**Research Question:**

A colleague tested undergraduates on their general happiness and overall search for happiness. They want to know what affects general happiness scores and have measured several other variables they think may affect happiness.

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

**DV:**

* Happiness Total – variable that contains college students’ general happiness scores. Higher scores indicate higher levels of happiness (60-135).

**IV(s):**

* Gender – Male and Female
* Ethnicity – White and Black

**CV(s):**

* GPA – 0 to 4.0
* Search for Happiness – Higher scores indicate college students are searching for happiness in their lives (0-35).

You must run at least TWO post hoc comparisons even if your interaction was not significant (i.e. you actually have to run something, not just male versus female), and report them.

**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.
   3. APA has now decided that we should use the Census labels for ethnicity and race. Therefore, you should change the Caucasian and African American labels to White and Black to match their current standards.

**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 correlation and symnum table of the **covariates**.
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/Homoscedasticity:**

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

**Power:**

1. Calculate the number of participants you would need for the research question, assuming a medium 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.

**Levene’s Test:**

1. Run Levene’s test using the car library and include the output.
   1. Did you meet the assumption for homogeneity?

**ANCOVA:**

1. Run the ANCOVA and include the summary output.
2. Were your CVs significant?
3. Include the correlations between the CV and DV for each CV.

**Post hocs:**

1. **Be sure to analyze the interaction even if it is not significant – you must have at least two post hoc tests.**
2. Calculate the means, standard deviations, and group sizes for your conditions.
3. Include the effects output.
4. Post hocs:
5. What type of post hoc *test* did you run?
6. What type of post hoc *correction* did you run?
7. Include the t-test output from multcomp.
8. Effect size:
9. Calculate the effect size for your pairwise comparisons.
10. Include the effect size output.
11. 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/Homoscedasticity
      5. Levene’s
13. ANOVA
14. Overall F statistics: you should have F values for your CVs, main effects, and interaction.
15. Correlations for your CVs
16. Post hoc tests / corrections and results
17. Effect size for all tests
18. Graph with reference to the figure in the text.