**Module 3 Homework**

I know there is A LOT of information in this Module! You should be able to answer the following questions for Homework #3 after doing the assigned reading assignment and viewing the Micro-lectures. If you are unclear on certain things, you might go to Smart Alex’s tasks on p. 71 and 101. See if any of these address your issue. Answers and explanations for all these tasks are on the online resources website. <https://edge.sagepub.com/field5e>

If you are having difficulty with a concept, be sure to let me know so that I can help. If you have a specific question, please post on Module 3 Question & Answer Discussion.

**RECORD ALL YOUR ANSWERS ON THIS DOCUMENT. FOR THE MULTIPLE CHOICE QUESTIONS, PLEASE BOLD OR HIGHLIGHT THE CORRECT ANSWER AND DO NOTHING TO THE INCORRECT ANSWERS (such as crossing off). USE AS MUCH ROOM AS YOU NEED TO ANSWER ANY GIVEN QUESTION. Where appropriate, please show your work (or some indication of how you derived your answer if not possible to show calculation).**

There are 40 possible points for this homework.

1. In an experiment, the \_\_\_\_\_\_\_\_\_\_ is that the treatment has an effect on the outcome, and the \_\_\_\_\_\_\_\_\_\_ is that the treatment does not have an effect.
2. Alternative (research) Hypothesis *(H*1), Null Hypothesis *(H*0)
3. Null Hypothesis *(H*0), Alternative (research) Hypothesis *(H*1)
4. If you accept the null hypothesis when in reality there is an effect in the population, what type of error have you made?
5. Type I
6. Type II
7. Type III
8. You have made no error
9. Which of the following would result in increased power in your experiment?
10. Setting an alpha level of .10 rather than the traditional .05
11. Setting an alpha level of .01 rather than the traditional .05
12. Reduce your sample size
13. Use discrete data rather than continuous
14. A Bonferroni correction is a method used to control for the cumulative effects of error when conducting multiple statistical tests on the same data. If we conducted 5 t-tests for example, the Bonferroni correction would adjust our alpha level by dividing it by 5. What effect does the Bonferroni correction have on our statistical power?
15. No effect
16. Increases power
17. Reduces power
18. The probability of making a Type II error is called \_\_\_\_\_\_.
19. Alpha
20. Beta
21. Gamma
22. Equal to the region of rejection
23. You are interested in knowing whether participating in moderate physical activity will affect your patients’ score on a functional assessment. [Questions 6-11 relate to this experiment.] What would your dependent variable be if you designed a study to determine the answer?

The dependent variable would be the patients’ score on the functional assessment.

1. What would your independent variable be?

The independent variable would be whether or not the patients participated in moderate physical activity.

1. If you assess function by rating how well patients are able to perform 5 functional tasks, what level of measurement is this?

Ordinal

1. If you assess function by measuring the amount of time it takes patients to perform the 5 time sit to stand task, what level of measurement is this?

Ratio because there is a true zero in the performance time because it is a measure of duration.

1. Please state a null hypothesis for your experiment.

Participating in moderate physical activity does not have an effect on a patients’ score on a functional assessment.

1. State the alternative or research hypothesis as a directional hypothesis.

Participating in moderate physical activity does have an affect on a patients’ score on a functional.

