**Jamovi ANOVAHomework (10 points)**

This exercise will introduce using JAMOVI to conduct univariate independent-measures, and repeated-measures ANOVA. These tests are vital for understanding and conducting statistical analyses. For this exercise, you will use the “Emotional Lexical Decision.omv” file that is available on D2L.

**Assignment prompt.**

In 2013, I conducted a study to compare the way younger (YA) and older (OA) adults recognized emotional words. In the study, I created a “lexical decision” task with previously-rated negative (e.g., awful), positive (e.g., party), and neutral (e.g., seat) words. These words also differed in how common, or frequent, they are used in written English. For example, “dreary” is a low frequency word and “light” is a high frequency word.

In the lexical decision task, participants determined, as quickly as possible, whether a string of letters that were presented on a computer screen represented a word (e.g., anger) or a nonword (e.g., hirg). While participants completed this task, I monitored their brain activity using electroencephalography (EEG). The data in the provided file represents the brain activity in microvolts for each participant. For this exercise, I have also created a middle-aged (MA) group, though this data is simulated for the exercise.

**Step #1. Independent-measures ANOVA**

First, I would like you test the hypothesis that there were age group differences in brain activity for word stimuli. Remember, ANOVA requires that you both (1) whether there are differences between any levels of a factor and (2) where those difference lie.

1) Let’s describe the data.

*MYA \_\_\_\_\_\_\_\_\_\_\_\_ SE-YA \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIYA* [\_\_\_\_\_\_\_\_\_\_\_\_]

*MMA \_\_\_\_\_\_\_\_\_\_\_\_ SE-MA \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIMA* [\_\_\_\_\_\_\_\_\_\_\_\_]

*MOA \_\_\_\_\_\_\_\_\_\_\_\_*  *SE-OA \_\_\_\_\_\_\_\_\_\_\_\_* *95% CIOA* [\_\_\_\_\_\_\_\_\_\_\_\_]

2) Let’s look at the testable assumptions (Circle/underline one).

Homogeneity of variance check (Levene’s test) – (Assumption met/Assumption not met)

Normal distribution check (Shapiro-Wilk) – (Assumption met/Assumption not met)

3) Identify whether there was at least one difference between the levels of the factor

*F \_\_\_\_\_\_\_\_\_\_\_\_ dfbetween \_\_\_\_\_\_\_\_\_\_\_\_ dfwithin \_\_\_\_\_\_\_\_\_\_\_\_*

*p \_\_\_\_\_\_\_\_\_\_\_\_ ηp2 \_\_\_\_\_\_\_\_\_\_\_\_*

4) If there were differences between any levels of the factor, determine where the differences lie. If there were no differences between any levels of the factor, you only need to report that there was a non-significant ANOVA result.

*Tukey HSDYA-MA: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDYA-OA: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDMA-OA: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

5) Let’s put these results in the correct format! Please underline or fill in the relevant phrases and values.

“There was a [significant/not significant] effect for age group,

*F*(\_\_\_,\_\_\_) =\_\_\_, *p* = \_\_\_, *ηp2* = \_\_\_.”

If there was a significant effect:

Significant group differences [existed/did not exist] between younger and older adults, *t*(\_\_\_) = \_\_\_, *p* = \_\_\_. Reliable group differences [existed/did not exist] between younger and middle-aged adults, *t*(\_\_\_) = \_\_\_, *p* = \_\_\_. Finally, significant group differences [existed/did not exist] between middle-aged and older adults, *t*(\_\_\_) = \_\_\_, *p* = \_\_\_.

If there was not a significant effect, you are done reporting results!

Let’s try one more. I would like you test the hypothesis that there were age group differences in brain activity for nonword stimuli.

1) Let’s describe the data.

*MYA \_\_\_\_\_\_\_\_\_\_\_\_ SE-YA \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIYA* [\_\_\_\_\_\_\_\_\_\_\_\_]

*MMA \_\_\_\_\_\_\_\_\_\_\_\_ SE-MA \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIMA* [\_\_\_\_\_\_\_\_\_\_\_\_]

*MOA \_\_\_\_\_\_\_\_\_\_\_\_*  *SE-OA \_\_\_\_\_\_\_\_\_\_\_\_* *95% CIOA* [\_\_\_\_\_\_\_\_\_\_\_\_]

2) Let’s look at the testable assumptions (Circle/underline one).

Homogeneity of variance check (Levene’s test) – (Assumption met/Assumption not met)

Normal distribution check (Shapiro-Wilk test) – (Assumption met/Assumption not met)

3) Identify whether there was at least one difference between the levels of the factor

*F \_\_\_\_\_\_\_\_\_\_\_\_ dfbetween \_\_\_\_\_\_\_\_\_\_\_\_ dfwithin \_\_\_\_\_\_\_\_\_\_\_\_*

*p \_\_\_\_\_\_\_\_\_\_\_\_ ηp2 \_\_\_\_\_\_\_\_\_\_\_\_*

4) If there were differences between any levels of the factor, determine where the differences lie. If there were no differences between any levels of the factor, you only need to report that there was a non-significant ANOVA result.

