# Assessment 3 – Hypothesis, Effect Size, Power, and *t* Tests

Complete the following problems within this Word document. Do not submit other files. Show your work for problem sets that require calculations. Ensure that your answer to each problem is clearly visible. You may want to highlight your answer or use a different type color to set it apart.

## Hypothesis, Effect Size, and Power

#### Problem Set 3.1: Sampling Distribution of the Mean Exercise

**Criterion:** Interpret population mean and variance.

**Instructions:** Read the information below and answer the questions.

Suppose a researcher wants to learn more about the mean attention span of individuals in some hypothetical population. The researcher cites that the attention span (the time in minutes attending to some task) in this population is normally distributed with the following characteristics: 20 **** 36 ****. Based on the parameters given in this example, answer the following questions:

#### What is the population mean (μ)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### What is the population variance ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### Sketch the distribution of this population. Make sure you draw the shape of the distribution and label the mean plus and minus three standard deviations.

#### Problem Set 3.2: Effect Size and Power

**Criterion:** Explain effect size and power.

**Instructions:** Read each of the following three scenarios and answer the questions.

Two researchers make a test concerning the effectiveness of a drug use treatment. Researcher A determines that the effect size in the population of males is *d* = 0.36; Researcher B determines that the effect size in the population of females is *d* = 0.20. All other things being equal, which researcher has more power to detect an effect? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Two researchers make a test concerning the levels of marital satisfaction among military families. Researcher A collects a sample of 22 married couples (*n* = 22); Researcher B collects a sample of 40 married couples (*n* = 40). All other things being equal, which researcher has more power to detect an effect? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Two researchers make a test concerning standardized exam performance among senior high school students in one of two local communities. Researcher A tests performance from the population in the northern community, where the standard deviation of test scores is 110 (); Researcher B tests performance from the population in the southern community, where the standard deviation of test scores is 60 (). All other things being equal, which researcher has more power to detect an effect? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### Problem Set 3.3: Hypothesis, Direction, and Population Mean

**Criterion:** Explain the relationship between hypothesis, tests, and population mean.

**Instructions:** Read the following and answer the questions.

Directional versus nondirectional hypothesis testing. Cho and Abe (2013) provided a commentary on the appropriate use of one-tailed and two-tailed tests in behavioral research. In their discussion, they outlined the following hypothetical null and alternative hypotheses to test a research hypothesis that males self-disclose more than females:

* H0: µmales − µfemales ≤ 0
* H1: µmales − µfemales > 0

1. What type of test is set up with these hypotheses, a directional test or a nondirectional test? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Do these hypotheses encompass all possibilities for the population mean? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### Problem Set 3.4: Hypothesis, Direction, and Population Mean

**Criterion:** Explain decisions for p values.

**Instructions:** Read the following and respond to the prompt.

The value of a p value. In a critical commentary on the use of significance testing, Lambdin (2012) explained, “If a p < .05 result is ‘significant,’ then a p = .067 result is not ‘marginally significant’” (p. 76).

Explain what the author is referring to in terms of the two decisions that a researcher can make. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## *t* Tests

#### Problem Set 3.5: One-Sample *t* test in SPSS

**Criterion:** Calculate a one-sample *t* test in SPSS.

**Data:** Riverbend City online news advertises that it is read longer than the national news. The mean for national news is 8 hours per week. The following sample of the Riverbend City online news readers is: 5, 7, 6, 2, 4, 8, 5, 4, 18, 21, 8, 7, 4, 5, 6.

**Instructions:** Complete the following:

1. Enter the data from Problem Set 3.5 into SPSS and name the variable as **Time**.
2. In the **Toolbar**, click **Analyze**, select **Compare Means**, and then select **One**-**Sample *t* Test**.
3. Select **Time**, then click **Arrow** to send it over to the right side of the table. In the box labeled **Test Value**, enter **8**.
4. Click **OK** and copy and paste the output into the Word document.
5. State the nondirectional hypothesis.
6. State the critical *t* for *a = .05* (two tails).
7. Answer the following: Is the length of viewing for Riverbend City online news significantly different than the population mean? Explain.

