Psych 315, Winter 2021, Homework 10

Due Friday, March 12th by midnight (PST).

Name ____________________________ ID ____________________________

Section [AA] (Natalie), [AB] (Natalie), [AC] (Ryan), [AD] (Ryan), [AE] (Kelly), [AE] (Kelly)

Problem 1 Does how much time you spend playing video games vary with what kind of computer you have?

<table>
<thead>
<tr>
<th></th>
<th>Apple</th>
<th>Other</th>
<th>PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>95</td>
<td>11</td>
<td>46</td>
</tr>
<tr>
<td>mean</td>
<td>0.76</td>
<td>0.36</td>
<td>1.74</td>
</tr>
<tr>
<td>SS</td>
<td>131.168</td>
<td>8.5456</td>
<td>184.3696</td>
</tr>
</tbody>
</table>

The grand mean (mean of video game playing for all 152 students) is 1.0276 hours per day.

a) Make a bar graph of these means with the error bars representing the standard error of the mean:

1. Calculate the standard deviation from SS: 
   \[ s_x = \sqrt{\frac{SS}{n-1}} \]

2. Calculate the standard error of the mean from \( s_\bar{x} \): 
   \[ s_\bar{x} = \frac{s_x}{\sqrt{n}} \]

You’ll be filling in the following summary table in the remaining steps:
<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>F_{crit}</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Calculate $SS_{bet}$ by calculating the sums of squared deviations of each mean from the grand mean (1.0276), scaling each SS by its sample size.

$$SS_{bet} = \sum n(\bar{X} - \bar{X})^2$$

Put the result in the table above.

c) Calculate the degrees of freedom for $SS_{bet}$, which is the number of groups - 1. Calculate $MS_{bet}$ by dividing $SS_{bet}$ by its degrees of freedom:

$$MS_{bet} = \frac{SS_{bet}}{df_{bet}}$$

Put the result in the table above.

d) Calculate $SS_w$ by adding up the SS for each of the 3 groups. Put the value in the table above.
e) Calculate the degrees of freedom \( df_w \) for \( SS_w \), which is the total number of scores minus the number of groups \((n_{total} - k)\). Calculate \( MS_w \) by dividing \( SS_w \) by \( df_w \). Put the value in the table above.

f) Calculate the F statistic by dividing:

\[
F = \frac{MS_{bet}}{MS_w}
\]

Put the value in the table above.

g) Find the critical value of F from Table E, using a value of alpha \( \alpha = 0.05 \). Use the F-calculator to find the p-value for this test. Place the values in the table above.

h) State your conclusions using APA format
**Problem 2** Conduct the hypothesis test in problem 1 using R. From the survey, the amount of video game playing can be found in the field 'games_hours' and their choice of computer is in 'computer'. Don’t worry about plotting the results or calculating the effect size.

Hint: Start with the example in the R script from the one factor ANOVA tutorial: [OneFactorANOVA.R](#)