PSYC 5086: Advanced Statistical Methods

Tarleton State University — Unit 3 Homework

1. Davey et al. (2003) were interested in the role of mood on the degree of compulsive checking in which a person engaged. Three groups of $N = 10$ participants each listened to music designed to induce positive, negative, or neutral mood. They were then asked to "list as many things around your home that you should check for safety or security reasons before you go away for three weeks." The dependent variable was the number of things listed. The data follow:

Positive mood	9	12	7	3	10	4	5	4	7	9
Negative mood	7	5	16	13	13	24	20	10	11	7
Neutral mood	8	5	11	9	11	10	11	10	7	5

   (a) Write precise definitions for a null hypothesis $\mathcal{H}_0$ and alternative hypothesis $\mathcal{H}_1$ for this scenario.

   (b) Calculate the F statistic for an ANOVA comparing the means of the three groups.

   (c) Calculate and interpret the p-value and Bayes factor associated with your obtained F statistic. Which model ($\mathcal{H}_0$ or $\mathcal{H}_1$) receives the most support from the data? Explain.

   (d) Compute a 95% confidence interval for each of the group means.

2. Sometimes it is necessary to perform supplementary analyses to those reported in published research papers. Suppose a journal article reports means of 3 for a control group, and 7,9,11 for three experimental groups, each with $N = 8$. The article reports $F(3, 28) = 8.00$, so the author concludes that the data show real differences. You wish to test differences among the three experimental groups (excluding the control group).

   (a) Compute MS_{within} using the information you have.

   (b) Perform an ANOVA comparing the means of the *three experimental groups*.

   (c) Compute a 95% confidence interval for each single mean in the three experimental groups.

   (d) Discuss how your results compare to the originally reported results.

3. Suppose three group means are 3, 5, and 7, with a total of $N = 30$ subjects. Suppose further that the within-groups variance is 9.

   (a) Compute F, assuming that there are 10 subjects in each group.

   (b) Compute F, assuming instead that the subjects are divided 3, 10, and 17 for the three groups in the given order.

   (c) What broader lesson does this exercise suggest?