#### Problem Set 3.6: Confidence Intervals

**Criterion:** Calculate confidence intervals using SPSS.

**Data:** Usethe SPSS output from Problem Set 3.5 above.

**Instructions:** Based on the SPSS output from Problem Set 3.5, including a test value (population mean) of 8, calculate the 95% confidence interval.

#### Problem Set 3.7: Independent Samples *t* Test

**Criterion:** Identify IV, DV, and hypotheses and evaluate the null hypothesis for an independent samples *t* test.

**Data:** Use the information from Problem Set 3.7.

**Instructions:** Complete the following:

a. Identify the IV and DV in the study. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. State the null hypothesis and the directional (one-tailed) alternative hypothesis. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. Can you reject the null hypothesis at α = .05? Explain why or why not. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### Problem Set 3.8: Independent *t* Test in SPSS

**Criterion:** Calculate an independent samples *t* test in SPSS.

**Data:** Dr. Z divides her clients with depression into 2 groups. She asks Group 1 not to watch or read any news for two weeks while in therapy and asks Group 2 to continue with therapy as normal. The groups scored the following on measure of depression:

Depression Scores:

Group 1: 34, 25, 4, 64, 14, 49, 54

Group 2: 24, 78, 59, 68, 84, 79, 57

**Instructions:** Complete the following steps:

1. Open SPSS and create a **New Dataset**.
2. Click the **Variable View** tab and type **Groups** in the **Name** column. Click on the gray box in the **Values** column. **Value Labels** window appears. Enter **1** in the **Value** area and enter **No News** in the **Label** area. Click **Add**. Now enter **2** in the **Value** area and enter **Treatment Only** in the **Label** area. Click **Add**. Click **OK**. The **Variable View** screen appears.
3. In row two, enter **Scores** in the **Name** column.
4. Click **Data View**.
5. Enter the depression scores data (e.g., 1 under Groups and 34 under **Scores**; 2 under Groups and 24 under **Scores**).
6. In the **Toolbar**, click **Analyze**, select **Compare Means**, and then select **Independent-Samples *t* Test**.
7. Select **Scores**, then click **Arrow** to send it over to the **Test Variable** box.
8. Select **Groups** and then click **Arrow** to send it over to the **Grouping Variable** box.
9. Click **Define Groups** and enter **1** for Group 1 and enter **2** for Group 2. Click **Continue**.
10. Click **OK** and then copy and paste the output to the Word document.

#### Problem Set 3.9: Independent *t* Test using Excel

**Criterion:** Calculate an independent samples *t* test in Excel.

**Instructions:** Complete the following steps:

1. Open **Excel**.
2. On an empty tab, enter the data from Problem Set 3.7. Use **column A** for **group 1** and **column B** for **Group 2**. In **Cell A1**, enter 1. In **cell B1**, enter 2.
3. Enter the data for each group below the label.
4. Click **Data Analysis**, select **t-Test: Two-Sample Assuming Equal Variances**. Click **OK.**
5. In **Variable 1 Range** enter **$A$2:$A$8.** (Or, click the graph icon at the right of the box and highlight your data for Group 1. Then, click the graph icon.)
6. In **Variable 2 Range** enter **$B$2:$B$8.**
7. Then click **OK**. Your results will appear on a **new tab** to the left.
8. Return to your data. Click **Data Analysis,** select **t-Test: Two-Sample Assuming Unequal Variances**. Then click **OK.**
9. In **Variable 1 Range** enter **$A$2:$A$8.** (Or, click the graph icon at the right of the box and highlight your data for Group 1. Then, click the graph icon.)
10. In **Variable 2 Range** enter **$B$2:$B$8.**
11. Then click **OK**. Your results will appear on a **new tab** to the left.
12. Copy the results from both *t* tests below.