SW 430: Research Methods in Social Work I
Final Examination

1.26. When we adhere to a belief because it has been endorsed by someone who has been socially or politically defined as a qualified producer of knowledge, we are using the
   a. Method of Argument   d. Method of Rationality
   b. Method of Authority   e. Method of Science
   c. Method of Intuition

1.38. “Last week, Elwood’s BAT indicated that he had consumed alcohol. His probation officer changed his testing schedule from two random tests a month to two random tests a week.
“At the Elwood’s next BAT, his results indicated that he had consumed alcohol. His probation officer changed his testing schedule from two random tests a week to daily testing.
“At his BAT the next day (today), Elwood’s results indicated that he had consumed alcohol.
“I think that the results of Elwood’s test tomorrow will indicate consumption of alcohol.”
Does this inductive argument adequately support the conclusion that the results of tomorrow’s test will indicate that Elwood consumed alcohol or is the argument fallacious? Give one reason why or why not. (Your explanation should contain less than thirty words.)
   SUPPORTED   FALLACIOUS
       (circle your answer)

1.82. When we work to ensure “reasonable, nonexploitative, and carefully considered procedures and their fair administration; fair distribution of costs and benefits among persons and groups,” we are implementing which one of the following ethical principles.
   a. Beneficence   d. Justice
   b. Competence     e. Respect
   c. Comprehension

2.02. S.S. Stevens defined four levels of measurement used to classify measurement schemes: Nominal, Ordinal, Interval, and Ratio.
For each of the following, identify the level of measurement by writing Nominal, Ordinal, Interval, or Ratio in the space provided. Do NOT use initials.
2.02.08. __________ Classification of age (1 = infant, 2 = toddler, 3 = pre-school child, 4 = pre-adolescent child, 5 = adolescent, 6 = young adult, 7 = middle-aged adult, 8 = old adult, or 9 = very old adult).
2.02.26. __________ Number of people in a family
2.02.31. __________ Rating of frequency of negative thoughts about self (evaluation of oneself as a “bad” person) in one day: 0 = none of the time, 1 = rarely, 2 = a little of the time, 3 = some of the time, 4 = a good part of the time, 5 = most of the time, 6 = all of the time.
2.02.34. __________ Time spent on task (in minutes).
2.02.35. __________ Years of formal education
3.21. The score \((Y)\) in the following table represents the number of times a child received first aid at the Gomer Pyle Fine Arts and Letters Summer Boot Camp. \(f\) represents the number of children at that particular score.

<table>
<thead>
<tr>
<th>(Y)</th>
<th>(f)</th>
<th>(c)</th>
<th>(c%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>5</td>
<td></td>
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<tr>
<td>4</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.21.1. Fill in the cumulative frequency \((c\)\) column so that it shows the number of children at or below each score level.

3.21.2. Fill in the cumulative percentage frequency \([c\%\) = \((c\)\( /n\)\)\()\) column so that it shows the percentage of children at or below each score level. Round your answer to two decimal places.

Please show your work.

4.20. We typically set the criterion maximum probability of committing a Type I Error – \(P[\text{Type I Error}]\) – at \(\alpha = .05\).

This implies that the criterion probability of not committing a Type I Error – \(P[\sim\text{Type I Error}] = 1 – P[\text{Type I Error}]\) – would be \(1 – \alpha = .95\).

We have compared the effectiveness of \(j = 3\) programs using \(c = 3\) pairwise comparisons:
1. Program 1 vs Program 2
2. Program 1 vs. Program 3
3. Program 2 vs. Progam 3.

For each pairwise comparison, we used a statistical hypothesis test at \(\alpha = .05\) to evaluate the outcome data. Evaluate the following across these \(c = 3\) comparisons.

4.20.1. Assuming that the Null Hypothesis is true, what is the probability that you will not commit a Type I Error on at least one of the \(c = 3\) pairwise comparisons?

Please show your work and round your final answer to three decimal places.

\((1 – \alpha)^c = \) ______________________

4.20.2. Assuming that the Null Hypothesis is true, what is \(\alpha_{exp}\) (the experiment-wise \(\alpha\); the probability that you will commit a Type I Error on at least one of the \(c = 3\) pairwise comparisons)?

Please show your work and round your final answer to three decimal places.

\(\alpha_{exp} = \) ______________________
4.33. You want to evaluate the support for publicly-funded charter schools in the state. You have reason to believe that type of school district (large urban, medium urban, small urban, suburban, or rural districts) may affect attitude, so you want to make sure that individuals are surveyed in proportion to the representation of their type of school district in the population.

You have a sampling frame where households are classified according to location in one of these five types of school district.

You randomly select individuals so that the proportions from each of the five types of district are equal in the sample and the population.

If you follow this procedure you have drawn a(n)

a. purposive sample
b. quota sample
c. random sample
d. stratified sample
e. systematic sample

5.10. A numerical characteristic of a population (such as average age) is called a(n)________________________

while the same numerical characteristic of a sample is called a(n) ____________________.

5.23. The score (Y) in the following table represents the score on a social skills checklist.

<table>
<thead>
<tr>
<th>Y</th>
<th>f</th>
<th>cf</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-80</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>71-75</td>
<td>2</td>
<td>58</td>
</tr>
<tr>
<td>66-70</td>
<td>3</td>
<td>56</td>
</tr>
<tr>
<td>61-65</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>56-60</td>
<td>11</td>
<td>45</td>
</tr>
<tr>
<td>51-55</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td>46-50</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>41-45</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>36-40</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>31-35</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>26-30</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>21-25</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Use the following formula to find the score at the 75th percentile.

\[ Y_p = Y_L + \frac{n(p) - cf_b}{f_i} \]

where

\[ Y_p \] stands for the score at the percentile point

\[ Y_L \] stands for the exact lower limit of the interval containing the score at the percentile

\[ p \] stands for the percentile expressed as a proportion

\[ n \] stands for the total number of scores in distribution

\[ cf_b \] stands for the cumulative frequency up to lower limit of interval containing \( Y_p \)

\[ f_i \] stands for the number of scores within the interval containing \( Y_p \)

\[ i \] stands for the interval width (size of interval), \( i = Y_U - Y_L \)

Please show your work and round your final answer to one decimal place.

