1. Determine whether the data provided is appropriate for the test(s) available and that any analysis is achievable.

2. Formulate a hypothesis test to be used to compare the effectiveness of the two approaches (control, meditation) used during dental surgery.

3. Analyse the data to provide the hypothesis testing conclusion.

4. Provide descriptive statistics (graphs and tables) of the data.

5. Determine the 95% confidence interval for the population mean of each group, and the 95% confidence interval for the difference between the means of the two groups.

# Q1: Determine whether the data provided is appropriate for the test(s) available and that any analysis is achievable.

A1: The study consisted of 100 patients, using random sampling.

A group of 50 males and 50 females due for dental surgery were measured for Anxiety (GSR/Galvanic Skin Response) and Perceived pain (VNRS/verbal numerical Rating Scale), both on a scale of 0 to 10 respectively. We note that there is random sampling used. We have a control group (no meditation) and meditation (treatment) group. This means that there is an experiment, and that we can move forward to set up a Null Hypothesis. The sample size is > 30 so our Normality check is met.

We will look at the data made available to determine whether the results are appropriate to create a test and consider if any analysis is possible. A histogram with outliers? GSR and VNRS GO To R Studio

|  |  |
| --- | --- |
|  |  |

**Q2. Formulate a hypothesis test to be used to compare the effectiveness of the two approaches (control, meditation) used during dental surgery.**

*What will our Null Hypothesis be?*

# Null and alternative hypotheses.

**Null hypothesis:** There is no difference in the average of the two methods (Meditation & Control), which indicate the Mean difference between the two methods is equal to zero or there is no difference in means.

Let’s write our Null Hypothesis as follow:

**H0:** **μMeditationGSR = μControlGSR**

**Alternative Hypothesis:** There is a difference in average for the two methods (Meditation & Control), therefore the mean difference is not equal to zero or the two means are not equal.

**HA: μMeditationGSR < μControlGSR**

**Q3. Analyse the data to provide the hypothesis testing conclusion.**

*We set aside Male/Female for now and deal with overall differences in means. We consider what if any differences there are between the Control and Meditation groups.*

*Are we looking at this data in the right way?*

# Summary data.

|  |  |  |
| --- | --- | --- |
|  | GSR | VNRS |
| n | 50 | 50 |
| Mean | 6.847 | 7.9 |
| Min | 5 | 6 |
| Max | 8.9 | 9 |
| 1st Quartile | 6.3 | 7.75 |
| 2nd Quartile | 6.8 | 8 |
| 3rd Quartile | 7.3 | 8 |
| 4th Quartile | 8.9 | 9 |

**GSR:**

The sample mean difference for GSR:

MeanGSR = MeanMed – MeanCTRL

MeanGSR = 7.04 - 6.654

MeanGSR = 0.386

(It is expressed as a negative value as there is a decrease in GSR reading.)

So, there is a difference between the 2 means or μGSR = μVNRS, therefore H1 is true.

|  |  |  |  |
| --- | --- | --- | --- |
| **GSR** | Meditation | Control |  |
| Mean | 6.65 | 7.04 |  |
| Std. Dev | 0.7730697 | 0.8053393 |  |
| Sampling Size | 50 | 50 |  |
| Standard Error | 0.1093286 |  |  |

The standard error:

SE = **≈** ≈ ≈ ≈ ≈ 0.14

MeanGSR = 0.386

We can find the test statistic:

T = = 2.76

Confidence interval for a difference of means

**VNRS:**

The sample mean difference for VNRS:

MeanVNRS = MeanMed – MeanCTRL

MeanVNRS = 8.02 - 7.78

MeanVNRS = **0.24**

So, there is a difference between the 2 means or μGSR = μVNRS, therefore H1 is true.

**4. Provide descriptive statistics (graphs and tables) of the data.**