*Tukey HSDYA-MA: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDYA-OA: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDMA-OA: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

5) Now, put the results in the correct format using the same phrasing as we used for the word ANOVA.

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**Step #2. Repeated-measures ANOVA**

Now, I would like you test the hypothesis that participants differed in how they responded to the emotionality of words. Remember, ANOVA requires that you both (1) whether there are differences between any levels of a factor and (2) where those difference lie.

1) Let’s describe the data.

*Mangry \_\_\_\_\_\_\_\_\_\_\_\_ SE-angry \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIangry* [\_\_\_\_\_\_\_\_\_\_\_\_]

*Mneutral \_\_\_\_\_\_\_\_\_\_\_\_ SE-neutral \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIneutral* [\_\_\_\_\_\_\_\_\_\_\_\_]

*Mhappy\_\_\_\_\_\_\_\_\_\_\_\_*  *SE-happy \_\_\_\_\_\_\_\_\_\_\_\_* *95% CIhappy* [\_\_\_\_\_\_\_\_\_\_\_\_]

2) Let’s look at the testable assumptions (Circle/underline one).

Homogeneity of variance check (Levene’s test) – (Assumption met/Assumption not met)

Sphericity check (Mauchly’s test) – (Assumption met/Assumption not met)

*\*Remember, if the sphericity assumption is not met, we report Greenhouse-Geisser- corrected values*

3) Identify whether there was at least one difference between the levels of the factor

*F \_\_\_\_\_\_\_\_\_\_\_\_ dfbetween \_\_\_\_\_\_\_\_\_\_\_\_ dfwithin \_\_\_\_\_\_\_\_\_\_\_\_*

*p \_\_\_\_\_\_\_\_\_\_\_\_ ηp2 \_\_\_\_\_\_\_\_\_\_\_\_*

4) If there were differences between any levels of the factor, determine where the differences lie. If there were no differences between any levels of the factor, you only need to report that there was a non-significant ANOVA result.

*Tukey HSDangry-neutral: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDangry-happy: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDneutral-happy: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

5) Let’s put these results in the correct format! Please underline or fill in the relevant phrases and values.

“There was a [significant/not significant] effect for emotionality,

*F*(\_\_\_,\_\_\_) =\_\_\_, *p* = \_\_\_, *ηp2* = \_\_\_.”

If there was a significant effect:

Significant differences [existed/did not exist] between angry and neutral words, *t*(\_\_\_) = \_\_\_, *p* = \_\_\_. Significant differences [existed/did not exist] between angry and happy words, *t*(\_\_\_) = \_\_\_, *p* = \_\_\_. Finally, reliable differences [existed/did not exist] between neutral and happy words, *t*(\_\_\_) = \_\_\_, *p* = \_\_\_.

If there was not a significant effect, you are done reporting results!

Let’s try one more. I would like you test the hypothesis that participants differed in how they responded to the frequency (i.e., commonality) of words.

1) Let’s describe the data.

*Mlow \_\_\_\_\_\_\_\_\_\_\_\_ SE-low \_\_\_\_\_\_\_\_\_\_\_\_ 95% CIlow* [\_\_\_\_\_\_\_\_\_\_\_\_]

*Mmedium \_\_\_\_\_\_\_\_\_\_\_\_ SE-medium \_\_\_\_\_\_\_\_\_\_\_\_ 95% CImedium* [\_\_\_\_\_\_\_\_\_\_\_\_]

*Mhigh \_\_\_\_\_\_\_\_\_\_\_\_*  *SE-high \_\_\_\_\_\_\_\_\_\_\_\_* *95% CIhigh* [\_\_\_\_\_\_\_\_\_\_\_\_]

2) Let’s look at the testable assumptions (Circle/underline one).

Homogeneity of variance check (Levene’s test) – (Assumption met/Assumption not met)

Sphericity check (Mauchly’s test) – (Assumption met/Assumption not met)

*\*Remember, if the sphericity assumption is not met, we report Greenhouse-Geisser- corrected values*

3) Identify whether there was at least one difference between the levels of the factor

*F \_\_\_\_\_\_\_\_\_\_\_\_ dfbetween \_\_\_\_\_\_\_\_\_\_\_\_ dfwithin \_\_\_\_\_\_\_\_\_\_\_\_*

*p \_\_\_\_\_\_\_\_\_\_\_\_ ηp2 \_\_\_\_\_\_\_\_\_\_\_\_*

4) If there were differences between any levels of the factor, determine where the differences lie. If there were no differences between any levels of the factor, you only need to report that there was a non-significant ANOVA result.

*Tukey HSDlow-medium: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDlow-high: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

*Tukey HSDmedium-high: t \_\_\_\_\_\_\_\_\_\_\_\_ df \_\_\_\_\_\_\_\_\_\_\_\_ p \_\_\_\_\_\_\_\_\_\_\_\_*

5) Now, put the results in the correct format using the same phrasing as we used for the emotionality ANOVA.

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