5.23.1. \( n(p) = \) __________
5.23.2. \( Y_L = \) __________
5.23.3. \( cf_b = \) __________
5.23.4. \( f_i = \) __________
5.23.5. \( i = \) __________
5.23.6. \( Y_{75} = \) __________
5.35. A distribution of \( n = 1600 \) scores has the following characteristics.

\[
\begin{align*}
\bar{Y} & = 16 \\
Y_{.50} & = 26 \\
Y_{\text{Mode}} & = 26 \\
Y_{\text{Max}} & = 32 \\
Y_{\text{Min}} & = 2
\end{align*}
\]

What type of frequency distribution would you expect this to be?

a. bimodal  

b. leptokurtic  

c. platykurtic  

d. positively skewed  

e. negatively skewed

5.43. If Elwood has a score at the 95\textsuperscript{th} percentile, this means that ______ percent of the scores are greater than or equal to his.

5.52. The following scores represent the number of visits made to Louis Rose Community Mental Health Clinic for a sample of \( n = 12 \) clients.

Visits: \( \{Y|Y = 2, 5, 5, 4, 5, 5, 1, 3, 8, 6, 8, 7\} \)

Calculate the following and SHOW YOUR WORK. Round your final answer to one decimal place.

5.52.1. Mean =  

5.52.2. Median =  

5.52.3. Mode =  

5.75. The following distribution of scores has a mean of \( \bar{Y} = 6 \). Calculate the sum of squares – \( SS_Y \) – and write the answer in the space provided.

Please show your work in the table.

<table>
<thead>
<tr>
<th>Score ((Y))</th>
<th>(Y - \bar{Y})</th>
<th>((Y - \bar{Y})^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
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<td>4</td>
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</table>

\( SS_Y = \)  

5.83. The mean of a population \((n = 16)\) of scores is \( \mu_Y = 64 \). The sum of squares is \( SS_Y = 1024 \).

5.83.1. What is the variance of this population? \( \sigma^2 = \)  

5.83.2. What is the standard deviation of this population? \( \sigma = \)  

Show your work and round your final answer to the nearest whole number.
5.97. Many clinical assessment scales are standardized, which is to say that the scores are normally distributed with a known population mean and standard deviation. One example of such scales are the Wechsler IQ scales that have a mean, $\mu = 100$, and a standard deviation, $\sigma = 15$. By converting scores on these tests to z-scores, where

$$z = \frac{Y - \mu}{\sigma},$$

one may determine the distance from the mean to the score in units of standard deviation. This allows you to determine what proportion of the population would be expected to obtain scores below (or above) the score being evaluated.

Jake took the most recent revision of the Wechsler Intelligence Scale for Children (WISC) and received a Full Scale score of 112.

5.97.1. Jake's Full Scale WISC score is (enter the correct value to two decimal places)

<table>
<thead>
<tr>
<th>standard deviations</th>
<th>ABOVE THE MEAN</th>
<th>BELOW THE MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(circle correct answer)</td>
</tr>
</tbody>
</table>

5.97.2. What proportion of the population would be expected to score below Jake on the WISC Full Scale? Refer to Table of the Standard Normal Distribution (z) (Proportions of area under the normal curve) to obtain this proportion.

Proportion below Jake's score (to four decimal places) = ________________

6.14. For depressed individuals, intensity of stress ($X$) has been found to be related to help-seeking behavior ($Y$ = percentage seeking assistance within one week).

A prediction equation has been derived with a slope of $B_1 = -0.4$ and Y-intercept of $B_0 = +4.8$.

6.14.1. Write the prediction equation in simplest form using the $\hat{Y} = b_0 + b_1X$ format. __________________

6.14.2. On the following table, calculate predicted values for help seeking ($\hat{Y}$) for stress intensity measures from $X = 0$ to $X = 10$.

<table>
<thead>
<tr>
<th>$X$</th>
<th>$\hat{Y}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Show your calculations in the table.
6.14.3. On the following graph, draw the prediction line for help seeking over the range of stress intensity from $X = 0$ to $X = 10$.

![Graph showing suicide risk vs stress rating]

6.62. We know that the correlation between shoe size and vocabulary test score is $r = +0.35$ for elementary school children.
What is the proportion of variance in vocabulary score explained (PVE) by shoe size?

\[ \text{PVE} = \underline{\underline{\underline{}}} \]

Please show your work and round your answer to two decimal places.

7.15 The following table shows data on reported reliability coefficients of five tests designed to measure an individual’s tendency to respond aggressively.

<table>
<thead>
<tr>
<th>Test</th>
<th>Alpha</th>
<th>Retest</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.80</td>
<td>.87</td>
</tr>
<tr>
<td>B</td>
<td>.80</td>
<td>.80</td>
</tr>
<tr>
<td>C</td>
<td>.90</td>
<td>.83</td>
</tr>
<tr>
<td>D</td>
<td>.90</td>
<td>.90</td>
</tr>
<tr>
<td>E</td>
<td>.90</td>
<td>.97</td>
</tr>
</tbody>
</table>

The alpha reliability coefficients for each test are based data collected from a single administration of the test to a single group of individuals.
The retest reliability coefficients for each test are based upon the correlations between test scores for two administrations of the test to a single group of individuals. The test administrations were separated by seven days.
We want to select the test that would be most sensitive to change in an individual’s tendency to respond aggressively.
Based solely upon the reliability coefficient data in the table, which of the five tests would be most sensitive to change. Please circle the correct answer.

