QSCI 381 Homework #2 - Vinsensius

Number 1

1a

For each of the two treatment groups calculate the

- Sample size
- Mean
- Median
- Minimum
- Maximum
- Standard Deviation

of the time taken until the anesthetic took effect (i.e. of onset_sensory) and place your results into a table with one column for each treatment group and a row for each descriptive statistic, making sure your rows are labeled. Round all of your answers to one decimal place (12 pts).

Answer:

	Group 1	Group 2
Sample size	52	51
Mean (mins)	11.4	15.3
Median (mins)	7.5	10
Minimum (mins)	0	1
Maximum (mins)	50	50
Standard Dev. (mins)	11.5	12.1

1b

For each treatment group calculate the coefficient of variation. Show your answers below, rounding numeric values to two decimal places (4 pts)

Answer: CV for group 1 is 1.00 and CV for group 2 is 0.79.

1c

For each treatment group calculate the lower (Q1), and upper (Q3) quartiles, the interquartile range (IQR), and the upper and lower deciles (i.e. 10% percentile, 90% percentile). Which treatment group had the largest IQR? Compare and contrast this with the coefficient of variation finding from 1b (12 pts).

Answer:

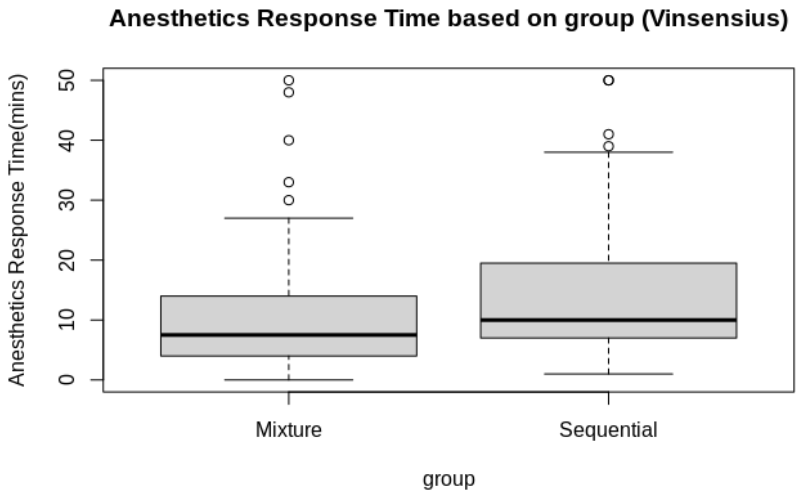
	Group 1 (mixture)	Group 2 (sequential)
Q1 (mins)	4	7
Q3 (mins)	13.5	19.5
IQR (mins)	9.5	12
Upper Decile (mins)	26.5	37
Lower Decile (mins)	2	5

Group 2 has the largest IQR out of the two group. While group 1 has larger CV than group. We can draw conclusion that having lower IQR, and higher CV will have more outlier.

1d

Using the boxplot() or plot() function, plot anesthetic response times (onset_sensory) as a box-whisker plot with onset_sensory on the y-axis, and treatment group on the x-axis. Label the axes accordingly (including units for onset_sensory), and include your name as the title of the plot. (5 pts)

Answer:



1e

Based on the mean and median response times, and via examination of the boxplots created in (1d), is the distribution of response times symmetric, left-skewed or right-skewed, giving reasons for your answer (3 pts).

Answer:

The data for both groups are right-skewed. This is because the mean is higher than the median for both of the group. Furthermore, if we look at the box plot there are outliers on the higher values of the response time, indicating there is a right 'tail', hence the right-skewed distribution.

1f

Calculate the z-scores for a response time of 20 minutes for each treatment group based on each group's mean and standard deviation. Round your answers to 2 decimal places (4 pts)

Answer: Z-score based on group 1 is 0.75. The z-score based on group 2 is 0.39.

1g

Using the mean and standard deviation calculated for each group, calculate the proportion of observations for each group that are within ± 1 SD of the mean, and also the proportion that are within ± 2 SD of the mean. Round your answers to 3 decimal places.

Compare these proportions to the expected values according to the Empirical Rule, noting any differences between the calculated values, and those expected from the Empirical Rule, and why this difference may have occurred (12 pts)

Answer:

	Group 1	Group 2
Proportion $\pm 1sd$	0.885	0.824
Proportion $\pm 2sd$	0.942	0.941

From empirical rule, we expect that the proportion of the data that is within 1 standard deviation is 0.68 while the proportion of the data that is within 2 standard deviation is 0.95. However, the proportion values calculated from each group are different from the expected values. The reason is because the data distributions for both groups are not symmetric based on 1d and empirical rule does not apply to the data for both groups.

Number 2

2a

Construct a contingency table of the frequency of eye dominance (2 rows; right or left) by which side of the room they sat in (3 columns; Left, Middle, Right), making sure you label rows and columns. Include column and row totals, and place your table below (8 pts)

Answer:

Seating Location / Eye Dominance	Left	Middle	Right	Sum
Left	9	13	13	35
Right	32	18	32	82
Sum	41	31	45	117

2b

Calculate the empirical probabilities for the following scenarios

- The probability an individual is left eye dominant
- The probability an individual is right-eye dominant AND sat in the middle of the room
- The probability an individual is left eye dominant GIVEN they are sat in the left side of the room
- The probability an individual is right-eye dominant OR is sat in the right side of the room

In each case round your answer to 3 decimal places (7 pts)

Answer:

- P(left eye dominant) = $\frac{35}{117} = 0.299$
- P(Right eye and sat in the middle) = $\frac{82}{117} * \frac{18}{82} = 0.154$
- P(Left eye dom given sat on left) = $\frac{9}{41} = 0.219$
- P(Right eye dom or sat on right) = $\frac{82}{117} + \frac{13}{117} = 0.811$

2c

Using the probability an individual is right-eye dominant P(right-eye), and the probability an individual sat in the left of the room P(left-room), calculate the **expected probability** of an individual being right-eye dominant **AND** that sat in the left side of the room P(right-eye AND left-room) **assuming that these events are Independent using the Multiplication Rule**. Round your answer to 3 decimal places (4 pts).

Answer:

P(right-eye and left-room) = $\frac{82}{117} * \frac{41}{117} = 0.246$

2d

Now calculate the empirical observed probability of an individual being right eye dominant AND that sat in the left side of the room. Round your answers to 3 decimal places Comparing this probability to the one calculated in 2c, do you think the side of the room sat in and eye dominance are independent? (3 pts)

Answer:

$$\begin{aligned} \text{P(right-eye and left-room)} &= \text{P(right-eye)P(left-room given right-eye)} \\ &= \frac{82}{117}\frac{32}{82} = 0.274 \end{aligned}$$

Since the values of probability of P(right-eye and left-room) calculated in 2c and 2d are different, thus the events are not independent of each other.