1. Researchers were interested in comparing gender differences on memory for pictures. Fifty male and fifty female participants were given photographs of scenes and faces and asked to recall as many details as they could. The independent variable in this study is:
   1. The number of participants
   2. Gender
   3. Memory for pictures
   4. The type of photographs
2. Researchers were interested in comparing gender differences on memory for pictures. Fifty male and fifty female participants were given photographs of scenes and faces and asked to recall as many details as they could. The dependent variable in this study is:
   1. Gender
   2. The number of participants
   3. The type of photographs
   4. Memory for pictures
3. Statistical results that meet the criterion for an alpha level of <.05 indicates that:
4. The amount of difference found between the treatment and control groups would have occurred less than 5 times out of 100 times by chance alone.
5. The amount of difference found between the treatment and control groups could have occurred in more than 5% of the samples by chance.
6. There is a 95% chance that the results are random.
7. There is a 95% chance that the results are correct.
8. If statistical results meet the alpha level criteria (p<.05):
9. The null hypothesis is rejected.
10. The null hypothesis is retained.
11. The alternative (research) hypothesis is rejected.
12. The results are valid.
13. Pretend that you completed your experiment regarding physical activity and function (from #6 above) and your comparison between people who met PA guidelines and those who did not meet guidelines showed that physically active people had a higher level of function than those who were inactive. You wish to know if the difference that you found between your groups is statistically significant or if the magnitude of the difference is likely to be due to chance. Assuming you chose the appropriate statistical test and your group comparison has a p-value of .023, what does this mean exactly? What do you conclude?

It means that we can reject our null hypothesis because our p-value is less than our alpha level (or confidence interval) of 0.05. This means that there is enough evidence to say that moderate physical activity does have some sort of effect on the function assessment scores.

1. Now, pretend you have the same scenario as in #16, but your group comparison test has a p-value of .56. What does this mean and what do you conclude?

It means we can accept our null hypothesis because our p-value is more than our alpha level of 0.05. This means that there was enough evidence to say that moderate physical activity has no affect on the function assessment scores.

1. In statistics, the concept of power is defined as:
2. The probability of rejecting the null hypothesis when there truly is no effect
3. The probability of retaining the null hypothesis when there truly is an effect
4. The probability of rejecting the null hypothesis when there truly is an effect
5. The probability of retaining the null hypothesis when there truly is no effect
6. State the concept of power in more understandable terms. That is, what does having adequate power in an experiment really mean?

Having adequate power in an experiment means that any significant test has a probability of detecting deviations from the null hypothesis. Meaning, if there is any affect at all in the experiment, then we should be able to detect it.

1. The standard deviation is the square root of:
2. The coefficient of determination
3. The sum of squares
4. The variance
5. The range
6. If the scores on a test have a mean of 26 and a standard deviation of 4, what is the *z*-score for a score of 18?
7. –2
8. 11
9. 2
10. –1.41
11. If your score above (#21) was based on a sample mean of 50 people, you would calculate confidence intervals based on:
12. F-scores
13. t-scores
14. z-scores
15. Please calculate the 95% confidence interval for the mean using the data in #21 and #22. Please show your work so that if you come up with an incorrect answer, we can see where you went wrong. (24.87, 27.13)

26+ -2(4/50^(1/2))= 24.87

26- -2(4/50^(1/2))=27.13

1. Which of the following is true about a 95% confidence interval of the mean for a given sample:
2. In 95% of samples, the true population mean will fall within the limits of the confidence interval.
3. We are 95% confident that the sample mean will fall within the limits of the confidence interval
4. We are 95% confident that the population mean will fall within the limits of the confidence interval.
5. There is a .05 probability that the population mean falls within the limits of the confidence interval.
6. When calculating confidence intervals for a small sample size such as one with 20 people, you cannot assume a normal distribution, so you calculate confidence intervals based on:
   1. F-scores
   2. T-scores
   3. Z-scores
7. If you calculate a Cohen’s *d* between your treatment group’s ROM and a control group’s to be .47, what does this mean?
8. Mean ROM in the treatment group’s ROM is .47 degrees greater than the control group’s ROM
9. The treatment group’s ROM was .47 standard deviations lower than the control group’s ROM
10. The treatment group’s ROM was .47 standard deviations greater than the control group’s ROM
11. There is a .47 probability that the ROM difference between the treatment group and the control group is real and NOT due to chance
12. If you calculate a Cohen’s *d* between your treatment group’s ROM and a control group’s to

be -.47, what does this mean?