a. Test A  d. Test C  e. Test E
b. Test B  e. Test D

test-retest

7.22. We administered a 20-item instrument (self-report questionnaire) to a single group of \( n = 100 \) individuals. After one week, we administered the same instrument to the same group of \( n = 100 \) individuals. We scored the items for the instruments filled out at the first administration for each of the \( n = 100 \) individuals in our sample. We added the item scores to obtain a total score for the first administration tests. Then we scored the items for the instruments presented a week later at second test administration for each of the \( n = 100 \) individuals in our sample. We added the item scores to obtain a total score for the second administration tests. This gave us a set of ordered pairs of first administration and second administration test scores for each of the \( n = 100 \) individuals in our sample. We calculated the correlation coefficient for the pairs of first and second administration test scores scores. We call this correlation coefficient a ________________________________ reliability coefficient. Please circle the correct answer.

a. coefficient alpha  b. parallel administrations  c. parallel forms  d. split-half  e. split-plot  f. test-retest

8.11. The population of Michigan public school seventh graders was evaluated on an empathy examination. The mean score was \( \mu_Y = 42 \) and the standard deviation was was \( \sigma_Y = 15 \). For a sample size of \( n = 25 \), what is the value of the standard error of the mean \( (\sigma_{\bar{Y}}) \)?

\[
\sigma_{\bar{Y}} = ________________
\]

Show your work and round your final answer to one decimal place.

8.30. We administered the Generalized Contentment Scale (GCS) to a random sample of \( n = 64 \) clients seen at the Community Service Clinic last. The statistics on the GCS scores for this group were \( \bar{Y} = 45 \quad s = 16 \quad s_{\bar{Y}} = 2 \)

Calculate a 95% confidence interval around the sample mean to estimate the upper and lower limits for the mean GCS score for all clients seen at the clinic last year. Refer to the Table of Critical Values for the Student \( t \) to obtain the \( t \) statistic.

Show your work and round your final answer to three decimal places.

\[
\hat{\mu}_{\text{Upper}} = \bar{Y} + (t_{0.05; df}) \cdot (s_{\bar{Y}}) \\
\hat{\mu}_{\text{Lower}} = \bar{Y} - (t_{0.05; df}) \cdot (s_{\bar{Y}})
\]

Upper Limit (\( \hat{\mu}_{\text{Upper}} \)) = ________________________________

Lower Limit (\( \hat{\mu}_{\text{Lower}} \)) = ________________________________

9.02. The probability of rejecting the Null Hypothesis when the Alternative Hypothesis is true is so important that it has a name. The name is ________________________________.

9.03. ________________________________ Error occurs when you fail to reject the Null Hypothesis and the Alternate Hypothesis is true.
9.40 Circle the two most important (most likely to lead to an incorrect decision if violated) assumptions of the independent samples Student t test.
   a. Sample scores are independent of each other.
   b. Sampling units are drawn from normally distributed populations.
   c. Population dependent measure variances are equal (\( \sigma^2_1 = \sigma^2_2 \)).
   d. Sampling units are randomly selected and randomly assigned to levels of the independent variable.
   e. The dependent variable is measured at the interval or ratio level.
   f. Sample sizes are equal (\( n_1 = n_2 \)).

12.11. The following represent level of functioning statistics for two groups of subjects receiving different interventions.

\[
\begin{align*}
\bar{Y}_1 &= 39 & \bar{Y}_2 &= 54 \\
s_1 &= 11.96 & s_2 &= 11.76 \\
n_1 &= 20 & n_2 &= 22 \\
s_{1,2} &= 11.86
\end{align*}
\]

Fill in the following answers. Show your work and round your final answers to four decimal places. However, do not use rounded answers in calculations,

12.11.1. Calculate \( s_{\overline{Y}_1, \overline{Y}_2} \).

\[ s_{\overline{Y}_1, \overline{Y}_2} = \frac{1}{n_1} + \frac{1}{n_2} \]

12.11.2. Calculate \( t_{obt} \).

\[ t_{obt} = \frac{\bar{Y}_1 - \bar{Y}_2}{s_{\overline{Y}_1, \overline{Y}_2}} \]

12.11.3. What are the degrees of freedom for \( t_{obt} \)?

\[ df = \]

12.11.4. Look up \( t_{crit} \) for nondirectional \( \alpha = .05 \).

\[ t_{crit} = t(\alpha/2; df) = \]

12.11.5. Is the difference between the group means statistically significant at non-directional \( \alpha = .05 \)? (circle your answer).

YES   NO

14.10. We wish to evaluate the relative effectiveness of two training packages (videotape or workbook) designed to help students deal with math anxiety. Each of the two training packages consisted of five weekly modules that subjects were to complete at home.

We randomly selected the subjects in our study from students who presented at a university clinic for participation in a treatment study on how to cope with math anxiety.

We randomly assigned each subject to receive one of two training packages: a videotape treatment package or a workbook treatment package. The content presented in the videotapes and the workbooks was identical.

At the beginning of the program, each subject met individually with a social worker for thirty minutes. At this meeting, the social worker oriented the subject to the program, gave the subject either a videotape or workbook covering the material in the first module and instructions for the use of the module.

At the second through fifth weekly sessions, each subject met individually with his or her social worker for ten minutes to review progress, receive the next training module, and instructions for the use of the module.

At the sixth session (after completion of the program), each subject met individually with his or her social worker for thirty minutes to review progress, and discuss how to maintain gains.
At this appointment, each subject rated his or her level of anxiety about mathematics. Each subject used the following seven level scale to rate intensity of anxiety about mathematics:

- 0 = no anxiety
- 1 = very weak anxiety
- 2 = weak anxiety
- 3 = moderate anxiety
- 4 = strong anxiety
- 5 = very strong anxiety
- 6 = anxiety as strong as it could possibly be

We compared math anxiety ratings between the two training packages.

14.10.1. The independent variable in this study refers to which one of the following.

- a. (1) anxiety about mathematics, (2) other anxiety
- b. anxiety rating on seven level scale.
- c. (1) anxiety reduction videotape, (2) anxiety reduction workbook.
- d. five modules.
- e. length of time in training.
- f. math anxiety.
- g. pre-participation vs. post-participation status
- h. presenting problem
- i. (1) social worker, (2) student
- j. (1) students with math anxiety, (2) students without math anxiety.
- k. six weeks.
- l. training package.

