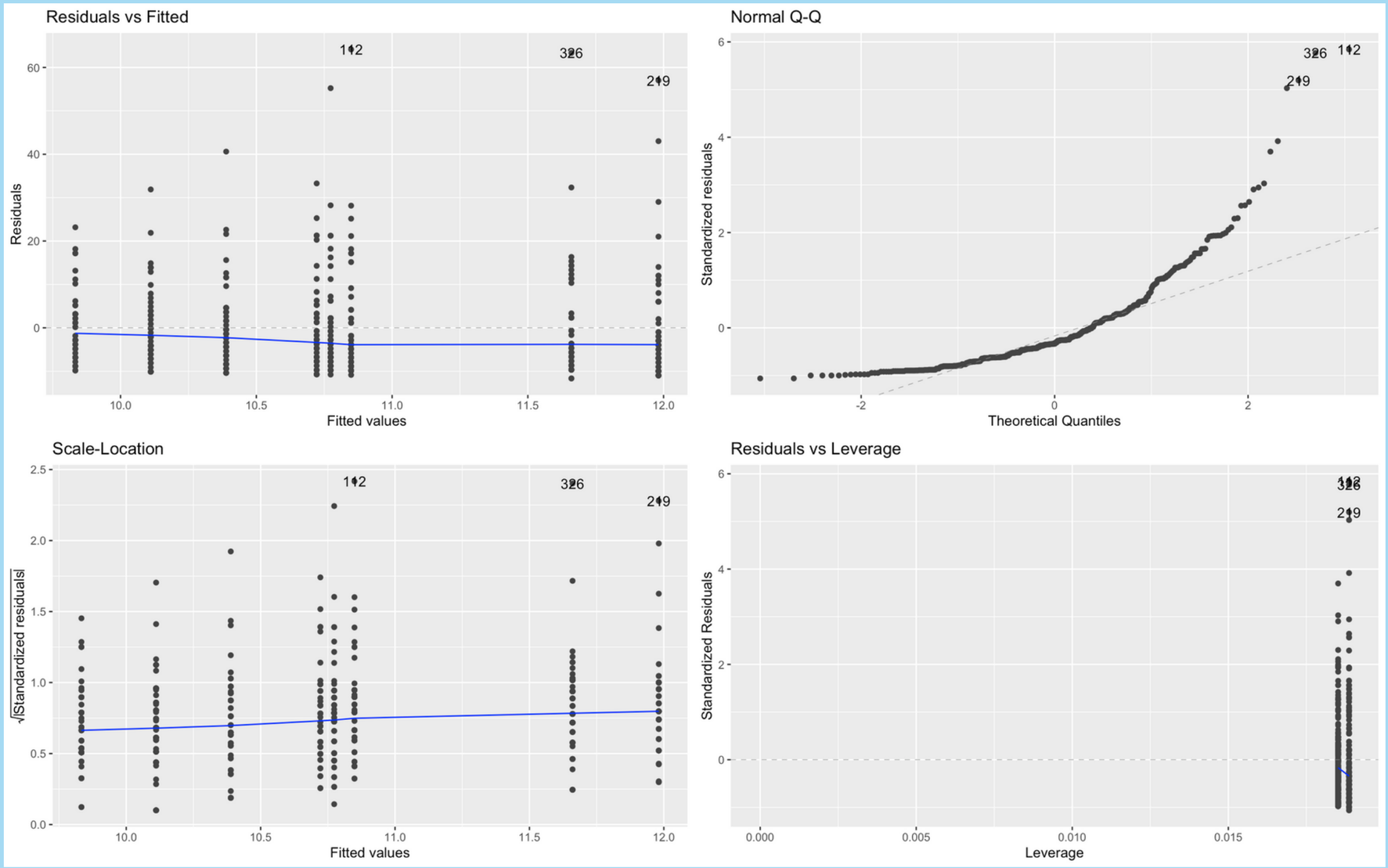
POST-HOC TUKEY HSD

	diff	lwr	upr	p adj
Caffeine-Nicotine	0.047	-0.051	0.146	0.344
2-3	0.020	-0.163	0.202	0.992
1-3	0.020	-0.162	0.203	0.991
0-3	0.024	-0.159	0.206	0.987
1-2	0.001	-0.181	0.183	1.000
0-2	0.004	-0.178	0.186	1.000
0-1	0.003	-0.179	0.185	1.000

