Lab activity for P554 Statistics

Name: ____________________________________

Data from Chapter 10, Exercise 7. Method ("method") is a fixed factor, therapist ("therap") is a random factor. Here's output from SPSS:

```
UNIANOVA ratings  BY method therap   /* notice this is specified as fixed effects */
/METHOD = SSTYPE(3)
/INTERCEPT = INCLUDE
/CRITERIA = ALPHA(.05)
/TEST method vs method*therap  /* notice extra test with interaction error term */
/DESIGN = method therap method*therap .
```

Dependent Variable: ratings

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>230.000(a)</td>
<td>8</td>
<td>28.750</td>
<td>3.275</td>
<td>.007</td>
</tr>
<tr>
<td>Intercept</td>
<td>79380.000</td>
<td>1</td>
<td>79380.000</td>
<td>9043.291</td>
<td>.000</td>
</tr>
<tr>
<td>method</td>
<td>120.000</td>
<td>2</td>
<td>60.000</td>
<td>6.835</td>
<td>.003</td>
</tr>
<tr>
<td>therap</td>
<td>43.333</td>
<td>2</td>
<td>21.667</td>
<td>2.468</td>
<td>.099</td>
</tr>
<tr>
<td>method * therap</td>
<td>66.667</td>
<td>4</td>
<td>16.667</td>
<td>1.899</td>
<td>.132</td>
</tr>
<tr>
<td>Error</td>
<td>316.000</td>
<td>36</td>
<td>8.778</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79926.000</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>546.000</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R Squared = .421 (Adjusted R Squared = .293)

Dependent Variable: ratings

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast</td>
<td>120.000</td>
<td>2</td>
<td>60.000</td>
<td>3.600</td>
<td>.128</td>
</tr>
<tr>
<td>Error(a)</td>
<td>66.667</td>
<td>4</td>
<td>16.667</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a method * therap

1. Estimate the power of the test of method. (See top of p. 493 and Eqn. 21 on p. 487; also last slide of lecture.) Show your work and indicate where the values come from.

\[
\text{est } \phi =
\]

\[
df_{\text{num}} = \quad \quad df_{\text{denom}} =
\]

approx. power =

2a. How many total subjects are used in the current design?

2b. Suppose that there were 5 therapists and 3 subjects per therapist. How many total subjects would there be in the design?
2c. Using the MS terms from the current design, estimate the power of the test of method if there were 5 therapists and 3 subjects per therapist. Show your work.

\[ \text{est } \phi = \]

\[ \text{df}_{\text{num}} = \quad \text{df}_{\text{denom}} = \]

approx. power =

3a. Estimate the power for 3 therapists and 9 subjects per therapist.

\[ \text{est } \phi = \]

\[ \text{df}_{\text{num}} = \quad \text{df}_{\text{denom}} = \]

approx. power =

3b. Estimate the power for 9 therapists and 3 subjects per therapist.

\[ \text{est } \phi = \]

\[ \text{df}_{\text{num}} = \quad \text{df}_{\text{denom}} = \]

approx. power =

4. Starting with the formula for estimated phi at the top of p. 493, plug in the expressions from Equation 21 on p. 487 and simplify (i.e., cancel out as many terms as possible). Does estimated phi depend on \( n \) (number of subjects per cell)? Does estimated phi depend on \( b \) (number of levels of the random factor)? So how do \( n \) or \( b \) have any influence on the estimated power?