14.10.2. Levels of the independent variable in this study refer to which one of the following.

- a. (1) anxiety about mathematics, (2) other anxiety
- b. anxiety rating on seven level scale.
- c. (1) anxiety reduction videotape, (2) anxiety reduction workbook.
- d. five modules.
- e. length of time in training.
- f. math anxiety.
- g. pre-participation vs. post-participation status
- h. presenting problem
- i. (1) social worker, (2) student
- j. (1) students with math anxiety, (2) students without math anxiety.
- k. six weeks.
- l. training package.

14.10.3. The dependent variable in this study refers to which one of the following.

- a. (1) anxiety about mathematics, (2) other anxiety
- b. anxiety rating on seven level scale.
- c. (1) anxiety reduction videotape, (2) anxiety reduction workbook.
- d. five modules.
- e. length of time in training.
- f. math anxiety.
- g. pre-participation vs. post-participation status
- h. presenting problem
- i. (1) social worker, (2) student
- j. (1) students with math anxiety, (2) students without math anxiety.
- k. six weeks.
- l. training package.

14.10.4. The dependent measure in this study refers to which one of the following.

- a. (1) anxiety about mathematics, (2) other anxiety
- b. anxiety rating on seven level scale.
- c. (1) anxiety reduction videotape, (2) anxiety reduction workbook.
- d. five modules.
- e. length of time in training.
- f. math anxiety.
- g. pre-participation vs. post-participation status
- h. presenting problem
- i. (1) social worker, (2) student
- j. (1) students with math anxiety, (2) students without math anxiety.
- k. six weeks.
- l. training package.

14.10.5. Identify the level of measurement for the dependent measure.

- a. Nominal
- b. Ordinal
- c. Interval
- d. Ratio
14.10.6. What type of research design was used?

a. Single sample comparison
[Uses a single sample. Evaluates difference between sample dependent measure values and known or theoretical population dependent measure values.]

b. \( j = 2 \) dependent samples comparison: pre-post
[Uses a single sample. Evaluates change between pre-test and post-test dependent measure values for sampling units.]

c. \( j = 2 \) dependent samples comparison: matched pairs
[Uses two samples of matched sampling units (pairs). Evaluates difference between dependent measure values for matched pairs of sampling units.]

d. \( j > 2 \) independent samples comparison:
[Uses samples formed by assigning sampling units to two different levels of the independent variable or uses samples selected from two different populations. Evaluates difference between dependent measure values for the two samples.]

e. \( j > 2 \) independent samples comparison:
[Uses samples formed by assigning sampling units to each of the \( j > 2 \) levels of the independent variable or uses samples selected from each of the \( j > 2 \) populations. Evaluates differences among dependent measure values for all samples.]

14.10.7. Please evaluate this research vignette using the assumptions for statistical hypothesis tests to determine which, if any, statistical hypothesis test would be appropriate to evaluate the data from this research.

Begin by briefly discussing whether the design and data meet the two basic (and most important) assumptions for all statistical hypothesis tests: the randomness assumption and the independence assumption.

Fully discuss how the design meets or does not meet the criteria for each of these assumptions. Unequivocally state whether or not each of these assumptions are met.

Based upon this brief discussion, unequivocally state whether or not any statistical hypothesis test would be appropriate.

If you decide that some test would be appropriate, evaluate how this study meets or does not meet the additional assumptions for a specific statistical test. Otherwise, go to the next question.

Identify the tests appropriate for the research design used in this study.

Then identify which of these tests would be ruled out due to the scaling of the dependent measure.

If appropriate, identify which of the remaining tests would be ruled out due to the type of distribution of the dependent measure scores.

Your discussion of the assumptions must support your conclusion about which, if any, test is appropriate. Your entire explanation should contain fewer than 200 words.
14.10.8. Which (if any) of the following statistical hypothesis tests should we use to determine if there is a statistically significant effect?

a. 2 x k chi-square test of independence
b. dependent samples Student t test
c. goodness-of-fit chi-square test
d. independent samples Student t test
e. j x k chi-square test of independence
f. Kruskal-Wallis test
g. McNemar change test
h. one-way analysis of variance
i. single sample Kolmogorov-Smirnov test
j. single sample Student t test
k. Wilcoxon/Mann-Whitney test
l. Wilcoxon T (matched pair, signed ranks) test
m. none of these tests would be appropriate

14.21. We wish to compare the effectiveness of two interventions with clients having unrealistic body image (body concept): a psychoanalytically-oriented intervention (aimed at ending self-hatred resulting from negative body image) or a cognitive restructuring intervention (aimed at eliminating cognitive distortions about body image).

We randomly selected clients with body image problems from two community mental health centers for participation in a study comparing two intervention conditions.

We assigned clients at one center to receive the psychoanalytically-oriented intervention while clients at the other center received the cognitive restructuring intervention.

Subjects in each of the intervention conditions had individual meetings with a clinical social worker for 50 minutes once a week for 12 weeks.

At post-treatment each client self rated satisfaction with body on a seven-level satisfaction scale:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>extremely dissatisfied</td>
</tr>
<tr>
<td>1</td>
<td>dissatisfied</td>
</tr>
<tr>
<td>2</td>
<td>slightly dissatisfied</td>
</tr>
<tr>
<td>3</td>
<td>neither satisfied nor dissatisfied</td>
</tr>
<tr>
<td>4</td>
<td>slightly satisfied</td>
</tr>
<tr>
<td>5</td>
<td>satisfied</td>
</tr>
<tr>
<td>6</td>
<td>extremely satisfied</td>
</tr>
</tbody>
</table>

We compared client satisfaction ratings between the two interventions.

