**MIDTERM EXAM ANSWER SHEET**

**100 points**

Work on this midterm must be completed individually. Please sign the honor pledge below:

***“I pledge on my honor that I have not given or received any assistance on this examination.”***



\*\*Sign your name: ­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\*\*

**Part 1:** For each of the 4 studies, identify which procedure you would use to test the hypothesis (*Z* test, single samples *t-*test, or dependent means *t-*test). **(10 points).**

**Study 1: single samples t-test**

**Study 2: z test**



**Study 3: dependent means t test**

**Study 4: single samples t test**

**Part 2:** For each of the 3 studies you choose to analyze, include a section with all of your work (including Excel screenshots and JASP tables) and then one paragraph describing the results. **(90 points)**

**Study 1- Single Sample t-test**

**Question 1 Answer:**

In this study an example of a type I error would be if I decided to reject the null when in reality there is a false positive of more people practicing mindfulness while using the app when they really weren’t any more mindful than those who weren’t using the app. A type II error in this study would be if I failed to reject the null hypothesis when there really was an increase in mindfulness practice when using the app than when not using the app.

**Question 2 Answers:**

1. Step 1: Population 1: patients who downloaded the app

Population 2: general population of patients

Step 2:

research hypothesis μ1 ≠ μ2  The two population means will be different from each other

Null hypothesis μ1 = μ2 The two population means will not be different from each other

Step 3: S^2= 62.73 SM=1.77 N=20 N-1=19

M= 14.1 SS= 1191.8

**A screenshot of a cell phone

Description automatically generated**

Comparison Distribution

**µM** = µ = 6

**SM** = √(S2*/N*) = 1.77 S2 = SS/df= 62.73

df = 19

t Cutoff(s): **+/-2.093**

Sample

***M*** = 14.1

***t*** = (*M* – μ)/ SM = **4.576**

**(14.1-6)/1.77= 4.576**

Is the *t* above the cutoff on the comparison distribution?

**The *t* is above the cutoff on the comparison distribution leading me to reject the null hypothesis because the app worked in increasing the amount of mindfulness practiced by the patients.**



**0**

**1**

**2**

**-2**

**-1**



1. 95% confidence interval
   1. M+/-

14.1- (2.093)(7.92)= -2.48

14.1+(2.093)(7.92)= 30.68

**Question 3 Answer:**

| **One Sample T-Test** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **t** | | **df** | | **p** | |
| Days\_Meditated |  | 4.574 |  | 19 |  | < .001 |  |
|  | | | | | | | |
| *Note.*  Student's t-test. | | | | | | | |
| *Note.*  For all tests, the alternative hypothesis specifies that the population mean is different from 6. | | | | | | | |

**Descriptives**

| **Descriptives** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **N** | | **Mean** | | **SD** | | **SE** | |
| Days\_Meditated |  | 20.000 |  | 14.100 |  | 7.920 |  | 1.771 |  |
|  | | | | | | | | | |

**Question 4 Answer:**

This study was attempting to prove the research hypothesis that the use of the app would increase how often patients practice mindfulness. There was a random sample of 20 patients who downloaded the app who would be compared to the general patient population. I ran a single sample t test in order to determine whether or not the people using the app meditated more than those who didn’t use the app. After running the test I found significant results and was able to reject the null hypothesis which stated there wouldn’t be a change. The 20 patients who used the app practiced mindfulness and meditation more days (*M*=14.1, *SD*=7.92) than the general population of population, *t*(19)=4.574, p<.05. Based on the sample of 20 patients who used the app, I am 95% confident that the true population mean falls between 2.48 and 30.68, 95% CI [2.48, 30.68]. The probability of a type I error in this study is 5%.

**Study 2- Z test**

**Question 1 Answer:**

1. Population 1- Musicians

Population 2- General Population

Research hypothesis- the mean of population 1 one will differ from the mean of population 2 μ1≠μ2

Null hypothesis- the mean of population 1 will not differ from the mean of population 2 μ1=μ2

µ = 100

Sample

*M* = 110

Z = (*M* – μM)/ σM = **2.82**

**Z=(110-100)/3.54**

Is the *Z* above the cutoff on the comparison distribution?

The z score is above the cutoff on the comparison distribution so I would reject the Null.

σ = 10

Comparison Distribution

**µM** = µ = 100

**σM** = √(σ2*/N*) = 3.54

√(10^2/8)= 3.54

Z Cutoff(s): +/-1.96

1. Effect size

d= μ1-μ2

d= 110-100= 10 /10 = 1

This is a large effect size. For the study this means that the relationship between musicians and high IQ scores is strong.

1. M+/- (z score limit)( σM)

110+(1.96)(3.54)= 116.94

110-(1.96)(3.54)=103.06 95% CI [103.06, 116.94]

This means that based on the sample of 8 musicians we are 95% confident their IQ scores would fall between 103.06 and 116.94.

**Question 2 Answer:**

This study was trying to prove the research hypothesis that musicians had higher IQs than the general population. It featured a random sample of 8 musicians and using the average score of these musicians and the scores of the general population I ran a z test. For the sample of the musicians I had a mean of 110. The results ended up being significant proving that the null hypothesis should be rejected. The effect size of this study was 1. This is a large effect size. For the study this means that the relationship between musicians and high IQ scores is strong. 95% CI [103.06, 116.94] This means that based on the sample of 8 musicians we are 95% confident their IQ scores would fall between 103.06 and 116.94.

**Study 3- Dependent Means t-test**

**Question 1 Answer:**

| **Paired Samples T-Test** | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  | | **t** | | **df** | | **p** | | **Cohen's d** | |
| Week\_0 |  | - |  | Week\_8 |  | 2.436 |  | 6 |  | 0.051 |  | 0.921 |  |
|  | | | | | | | | | | | | | |
| Note.  Student's t-test. | | | | | | | | | | | | | |

### Descriptives

| **Descriptives** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **N** | | **Mean** | | **SD** | | **SE** | |
| Week\_0 |  | 7 |  | 204.286 |  | 28.640 |  | 10.825 |  |
| Week\_8 |  | 7 |  | 198.714 |  | 32.108 |  | 12.136 |  |
|  | | | | | | | | | |

**Question 2 Answer:**

| **Paired Samples T-Test** | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  | | **t** | | **df** | | **p** | | **Cohen's d** | |
| Week\_0 |  | - |  | Week\_16 |  | 8.056 |  | 6 |  | < .001 |  | 3.045 |  |
|  | | | | | | | | | | | | | |
| Note.  Student's t-test. | | | | | | | | | | | | | |

### Descriptives

| **Descriptives** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **N** | | **Mean** | | **SD** | | **SE** | |
| Week\_0 |  | 7 |  | 204.286 |  | 28.640 |  | 10.825 |  |
| Week\_16 |  | 7 |  | 187.714 |  | 28.993 |  | 10.958 |  |
|  | | | | | | | | | |

**Question 3 Answer:**

This study was observing 7 people on a weight loss program to see how much weight they lost in the first eight weeks of the program as well as in the second 8 weeks. The data is significant although they lost less weight in the second set of eight weeks (M=187.714, SD=28.993). For the first study *t*(6)=2.436, p=.051 with an effect size of .921 and this is a large effect size (M=198.714, SD=32.108). In the second study the effect size was 3.045 which is large and the results of the t test were *t*(6)=8.056, p<.001. The power of this study may be under because the scores from week 1 to week 8 decreased. If we changed the sample size or the alpha we would be able to increase the power. Comparatively from week 8 to week 16 the mean weight lost went down.