**Group Project Report**

**Students:**

Patrick Curran

Steven Dignam

Github Link:

[**https://github.com/st3vd/2022\_DAIT\_GCA\_-SD-\_-PC-**](https://github.com/st3vd/2022_DAIT_GCA_-SD-_-PC-)

**Introduction.**

Dentist’s patients pain was collected.

A sample of 100 patients was taken from the population. This sample was split into 2 groups. One group of 50 received meditation. The other group of 50 did not get meditation. Within each group the gender was split 27 to 23. This was adjusted to having 23 in each sample.

The data analysis will then be concerned with whether patients who do meditation will have reduced pain from the treatments.

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

We want to have a reasonable Normal Distribution to apply our standard tests. These data satisfies with sample size > 30 and no significant outliers. Box and Whisker charts were completed on the data sets to show there were no significant outliers. Hence data can be taken as independent.

The bar charts show the data has a normal distribution appearance.

We had to make some assumptions.

* **Dental Work:** We assume dentist treatment was similar.
* **Age.** Age was not recorded so we assume age isn’t a factor.
* **Gender split:** Though each data is split equally, within the groups the male and female divide is not equal. For example there was more females (27) in the sample who meditated against not (23). Alternatively, there was less males (23) in the sample who meditated than not (27). Data was adjusted.

**Adjusting Figures:**

When looking at difference in gender results some adjustment was needed to make sure both genders had equal samples. I chose to adjust the Galvanic response data over the Perceived Data as the data is derived more scientifically.

**Data adjustment Male data.**

For Males there were 27 sampled in the control group, and 23 sampled in the Meditation group. 4 cases were removed from the control group.

Cntrol group for Galvanic Responses:



Chart, box and whisker chart

Description automatically generated

From the boxplot there doesn’t look like there is any outliers. However, the median is less than the mean so there is a small bit of skewness to the right. To improve this will remove some numbers up to and including the median.

The resulting stats are:



Chart, box and whisker chart

Description automatically generated

The median is now almost the same as the mean and the boxplot has a more normal appearance. The skewness to the right has reduced. We will proceed with this male data.

**Data adjustment Female data.**

The Female data has 27 in the meditation group V 23 in the control group.

Looking at the galvanic responses we have the following data:



Chart, box and whisker chart

Description automatically generated

The data looks reasonably normal in spread. Mean is slightly larger than median.

No outliers. Took 2 samples from extremes. 2 largest and 2 smallest.

New data gives.



Chart, box and whisker chart

Description automatically generated

Here the mean is closer to the median in value(less skewness) and reasonably normal looking with more data between the first and third quartile.

We proceed with this data.

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

**T1: Meditation V Control: GR Male**

* H0: µdiff = 0. There is no difference in the average Galvanic Response pain recorded for Males between the Meditation group and the control group.
* HA: µdiff 6= 0. There is a difference in the average Galvanic Response pain recorded for Males between the Meditation group and the control group.

**T2: Meditation V Control: PP Male**

* H0: µdiff = 0. There is no difference in the average Perceived pain recorded for Males between the Meditation group and the control group.
* HA: µdiff 6= 0. There is a difference in the average Perceived pain recorded for Males between the Meditation group and the control group.

**T3: Meditation V Control: GR Female**

* H0: µdiff = 0. There is no difference in the average Galvanic Response pain recorded for Females between the Meditation group and the control group.
* HA: µdiff 6= 0. There is a difference in the average Galvanic Response pain recorded for Females between the Meditation group and the control group.

**T4: Meditation V Control: PP Female**

* H0: µdiff = 0. There is no difference in the average Perceived pain recorded for Females between the Meditation group and the control group
* HA: µdiff 6= 0. There is a difference in the average Perceived pain recorded for Males between the Meditation group and the control group.