14.21.1. The independent variable in this study refers to which of the following.

a. (1) before intervention, (2) after intervention.
b. body concept.
c. (1) first center, (2) second center.
d. intervention condition.
e. (1) intervention, (2) no intervention.
f. mental health center.
g. (1) psychoanalytically-oriented intervention, (2) cognitive restructuring intervention.
h. pre- vs. post-intervention status.
i. presenting problem.
j. satisfaction self ratings.
k. twelve weeks.

14.21.2. Levels of the independent variable in this study refer to which of the following.

a. (1) before intervention, (2) after intervention.
b. body concept.
c. (1) first center, (2) second center.
d. intervention condition.
e. (1) intervention, (2) no intervention.
f. mental health center.
g. (1) psychoanalytically-oriented intervention, (2) cognitive restructuring intervention.
h. pre- vs. post-intervention status.
i. presenting problem.
j. satisfaction self ratings.
k. twelve weeks.
14.21.3. The dependent variable in this study refers to which of the following.
   a. (1) before intervention, (2) after intervention.
   b. body concept.
   c. (1) first center, (2) second center.
   d. intervention condition.
   e. (1) intervention, (2) no intervention.
   f. mental health center.
   g. (1) psychoanalytically-oriented intervention, (2) cognitive restructuring intervention.
   h. pre- vs. post-intervention status.
   i. presenting problem.
   j. satisfaction self ratings.
   k. twelve weeks.

14.21.4. The dependent measure in this study refers to which of the following.
   a. (1) before intervention, (2) after intervention.
   b. body concept.
   c. (1) first center, (2) second center.
   d. intervention condition.
   e. (1) intervention, (2) no intervention.
   f. mental health center.
   g. (1) psychoanalytically-oriented intervention, (2) cognitive restructuring intervention.
   h. pre- vs. post-intervention status.
   i. presenting problem.
   j. satisfaction self ratings.
   k. twelve weeks.

14.21.5. Identify the level of measurement for the dependent measure.
   a. Nominal
   b. Ordinal
   c. Interval
   d. Ratio

14.21.6. What type of research design was used?
   a. Single sample comparison
      [Uses a single sample. Evaluates difference between sample dependent measure values and known or theoretical population dependent measure values.]
   b. j = 2 dependent samples comparison: pre-post
      [Uses a single sample. Evaluates change between pre-test and post-test dependent measure values for sampling units.]
   c. j = 2 dependent samples comparison: matched pairs
      [Uses two samples of matched sampling units (pairs). Evaluates difference between dependent measure values for matched pairs of sampling units.]
   d. j = 2 independent samples comparison:
      [Uses samples formed by assigning sampling units to two different levels of the independent variable or uses samples selected from two different populations. Evaluates difference between dependent measure values for the two samples.]
   e. j > 2 independent samples comparison:
      [Uses samples formed by assigning sampling units to each of the j>2 levels of the independent variable or uses samples selected from each of the j>2 populations. Evaluates differences among dependent measure values for all samples.]

14.21.7. Please evaluate this research vignette using the assumptions for statistical hypothesis tests to determine which, if any, statistical hypothesis test would be appropriate to evaluate the data from this research.

   Begin by briefly discussing whether the design and data meet the two basic (and most important) assumptions for all statistical hypothesis tests: the \textit{randomness} assumption and the \textit{independence} assumption.

   Fully discuss how the design meets or does not meet the criteria for each of these assumptions. Unequivocally state whether or not each of these assumptions are met.

   Based upon this brief discussion, unequivocally state whether or not any statistical hypothesis test would be appropriate.
If you decide that some test would be appropriate, evaluate how this study meets or does not meet the additional assumptions for a specific statistical test. Otherwise, go to the next question.

Identify the tests appropriate for the research design used in this study.

Then identify which of these tests would be ruled out due to the scaling of the dependent measure.

If appropriate, identify which of the remaining tests would be ruled out due to the type of distribution of the dependent measure scores.

Your discussion of the assumptions must support your conclusion about which, if any, test is appropriate.

Your entire explanation should contain fewer than 200 words.

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

14.21.8. Which (if any) of the following statistical hypothesis tests should we use to determine if there is a statistically significant effect?

a. 2 x k chi-square test of independence
b. dependent samples Student t test
c. goodness-of-fit chi-square test
d. independent samples Student t test
e. j x k chi-square test of independence
f. Kruskal-Wallis test
g. McNemar change test
h. one-way analysis of variance
i. single sample Kolmogorov-Smirnov test
j. single sample Student t test
k. Wilcoxon/Mann-Whitney test
l. Wilcoxon T (matched pair, signed ranks) test
m. none of these tests would be appropriate

14.32. We are interested in evaluating the effect of twelve weeks of individual nondirective counseling on depression for a randomly selected sample of n = 279 depressed clients.

Since global negative self-evaluations (evaluating self as totally bad, incompetent, useless, unlovable, etc.) are a major component of depression, we decided to assess the change in number of negative self-evaluations made by clients in the week preceding the onset of the counseling intervention versus the week following the end of the counseling intervention.

For one week before beginning participation in counseling (intervention status: pre-intervention - no intervention received), each client recorded the number of times he or she evaluated themselves negatively.

For the week after the counseling intervention was completed (intervention status: post-intervention – intervention received), each client kept a post-test record of the number of times he or she evaluated themselves negatively.

Change in negative self-evaluations was measured by subtracting an individual’s pre-test negative self-evaluation score from his or her post-test negative self-evaluation score. The resulting difference represents the change in number of negative self-evaluations.

The change in number of negative self-evaluations had a bimodal and positively skewed frequency distribution (see chart).

We wish to know if there is sufficient evidence to conclude that an observed relationship between participation in nondirective counseling and change in magnitude of depression is “real” rather than a manifestation of sampling error.
14.32.1. The independent variable in this study refers to which of the following.

a. (1) bad, (2) unlovable, (3) incompetent, (4) useless.  
ed. depression.  
f. intervention status.

b. (1) bimodal distribution, (2) skewed distribution.  
g. (1) pre-intervention, (2) post-intervention.

c. change in number of negative self-evaluations.  
h. twelve weeks.

d. (1) clients who are depressed, (2) clients who are not depressed.

