**Research Question:**

The material in this class slowly gets harder as the semester continues (or the students get sick of the class). Run an ANOVA to determine if there are differences in quiz grade averages across the semester or if all the averages are the same. **Run ONLY THREE post hoc pairwise comparisons to determine which quiz might have the lowest score.**

**IV:** Different quizzes with different course materials

**DV:** Quiz scores – each quiz grade is listed. Quizzes were given every two weeks over material. Scores ranged from 0 to 75, but since extra credit was allowed, some scores may go up to 80 points.

Remember to paste your output in this document and upload your R script to blackboard to complete this assignment.

**Accuracy:**

1. Check the data for out of range scores.
   1. Include a summary showing you do/do not have out of range scores.
   2. If necessary, fix the out of range scores.
      1. Indicate what the problems were in the dataset.
      2. Make all out of range values NA.
      3. Include a summary showing that you fixed the accuracy issues.

**Missing data:**

1. Include a table of the missing data by participant.
2. Include a table of the missing data by column after you exclude participants with too much missing data.
3. Exclude all missing data.

**Outliers:**

1. Calculate Mahalanobis distance scores for your data.
   1. What is your *df* for the cut off score?
   2. What is the cut off score?
   3. How many outliers did you have? You can include the summary of the mahal < cutoff.
   4. Delete the outliers.

**Additivity:**

1. Include a symnum table of the continuous variables.
2. Are any of the variables too highly correlated?

**Normality:**

1. Include the multivariate normality histogram.
2. Interpret the graph. Does it indicate multivariate normality?

**Linearity:**

1. Include the multivariate QQ plot.
2. Interpret the graph. Does it indicate multivariate linearity?

**Homogeneity:**

1. Include the multivariate residuals plot.
2. Interpret the graph. Does it indicate homogeneity?

**Power:**

1. Calculate the number of participants you would need for this study, assuming a large effect size.
   1. Include a screen shot or summary of the numbers you typed into G\*Power, so we can give you partial credit if you get a different sample size than us.

**ANOVA and Mauchly’s:**

1. Include the ANOVA and Mauchly’s test output.
2. Do you meet the sphericity assumption given the results from Mauchly’s test?
3. Was the overall test significant?
4. Include the APA/AMA style write up for F (just the statistics):

**Post Hocs: REMEMBER ONLY DO THREE POST HOCS.**

1. Calculate the means, standard deviations, and group sizes for your levels.
2. Include the tapply ouput.
3. Post hocs:
4. What type of post hoc *test* did you run?
5. What type of post hoc *correction* did you run?
6. Include the t-test output.
7. Effect size:
8. Calculate the effect size for your pairwise comparisons.
9. Include the effect size output or MOTE screen shot.
10. Fill in the table below with the information from the above calculations (like the one from the notes):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mean 1 | Mean 2 | P-value | Explain? | Effect size |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Graph:**

1. Include a graph of the means and confidence interval for your ANOVA. Be sure to check the following:
2. X-axis label
3. Y-axis label
4. X-axis group labels
5. Error bars
6. Cleaned up graph (no gray backgrounds)

**Write up:**

1. Write up an analysis of what you find in this data, including all the information you answered above. Use the example in the notes for a guide. This write up should include the following for credit:
2. Result section style (APA and AMA):
3. Double space
4. Times New Roman 12 point
5. Two decimals
6. Centered, bolded Results
7. Short description of the study/variables.
8. Data screening summary:
9. Accuracy – did you have problems? What did you do to fix it?
10. Missing data - did you have problems? What did you do to fix it?
11. Outliers - did you have problems? What did you do to fix it?
12. Assumptions:
    * 1. Additivity
      2. Normality
      3. Linearity
      4. Homogeneity and Mauchly’s
13. ANOVA
14. Overall F statistic
15. Post hoc tests / corrections and results
16. Effect size for all tests
17. Graph with reference to the figure in the text.