

PSYC 5301: Research Methods

Tarleton State University

Homework 4

1. A sample of $N = 4$ subjects each performs an attentional networks task under three separate conditions (labeled A, B, and C). The scores for each subject and condition are presented in the table below:

Subject	Condition A	Condition B	Condition C
#1	3	2	1
#2	7	5	6
#3	6	3	6
#4	4	2	3

- (a) Write the full model for the data, specifying point estimates for the grand mean μ , treatment effects α_j , and subject effects π_i .
- (b) Test the constrained model $\mathcal{H}_0 : \alpha_j = 0$ against the full model in part (a). Report both a p -value and a Bayes factor.
- (c) What can you conclude from part (b)?
2. The following data were collected from a repeated measures study:

Subject	Treatment A	Treatment B	Treatment C	Treatment D
#1	6	3	3	0
#2	4	4	2	2
#3	4	2	0	2
#4	6	3	3	0

- (a) Write the full model for the data, specifying point estimates for the grand mean μ , treatment effects α_j , and subject effects π_i .
- (b) Test the constrained model $\mathcal{H}_0 : \alpha_j = 0$ against the full model in part (a). Report both a p -value and a Bayes factor.
- (c) What can you conclude from part (b)?
3. The following data were collected from a repeated measures study:

Subject	1	2	3	4
Treatment A	2	2	4	0
Treatment B	6	6	4	4

- (a) Compute a t -statistic for the *differences* between Treatment A and Treatment B.
- (b) Compute an F -ratio for a repeated measures ANOVA on the data.
- (c) Is there a relationship between the obtained t and F scores? Explain.
4. A researcher has measured performance on a task in a sample of $N = 6$ pigeons who were trained on a color discrimination task. Their initial performance as recorded as a baseline, then the pigeons were retested 4 more times at 6-month intervals (for a total of 5 measurements). Compute the F ratio, assuming the following values are known:
- between-treatments variance = 11
 - $SS_{\text{residual}} = 40$
 - $SS_{\text{total}} = 152$