M2 Assignment (35 points)

**Instruction:**

1. Review the *Assignment Guides*,which contains tutorials on how to show the math/process work and examples of assignment answers.
2. Use this Word document to fill in the answers to the questions. You must type out a clear answer to each question, *even if the answer is also contained in the SPSS output*.
3. Download the Excel file for this assignment and use that data set to answer all the questions in this assignment. Import the data into SPSS when instructed to do so.

**Background of the data set:**

A longitudinal project was conducted to study the cognitive functions of elderly residents in a community. The participants are assessed every few years with a set of cognitive tests. Demographic and health information was also collected. The data set for this assignment has been adapted from the data from that project.

**Q1. Data Preparation: (2 points total)**

Create an SPSS data file from the provided Excel data set by importing the data into SPSS. Paste a screen shot of the variable view of the data file to show the following:

- All variables are present in the “Data View”

- Each variable is correctly configured in “Measure” under the “Variable View”

- All nominal/ordinal variables have the “Values” specified.

(2 points total: Deduct .5 for each missing/incorrect element up to 2 points total)

**Q1. Manually Perform and Interpret a one-sample *t* Test (13 points total)**

The average MMSE score is around 27 in the general population aged 75 and up. The participants in this project have no neurological disorders and are well-educated so the researchers hypothesized that the individuals aged 75 or older in their research population would score significantly higher than the general population in the same age range. So the research question here is:

Do people aged 75 or older in the research population (population 1) have significantly higher MMSE sores compared to those aged 75 or older in the general population (population 2)?

Select the participants who are 75 or older from the data set, and then enter their scores on MMSE into a separate Excel worksheet for this question set. There should be 10 data points. Follow the steps below to conduct a one-sample *t* test **MANUALLY**, with α = .05.

*Hint: We know that the mean MMSE score for population 2 (that is, the comparison population) is µ2 = 27.*

1. Create **directional** alternative hypothesis and null hypothesis from the research question listed above. Type the hypotheses out both in words and in symbol notations.

(2 points total: 1 for each hypothesis. If symbol notation or written format is missing or incorrect for a hypothesis, deduct .5)

2. For the one-tailed hypothesis test with *α* = .05:

What is the degree of freedom? (1 point, must show manual calculation process to earn the point)

Identify the critical *t* value from the t table. (1 point, must explain how the value is obtained to earn the point)

*Be sure to explain how you figure out each of the answers. No point is earned if there is no explanation or calculation process.*

3. Calculate the *t* statistic by following the steps below.

3a. Calculate the sample mean, *M*.

(1 point, must show manual calculation process to earn the point)

3b. Calculate the estimated population standard deviation *s.*

(1 point, must show manual calculation process to earn the point)

3c. Calculate the standard error of the comparison distribution, *sM*.

(1 point, must show manual calculation process to earn the point)

3d. Calculate the *t* statistic using the results from 3a, 3b, and 3c.

(1 point, must show manual calculation process to earn the point)

4. Compare the *t* statistic with the critical *t* value to make a decision on the hypothesis test.

-Is the *t* statistic more extreme than the critical *t* value?

-Do you reject (or fail to reject) the null hypothesis?

(2 points total: 1 for each question)

5. Answer the research question based on the hypothesis test result.

(1 point)

6. Calculate the raw effect size and standardized effect size of this hypothesis test.

(2 points total: 1 for each effect size, must show manual calculation process to earn the point)

**Q2. Use SPSS to Perform and Interpret a one-sample *t* Test (10 points total)**

Use the whole data set (50 participants) for this question set.

For examining cognitive functions of older adults, there is a national norm on a cognitive test that has been obtained from a sample with an average age of 70. The researchers would like to compare their participants against that national norm, but they need to know if their the average age in their research population is significantly different from the national norm population or not. If so, the national norm would not be an appropriate norm for this research project. So the research question here is:

Do the research population (population 1) and the national norm population (population 2) differ significantly in average age?

Follow the steps below to run a one-sample *t* test with *α* = .05 to answer the research question.

*Hint: We know that the mean age for population 2 (that is, the comparison population) is µ2 = 70.*

1. Create alternative hypothesis and null hypothesis from the research question. Type the hypotheses out both in words and in symbol notations.

*Hint: The hypotheses should be non-directional for the two-tailed test.*

(2 points total: 1 for each hypothesis. If symbol notation or written format is missing or incorrect for a hypothesis, deduct .5)

2. Paste the entire *t* test result table(s) from SPSS output here. And then compare the *p* value to the *α* to make a decision on the hypothesis test. If the SPSS output is missing or incomplete, all remaining questions in Q2 will receive no point.

-Is *p* lower or higher than *α*?

-Do you reject the null hypothesis?

(2 points, 1 for each question.)

3. Answer the research question based on the hypothesis test result.

(1 point)

4. Is it appropriate for the researchers to use the national norm for their research project as a comparison for cognitive functions? Why or why not? (1 point: .5 for answer yes/no, .5 for rationale)

5. Calculate the raw effect size and standardized effect size (Cohen’s d) of this hypothesis test, using the results from SPSS.

(2 points total: 1 for each effect size, must show manual calculation process to earn point for each)

6. Report the *t* test result in symbols according to the APA standards, including *t* statistic with degree of freedom, *p* value, and effect size *d*. Present all the items in one single line separated by commas.

-symbols must be italic

-do not include calculation process in the results

(2 points total: deduct .5 for each error in value or format up to 2 total)

**Q3. Use SPSS to Perform and Interpret a one-sample *t* Test (10 points total)**

Use the whole data set (50 participants) for this question set.

The researchers noticed that some of the participants have taken graduate-level courses or earned graduate degrees. They are curious if the research population on average has an education level significantly higher than 16 years (equivalent to college degree). But the researchers want to be conservative and run a two-tailed test so that they can catch a difference in either direction (higher or lower than the comparison population). The research questions is therefore:

Is the average number of years of education in the research population (population 1) significantly different from the population of college graduates (population 2)?

Run a two-tailed one-sample *t* test to answer the research question with *α* = .05.

*Hint: We know that the mean years of education for population 2 (that is, the comparison population) is µ2 = 16.*

1. Create alternative hypothesis and null hypothesis from the research question. Type the hypotheses out both in words and in symbol notations.

*Hint: The hypotheses should be non-directional for the two-tailed test.*

(2 points total: 1 for each hypothesis. If symbol notation or written format is missing or incorrect for a hypothesis, deduct .5)

2. Paste the entire *t* test result table(s) from SPSS output here. And then compare the *p* value to the *α* to make a decision on the hypothesis test. If the SPSS output is missing or incomplete, all remaining questions in Q2 will receive no point.

-Is *p* lower or higher than *α*?

-Do you reject the null hypothesis?

(2 points, 1 for each question.)

3. Answer the research question based on the hypothesis test result. Numerically, is the average education years of the research population higher or lower than 16?

(2 points total: 1 for each question)

4. Calculate the raw effect size and standardized effect size (Cohen’s d) of this hypothesis test, using the results from SPSS.

(2 points total: 1 for each effect size, must show manual calculation process to earn point for each)

5. Report the *t* test result in symbols according to the APA standards, including *t* statistic with degree of freedom, *p* value, and effect size *d*. Present all the items in one single line separated by commas.

-symbols must be italic

-do not include calculation process in the results

(2 points total: deduct .5 for each error in value or format, up to 2 total)