14.32.2. Levels of the independent variable in this study refer to which of the following.

a. (1) bad, (2) unlovable, (3) incompetent, (4) useless.  
ed. depression.  
f. intervention status.

b. (1) bimodal distribution, (2) skewed distribution.  
g. (1) pre-intervention, (2) post-intervention.

c. change in number of negative self-evaluations.  
h. twelve weeks.

d. (1) clients who are depressed, (2) clients who are not depressed.

14.32.3. The dependent variable in this study refers to which of the following.

a. (1) bad, (2) unlovable, (3) incompetent, (4) useless.  
ed. depression.  
f. intervention status.

b. (1) bimodal distribution, (2) skewed distribution.  
g. (1) pre-intervention, (2) post-intervention.

c. change in number of negative self-evaluations.  
h. twelve weeks.

d. (1) clients who are depressed, (2) clients who are not depressed.

14.32.4. The dependent measure in this study refers to which of the following.

a. (1) bad, (2) unlovable, (3) incompetent, (4) useless.  
ed. depression.  
f. intervention status.

b. (1) bimodal distribution, (2) skewed distribution.  
g. (1) pre-intervention, (2) post-intervention.

c. change in number of negative self-evaluations.  
h. twelve weeks.

d. (1) clients who are depressed, (2) clients who are not depressed.
14.32.5. Identify the level of measurement for the dependent measure.

a. Nominal  
b. Ordinal  
c. Interval  
d. Ratio

14.32.6. What type of research design was used?

a. Single sample comparison  
[Uses a single sample. Evaluates difference between sample dependent measure values and known or theoretical population dependent measure values.]

b. $j = 2$ dependent samples comparison: pre-post  
[Uses a single sample. Evaluates change between pre-test and post-test dependent measure values for sampling units.]

c. $j = 2$ dependent samples comparison: matched pairs  
[Uses two samples of matched sampling units (pairs). Evaluates difference between dependent measure values for matched pairs of sampling units.]

d. $j = 2$ independent samples comparison:  
[Uses samples formed by assigning sampling units to two different levels of the independent variable or uses samples selected from two different populations. Evaluates difference between dependent measure values for the two samples.]

e. $j > 2$ independent samples comparison:  
[Uses samples formed by assigning sampling units to each of the $j>2$ levels of the independent variable or uses samples selected from each of the $j>2$ populations. Evaluates differences among dependent measure values for all samples.]

14.32.7. *Please evaluate this research vignette using the assumptions for statistical hypothesis tests to determine which, if any, statistical hypothesis test would be appropriate to evaluate the data from this research.*

Begin by briefly discussing whether the design and data meet the two basic (and most important) assumptions for all statistical hypothesis tests: the *randomness* assumption and the *independence* assumption.

Fully discuss how the design meets or does not meet the criteria for *each* of these assumptions. Unequivocally state whether or not each of these assumptions are met. Based upon this brief discussion, unequivocally state whether or not *any* statistical hypothesis test would be appropriate.

*If you decide that some test would be appropriate*, evaluate how this study meets or does not meet the additional assumptions for a specific statistical test. Otherwise, go to the next question.

Identify the tests appropriate for the research *design* used in this study.

Then identify which of these tests would be ruled out due to the *scaling* of the dependent measure. If appropriate, identify which of the remaining tests would be ruled out due to the type of *distribution* of the dependent measure scores.

Your discussion of the assumptions must support your conclusion about which, if any, test is appropriate. Your entire explanation should contain fewer than 200 words.
14.32.8. Which (if any) of the following statistical hypothesis tests should we use to determine if there is a statistically significant effect?

a. 2 x k chi-square test of independence  
   b. dependent samples Student t test  
   c. goodness-of-fit chi-square test  
   d. independent samples Student t test  
   e. j x k chi-square test of independence  
   f. Kruskal-Wallis test  
   g. McNemar change test  
   h. one-way analysis of variance  
   i. single sample Kolmogorov-Smirnov test  
   j. single sample Student t test  
   k. Wilcoxon/Mann-Whitney test  
   l. Wilcoxon T (matched pair, signed ranks) test  
   m. none of these tests would be appropriate

15.53 We are planning a study on the relationship between night recreation programs and the frequency of property crimes. The dependent measure will be the difference between the number of property crime reports for the one year period before the implementation of the program (pre-test) and the one year period after the program has begun (post-test). We have reason to believe that the distribution of these change scores follows the form of a normal distribution. These data will be collected within neighborhoods (neighborhood = 16 contiguous blocks) randomly selected to participate in the study. To identify the appropriate test, you must identify

- the research design,
- tests appropriate to the research design and
- tests appropriate to the level at which the dependent (outcome) variable is being measured and, if relevant, to the distribution of dependent measure scores.

15.53.1. Research Design = __________________________

15.53.2. Appropriate Test = __________________________

You want to be able to detect a medium effect size (as defined by Cohen). Using non-directional $\alpha = .05$ and a power level of $1-\beta = .80$, how large a sample should you pick?

15.53.3. Total Sample Size = _________ Neighborhoods

10.03 Here is a descriptive statistics layout and ANOVA summary table for $j = 4$ groups with $n_j = 12$ subjects in each group.

<table>
<thead>
<tr>
<th>Levels of the Independent Variable (j)</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>$\bar{Y}_1 = 29.00$</td>
<td>$\bar{Y}_2 = 21.00$</td>
</tr>
<tr>
<td>$s_1 = 9.487$</td>
<td>$s_2 = 6.325$</td>
</tr>
<tr>
<td>$n_1 = 12$</td>
<td>$n_2 = 12$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares (SS)</th>
<th>df</th>
<th>Mean Square ($s^2$)</th>
<th>$F_{obt}$</th>
<th>$F_{crit}$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups [A]</td>
<td>1248</td>
<td>3</td>
<td>416.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups [S(A)]</td>
<td>4570</td>
<td>44</td>
<td>103.8636</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5818</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$$F_{obt} = \frac{MS_{Between}}{MS_{Within}} = \frac{MS_A}{MS_s}$$

$$\eta^2 = \frac{SS_{Between}}{SS_{Total}} = \frac{SS_A}{SS_{Total}}$$

In the summary table, enter the appropriate obtained value for $F$, the critical ($\alpha = .05$) value for $F_c$, and the value for the proportion of variance in dependent measure scores explained by level of the independent variable. Show your work and round your final answers to two decimal places.
Based upon the results of the analysis of variance, should you carry out *post hoc* comparisons among all pairs of dependent measure means for the \(j = 4\) groups? Circle your decision.