1. Mean ROM in the treatment group’s ROM is .47 degrees less than the control group’s ROM
2. The treatment group’s ROM was .47 standard deviations lower than the control group’s ROM
3. The treatment group’s ROM was .47 standard deviations greater than the control group’s ROM
4. There is a .47 probability that the ROM difference between the treatment group and the control group is real and NOT due to chance
5. What is an alpha level in NHST?
6. The level at which statistics finally becomes meaningful to a clinician
7. The level of confidence you have in your results
8. A pre-set level of probability that the results are correct
9. A pre-set level of probability used as grounds to accept or reject the null hypothesis
10. Which of the following is true regarding standard error?
11. It tells us how close each of our data points are to the sample mean
12. It tells us about the sum of squares
13. It tells us how well our sample mean represents the sample itself
14. It tells us how well our sample mean represents the population mean
15. You conduct an experiment to determine if a joint mobilization plus exercise intervention is more effective for reducing pain than exercise alone. You conduct the experiment on 40 patients with 20 in each of the treatment groups. In the end, the statistic you use to compare the groups (t-test) is low, yielding a p-value of .34 and you must conclude that the interventions are not significantly different. You are puzzled by this because a similar study conducted at a large medical center had shown significant differences between similar interventions. The only difference you note is that the large medical center had a sample of 200 patients with 100 in each treatment group. A likely explanation from the seemingly contradictory study results is which of the following?
16. Larger sample sizes typically yield lower p-values
17. The large medical center likely had a more representative sample of the target population
18. The mean pain level obtained in the large medical center study likely had a lower standard deviation
19. All of the above

31. The probability of significance is usually expressed as a value occurring somewhere between 0 and 1. Which of the following would be considered the most highly significant in statistical terms?

a. .10

b. .05

c. .025

d. .01

1. Which of the following statements best describes the value of an ‘effect size’ to research?

a. It has a key role to play when calculating assumptions about collected data.

b. It is a vital statistic when calculating the significance of an experimental study.

c. It is a measure of the power of an experiment and therefore its significance.

d. It is a standardized measure that allows for the comparison across different studies that have used different variables or measurement scales.

33. In order to determine the effects of a specific drug on the treatment of childhood asthma, randomized controlled trials are usually conducted. Which of the following statistical methods will provide the **best** conclusions for the trials conducted?

a. Patient survey

b. Meta-analysis

c. Observational study

d. Standardized *t*-test

34. Please go to Chapter 2’s Smart Alex’s Task 4. Use the same mean and standard deviation (Mean=32.19; s=11.59) for time in seconds for heavy smokers to fall off a treadmill, but this is now based on a sample of 50 smokers. A sample size of 50 constitutes a “large” sample and means that our sampling distribution will approximate a normal distribution. What is the principle or theory that allows us to make this assumption?

a. Theory of approximation

b. Normalization theory

c. Central limit theory

d. It is not based on any known theory

35. Calculate SE using the information in #34.

11.59/50^(1/2)= 1.639

36. Calculate the lower boundary for the 95% confidence interval for #34.

32.19-1.96(11.59/50^(1/2))= 28.98

37. Calculate the upper boundary of the 95% confidence interval for #34.

32.19+1.96(11.59/50^(1/2))= 35.40

38. What distribution did you use to calculate your confidence intervals?

Normal distribution of p being less than or equal to 0.05 with a z value of either plus or

minus 1.96.

39. Write a simple statement that states the meaning of your calculated confidence intervals.

Most heavy smokers (95%) will fall off a treadmill anywhere in between 28.98 and 35.40

seconds.

40. Even though the mean and standard deviation for the smokers falling off the treadmill data were the same when you had a sample size of 21 as when you had 50 smokers, which confidence interval would you presume to be a better representation of the population? Why?

I would presume that having a sample size of 50 smokers would be a better representation of the population because it is a bigger sample of the population, which not only allows for more variation/randomization but also makes the margins for error smaller.