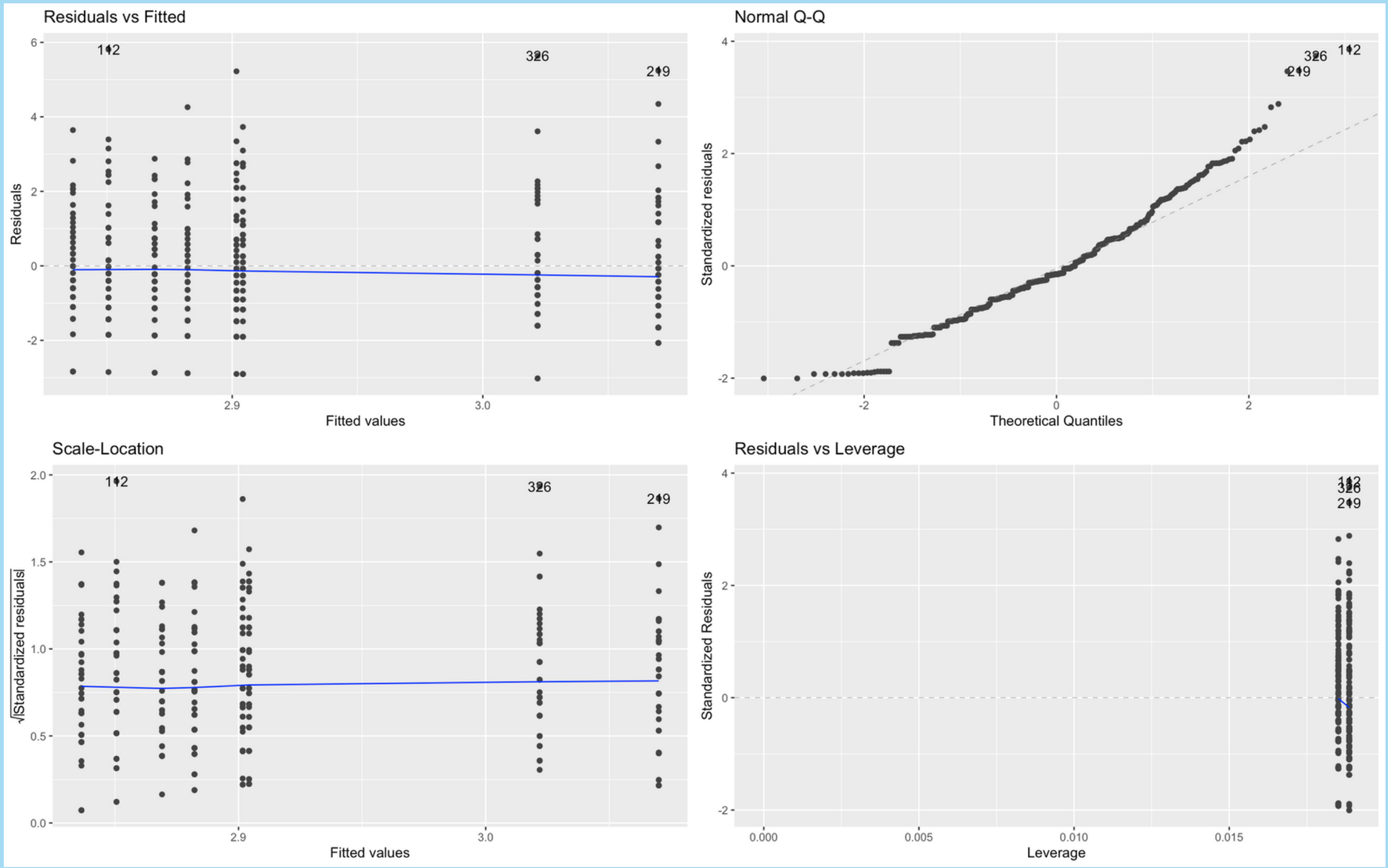




DIAGNOSTIC PLOTS: ORIGINAL



DIAGNOSTIC PLOTS: SQUARE ROOT TRANSFORMED



CONCLUSIONS

- The between groups factor of drug (caffeine, nicotine) is not significant
- The within groups factor of dosage (0, 1, 2, or 3 doses) is not significant
- The interaction between drug and dosage is insignificant
- There appeared to be no difference in the effects of different drugs and dosages on attention scores.
- Overall, islanders appeared consistent in their attention scores regardless of drug or dosage.

FUTURE RESEARCH QUESTIONS

- How do caffeine and nicotine affect other mental tasks?
- How would new drugs impact attention?
- How would other factors such as age and smoking status, etc, change the effect of the drugs?
- Is the 1 hour waiting time after injesting the drug a sufficient and optimal amount of wait time?

REFERENCES

- Caffeine: Cognitive and Physical Performance Enhancer or Psychoactive Drug?
- Cognitive Effects of Nicotine: Recent Progress
- A review of caffeine’s effects on cognitive, physical and occupational performance
- How Does The Body Metabolize Medication?
- Caffeine as an attention enhancer: reviewing exisitng assumptions