**YES**  **NO**

Explain your decision about *post hoc* testing in 100 words or fewer. Address the issues of the ANOVA Null Hypothesis and of capitalization on chance in this explanation.

---

10.04 Here is a descriptive statistics layout and ANOVA summary table for \(j = 4\) groups with \(n_j = 13\) subjects in each group.

<table>
<thead>
<tr>
<th>Levels of the Independent Variable (j)</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (\bar{Y}_1 = 29.00) (s_1 = 12.543) (n_1 = 13)</td>
<td>(\bar{Y} = 29.00)</td>
</tr>
<tr>
<td>2 (\bar{Y}_2 = 21.00) (s_2 = 7.958) (n_2 = 13)</td>
<td>(\bar{Y}_2 = 21.00)</td>
</tr>
<tr>
<td>3 (\bar{Y}_3 = 31.00) (s_3 = 15.465) (n_3 = 13)</td>
<td>(\bar{Y}_3 = 31.00)</td>
</tr>
<tr>
<td>4 (\bar{Y}_4 = 35.00) (s_4 = 15.465) (n_4 = 13)</td>
<td>(\bar{Y}_4 = 35.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares (SS)</th>
<th>df</th>
<th>Mean Square (s²)</th>
<th>(F_{\text{obt}})</th>
<th>(F_{\text{crit}})</th>
<th>(\eta^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups [A]</td>
<td>1352</td>
<td>3</td>
<td>450.6667</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups [S(A)]</td>
<td>8388</td>
<td>48</td>
<td>174.7500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9740</td>
<td>51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
F_{\text{obt}} = \frac{MS_{\text{Between}}}{MS_{\text{Within}}}
\]

\[
\eta^2 = \frac{SS_{\text{Between}}}{SS_{\text{Total}}}
\]

In the summary table, enter the appropriate obtained value for \(F\), the critical (\(\alpha = .05\)) value for \(F\), and the value for the proportion of variance in dependent measure scores explained by level of the independent variable (\(\eta^2\)). Show your work and round your final answers to two decimal places.

---

Based upon the results of the analysis of variance, should you carry out *post hoc* comparisons among all pairs of dependent measure means for the \(j = 4\) groups? Circle your decision.

**YES**  **NO**
Explain your decision about *post hoc* testing in 100 words or fewer. Address the issues of the ANOVA Null Hypothesis and of capitalization on chance in this explanation.

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

16.90. In a two-way factorial analysis, we evaluate the effects of combined levels of two independent variables or factors.

The following tables and their associated charts show dependent measure data for combinations of levels of two factors. They show results for the effects of combinations of three levels of Factor A (A₁, A₂ and A₃) crossed with three levels of factor B (B₁, B₂ and B₃) or the effects of nine crossed factor levels (A₁B₁, A₁B₂, A₁B₃, A₂B₁, A₂B₂, A₂B₃, A₃B₁, A₃B₂ and A₃B₃).

<table>
<thead>
<tr>
<th>Factor A</th>
<th>Factor B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B₁</td>
</tr>
<tr>
<td>A₁</td>
<td>A₁B₁</td>
</tr>
<tr>
<td>A₂</td>
<td>A₂B₁</td>
</tr>
<tr>
<td>A₃</td>
<td>A₃B₁</td>
</tr>
</tbody>
</table>

An important component of the factorial analysis is reaching a conclusion about whether the combined effects of the levels of the two factors are additive or non-additive.

An additive effect occurs when the effect of a level of one factor is independent of the level of the other factor with which it is paired.

For example, if the combined effects of factors A and B were additive, the first level of factor A (A₁) would affect the dependent variable in exactly the same way when it was combined with the first level of factor B (A₁B₁) as it would when combined with the second level of factor B (A₁B₂) as well as when combined with the third level of factor B (A₁B₃).

A non-additive effect occurs when the effect of a level of one factor changes depending upon the level of the other factor with which it is paired.

So, if the combined effects of factors A and B were non-additive, the first level of factor A (A₁) would affect the dependent variable differently when combined with the first level of factor B (A₁B₁) than when combined with the second level of factor B (A₁B₂) or than when combined with the third level of factor B (A₁B₃).

When the combined effects of levels of two factors are *non-additive*, we say that there is an *interaction effect*.

Examine the tables and charts on the following page and pick the one set that shows non-additive effects (an interaction effect).

a. Table A and Chart A  
b. Table B and Chart B  
c. Table C and Chart C  
d. Table D and Chart D  
e. Table E and Chart E
Table A: Descriptive Statistics

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>A Main Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y = 5.00</td>
<td>Y = 6.00</td>
<td>Y = 7.00</td>
<td>Y = 6.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s1 = 3.16</td>
<td>s12 = 3.16</td>
<td>s13 = 3.16</td>
<td>s14 = 3.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Main Effects</td>
<td>Y = 6.00</td>
<td>Y = 7.00</td>
<td>Y = 6.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s = 3.16</td>
<td>s = 3.87</td>
<td>s = 3.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 15</td>
<td>n = 15</td>
<td>n = 15</td>
<td>n = 45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table B: Descriptive Statistics