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

**G1: Male Control GR:**



68–95–99.7 rule: All data lies within 3\*(1.057647) of mean – indicates normal/no outliers

**G2: Male Meditation GR:**



All data lies within 3\*(0.8698053) of mean – indicates normal

**G3: Male Control PP**

Text

Description automatically generated with medium confidence

All data lies within 3\*(0.6712622) of mean – indicates normal

**G4: Male Meditation PP:**

Text

Description automatically generated with low confidence

All data lies within 3\*(0.5623216) of mean – indicates normal

**G5: Female Control GR:**

Text

Description automatically generated with medium confidence

All data lies within 3\*(0.5516415) of mean – indicates normal

**G6: Female Meditation GR:**



All data lies within 3\*(0.4747373) of mean – indicates normal

**G7: Female Control PP:**



All data lies within 3\*(0.8100163) of mean – indicates normal

**G8: Female Med PP:**

Text

Description automatically generated with medium confidence

All data lies within 3\*(0.5068698) of mean – indicates normal

Largest difference between means is Meditation V Control group of Females Galvanic Response. This showed up in the confidence interval test that suggested a difference between the main scores and that Females in particular benefit from meditation with pain relief with the Galvanic Response test. This may be that Females ‘buy’ into meditation more than males. This was the only group that indicated meditation improved pain.

The graphs as follows were for the adjusted data.

In general - boxplots look skewed for Perceived Pain data compared to Galvanic Response. Could be due to the narrower range of values (finite whole numbers for PP) but also could be that more randomness will follow as the measures are less scientific. Males have more randomness which support notion that males are less honest with pain scores.

1. **Descriptive Statistics:**

Chart, box and whisker chart

Description automatically generated

Chart, histogram

Description automatically generated

Chart, box and whisker chart

Description automatically generated

Chart, histogram

Description automatically generated

Chart, box and whisker chart

Description automatically generated

Chart, histogram

Description automatically generated

Chart, histogram

Description automatically generated

Chart, histogram

Description automatically generated

Chart, box and whisker chart

Description automatically generated

Chart, histogram

Description automatically generated

Chart, box and whisker chart

Description automatically generated

Chart, histogram

Description automatically generated

Chart, box and whisker chart

Description automatically generated

Chart, histogram

Description automatically generated

Chart

Description automatically generated

Chart, bar chart

Description automatically generated

1. 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.

**Group one: Male Control GR:**

A picture containing text

Description automatically generated







CI 95% is (6.66376,7.52824)

We are 95% happy the mean is correct.

**Group Two: Male Med GR:**

A picture containing text

Description automatically generated



Text

Description automatically generated with medium confidence

CI for group 2 is (6.470527,7.181473)

We are 95% happy the mean (6.826) is in this range.

**Group 3: Male Perceived Pain Control Group**

Graphical user interface, text, application

Description automatically generated



Text

Description automatically generated with medium confidence

CI 95% is (7.942668,8.491332)

We are 95% happy the mean is in this interval.

**Group 4: Male Perceived Pain Med Group**

A picture containing logo

Description automatically generated



Text

Description automatically generated

CI 95% is (7.81319,8.27281)

We are 95% happy the mean is in this interval.

**Group 5:Female GR Control Group**

Shape

Description automatically generated with low confidence

Text

Description automatically generated with medium confidence

CI 95% is (6.813555,7.264445)

We are 95% happy the mean is in this interval.

**Group 6: Female Med Group GR**

Logo

Description automatically generated



Text

Description automatically generated with medium confidence

CI 95% is (6.296984,6.685016)

We are 95% happy the mean is in this interval.

**Group 7: Female Control Group PP**

A picture containing graphical user interface

Description automatically generated



Text

Description automatically generated

CI 95% is (7.407962,8.070038)

We are 95% happy the mean is in this interval.

**Group 8: Female Med Group PP**

A picture containing logo

Description automatically generated



A picture containing text

Description automatically generated

CI 95% is (7.357852,7.772148)

We are 95% happy the mean is in this interval.

**Difference of Means**

Table

Description automatically generated

**Male Control GR – Male Med GR**

Mean – mean +\_ t\*(SE)





SE= 





CI interval is: (-0.3354693,0.8754693). Interval contains 0 so it supports the null hypothesis that there is no difference.

Table

Description automatically generated

**Male Control PP – Male Med PP**





A picture containing logo

Description automatically generated

CI interval is: (-0.2131786,0.5611786). Interval contains 0 so it supports the null hypothesis that there is no difference.

**Female Control GR – Female Med GR**

Table

Description automatically generated

Text

Description automatically generated with medium confidence

CI interval is: (0.226205,0.869795). This interval doesn’t have 0 so we reject the null hypothesis that there is no difference in favour of alternative hypothesis.

Table

Description automatically generated

Text

Description automatically generated

CI interval is: (-0.24849,0.59649). Interval contains 0 so it supports the null hypothesis that there is no difference.