

ASSIGNMENT 4 — Omnibus Tests II

For all questions below, provide all programming code and plots in the report. Unless stated otherwise, assume $\alpha = 0.05$

Mixed ANOVA

1. A biomedical engineer is interested in the role of the sound of a mother's heartbeat in the growth of newborn babies. Seven babies were randomly assigned to a condition in which they were exposed to a rhythmic heartbeat sound. The other seven babies did not hear a heartbeat sound. Infants were weighed at the same time of day for 4 consecutive days, yielding the following data (weight is measured in ounces): (11 marks).

<i>Subject</i>	Heartbeat Group			
	<i>Day 1</i>	<i>Day 2</i>	<i>Day 3</i>	<i>Day 4</i>
1	96	98	103	104
2	116	116	118	119
3	102	102	101	101
4	112	115	116	118
5	108	110	112	115
6	92	95	96	98
7	120	121	121	123

Control Group				
1	112	111	111	109
2	95	96	98	99
3	114	112	110	109
4	99	100	99	98
5	124	125	127	126
6	100	98	95	94
7	106	107	106	107

- Plot the data. (1 mark)
- Report the GG-corrected p-value and F-statistics for the main effects and interaction. (2 mark)
- Report the effect size η_p^2 . (1 mark)
- Is sphericity violated? (1 mark)
- Is normality violated? (1 marks)
- Perform follow up mean comparisons (two-tailed) (1 mark)
- Perform a Holm-Bonferroni correction (1 mark)
- Report the effect size for each followup mean comparison. (1 mark)

- i. Interpret the findings. (1 mark)
- j. How many participants should there be per group to obtain 80% power, with $\alpha = 0.05$, $f = 0.4$, and 1.0 sphericity? (1 mark)

ANCOVA

2. You have run a study to test the effectiveness of Viagra on Libido. There are three groups: Placebo (i.e., sugar pill), Low Dose of Viagra, and High Dose of Viagra. You have also considered the libido of each participant's partner as a covariate. Use the data below and perform an ANCOVA. 12 Marks.

Dose	Participant's Libido	Partner's Libido
Placebo	3	4
	2	1
	5	5
	2	1
	2	2
	2	2
	7	7
	2	4
	4	5
	7	5
Low Dose	5	3
	3	1
	4	2
	4	2
	7	6
	5	4
	4	2
	9	1
High Dose	2	3
	6	5
	3	4
	4	3
	4	3
	4	2
	6	0
	4	1
	6	3
	2	0
	8	1
	5	0

- a. Plot the data. (1 mark)
- b. Is there a significant main effect of group? (1 mark)
- c. Report the effect size η_p^2 for the main effect of group. (1 mark)
- d. Is there a linear relationship between the covariate and dependent variable? (1 mark)
- e. Is homogeneity of the regression slopes violated? (1 mark)
- f. Is normality of residuals (Shapiro Wilk test) violated? (1 mark)
- g. Is normality between group variance (Levene's test) violated? (1 mark)

- h. Perform follow up mean comparisons with the adjusted means. (1 mark)
- i. Report the adjusted means. (1 mark)
- j. Report the effect size (cohen's d) for each significant mean comparison. (1 mark)
- k. Interpret the findings. (1 mark)
- l. How many participants should there be for each of the three groups to obtain 80% power, with $m_{1.1} = 0.85$; $m_{2.1} = 2.5$, $m_{3.1} = 1.25$, $s_{1.1} = 1.7$, $s_{2.1} = 1$, $s_{3.1} = 1.2$, $\alpha = 0.05$, $r = 0.4$? (1 mark)