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>A Main Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y = 6.00</td>
<td>Y = 6.00</td>
<td>Y = 8.00</td>
<td>Y = 6.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s1 = 3.16</td>
<td>s12 = 3.16</td>
<td>s13 = 3.16</td>
<td>s14 = 3.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Main Effects</td>
<td>Y = 10.00</td>
<td>Y = 10.00</td>
<td>Y = 10.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s = 3.16</td>
<td>s = 3.16</td>
<td>s = 3.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table C: Descriptive Statistics

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>A Main Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y = 7.00</td>
<td>Y = 8.00</td>
<td>Y = 9.00</td>
<td>Y = 8.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s1 = 3.16</td>
<td>s12 = 3.16</td>
<td>s13 = 3.16</td>
<td>s14 = 3.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Main Effects</td>
<td>Y = 10.00</td>
<td>Y = 10.00</td>
<td>Y = 10.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s = 3.16</td>
<td>s = 3.16</td>
<td>s = 3.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table D: Descriptive Statistics

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>A Main Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y = 8.00</td>
<td>Y = 7.00</td>
<td>Y = 10.00</td>
<td>Y = 8.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s1 = 3.16</td>
<td>s12 = 3.16</td>
<td>s13 = 3.16</td>
<td>s14 = 3.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Main Effects</td>
<td>Y = 10.00</td>
<td>Y = 10.00</td>
<td>Y = 10.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s = 3.16</td>
<td>s = 3.16</td>
<td>s = 3.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table E: Descriptive Statistics

<table>
<thead>
<tr>
<th>Factor</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>A Main Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y = 9.00</td>
<td>Y = 8.00</td>
<td>Y = 10.00</td>
<td>Y = 8.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s1 = 3.16</td>
<td>s12 = 3.16</td>
<td>s13 = 3.16</td>
<td>s14 = 3.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Main Effects</td>
<td>Y = 11.00</td>
<td>Y = 11.00</td>
<td>Y = 10.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>s = 3.16</td>
<td>s = 3.16</td>
<td>s = 3.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 5</td>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Here is a factorial means layout and ANOVA summary table for \( j = 3 \) levels of Factor A (Intervention) and \( k = 2 \) levels of Factor B (Support).

**Support Services [B]: \( k = 2 \)**

<table>
<thead>
<tr>
<th>Intervention [A]: ( j=3 )</th>
<th>1</th>
<th>2</th>
<th>A: Main Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Y_{11} ) = 9.000</td>
<td>( Y_{12} ) = 4.000</td>
<td>( Y_{1.} ) = 6.500</td>
<td></td>
</tr>
<tr>
<td>( s_{11} = 3.162 )</td>
<td>( s_{12} = 2.390 )</td>
<td>( s_{1.} = 3.742 )</td>
<td></td>
</tr>
<tr>
<td>( n_{11} = 8 )</td>
<td>( n_{12} = 8 )</td>
<td>( n_{1.} = 16 )</td>
<td></td>
</tr>
<tr>
<td>( Y_{21} ) = 10.250</td>
<td>( Y_{22} ) = 14.250</td>
<td>( Y_{2.} ) = 12.250</td>
<td></td>
</tr>
<tr>
<td>( s_{21} = 3.196 )</td>
<td>( s_{22} = 3.196 )</td>
<td>( s_{2.} = 3.715 )</td>
<td></td>
</tr>
<tr>
<td>( n_{21} = 8 )</td>
<td>( n_{22} = 8 )</td>
<td>( n_{2.} = 16 )</td>
<td></td>
</tr>
<tr>
<td>( Y_{31} ) = 7.000</td>
<td>( Y_{32} ) = 10.000</td>
<td>( Y_{3.} ) = 8.500</td>
<td></td>
</tr>
<tr>
<td>( s_{31} = 1.690 )</td>
<td>( s_{32} = 2.726 )</td>
<td>( s_{3.} = 2.719 )</td>
<td></td>
</tr>
<tr>
<td>( n_{31} = 8 )</td>
<td>( n_{32} = 8 )</td>
<td>( n_{3.} = 16 )</td>
<td></td>
</tr>
</tbody>
</table>

**B: Main Effects**

| \( Y_{.1} \) = 8.750       | \( Y_{.2} \) = 9.417 | \( Y_{..} \) = 9.083 |
| \( s_{.1} = 2.982 \)       | \( s_{.2} = 5.055 \) | \( s_{..} = 4.120 \) |
| \( n_{.1} = 24 \)          | \( n_{.2} = 24 \)    | \( n_{..} = 48 \)    |

16.71.1. Enter the appropriate critical (\( \alpha = .05 \)) values for \( F \) in the summary table.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares (SS)</th>
<th>df</th>
<th>Mean Square (MS)</th>
<th>( F_{obt} )</th>
<th>( F_{crit} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model [AB]</td>
<td>472.6667</td>
<td>5</td>
<td>94.5333</td>
<td>12.22</td>
<td></td>
</tr>
<tr>
<td>Intervention [A]</td>
<td>272.6667</td>
<td>2</td>
<td>136.3333</td>
<td>17.62</td>
<td></td>
</tr>
<tr>
<td>Support [B]</td>
<td>5.3333</td>
<td>1</td>
<td>5.3333</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>Interaction [AxB]</td>
<td>194.6667</td>
<td>2</td>
<td>97.3333</td>
<td>12.58</td>
<td></td>
</tr>
<tr>
<td>Within Groups [S(AB)]</td>
<td>325.0000</td>
<td>42</td>
<td>7.7381</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>797.6667</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16.71.2. Which, if any, *post hoc* pairwise comparisons would you carry out?  Circle your decision:

a. no comparisons,
b. comparisons among dependent measure means for the combined effect of intervention and support (crossed factor means) [AB],
c. comparisons among dependent measure means for the main effect of intervention [A],
d. comparisons among dependent measure means for the main effect of support [B], or
e. comparisons among dependent measure means for the main effect of intervention [A] and among dependent measure means for the main effect of support [B].
16.71.3. Explain your decision about post hoc testing in 160 words or fewer. This includes discussing your decision about which obtained $F$s to evaluate and your decision about statistical significance for these obtained $F$s in this analysis.

End of Exam

Have a pleasant Summer!