Lab - 6

Fifteen secretaries of a certain corporation were sent on a two-day training course to increase their typing skills. The table below shows the typing speed of the secretaries in words per minute before and after the training.

Secretary	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Before	75	60	54	67	60	85	60	74	69	85	82	68	70	58	72
After	75	65	59	66	65	86	70	71	68	86	80	70	75	57	80

Assuming the data to be normally distributed and $\alpha = 0.05$, is there evidence for the training to improve the typing speed of the secretaries. Use paired sample t test.

SOLUTION

Paired T-Test and CI: Before Training, After Training

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
Before Training	15	69.27	9.80	2.53
After Training	15	71.53	8.81	2.28

Estimation for Paired Difference

μ_difference: mean of (Before Training - After Training)

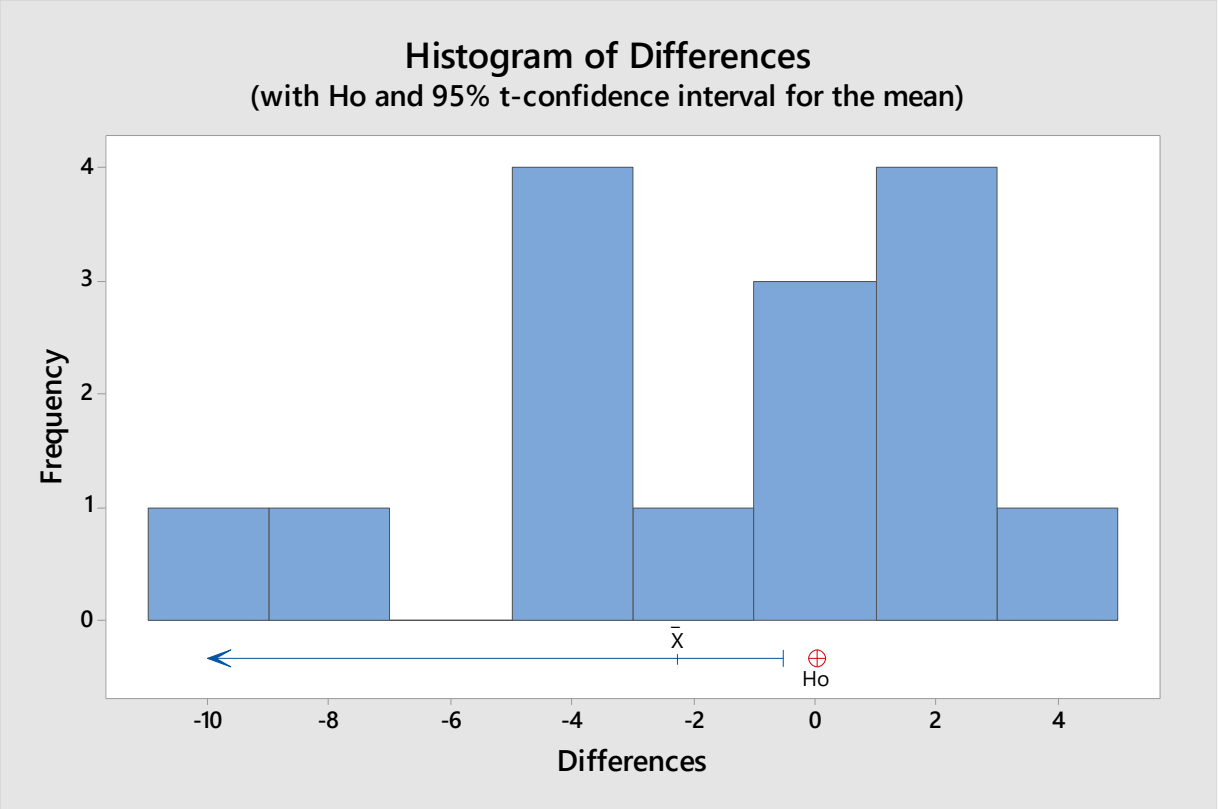
Mean	StDev	SE Mean	95% Upper Bound for μ_difference
- 2.267	3.863	0.997	- 0.510

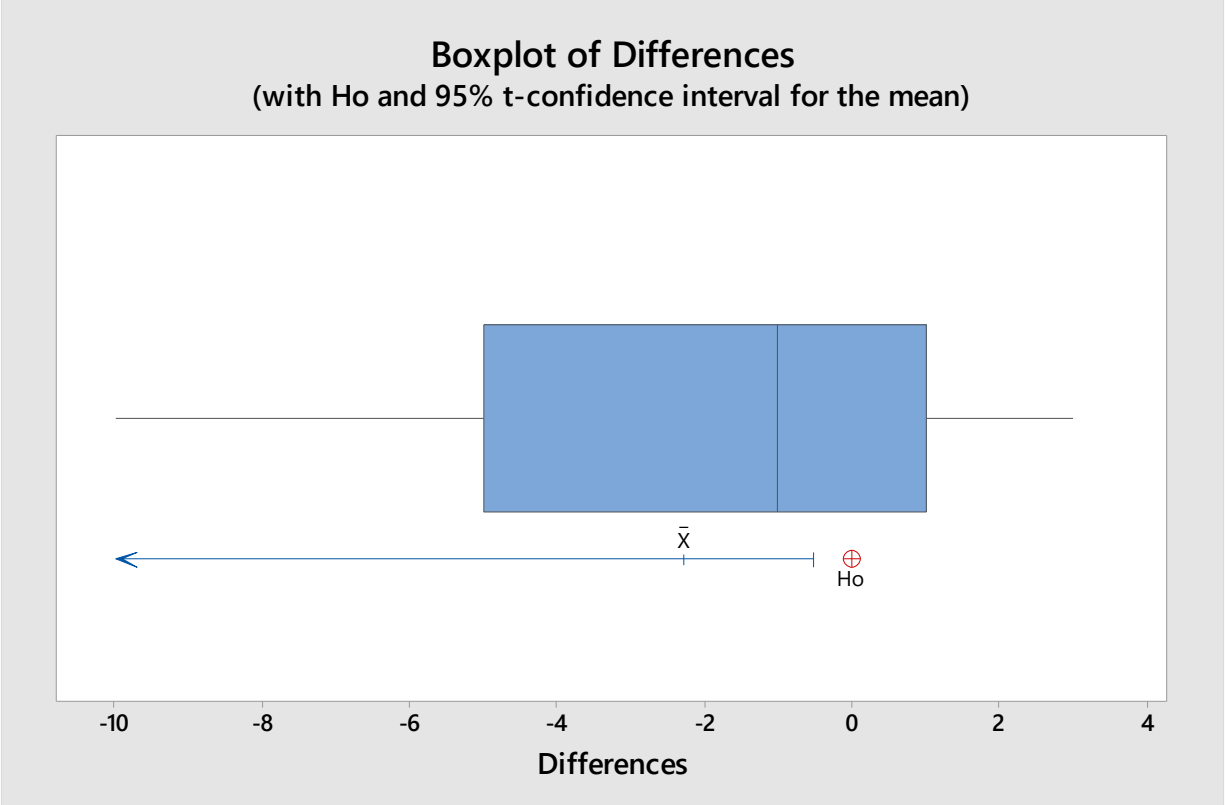
Test

Null Hypothesis H_0: μ_difference = 0

Alternative Hypothesis H_1: μ_difference < 0

T-Value	P-Value
-2.27	0.020





Conclusion

Fot the paired to test it is required that difference of two sample [before – after] is normally distributed. The graph shows that the differences are negatively skewed. Hence it raises the validity of the test. The alternative test could be Wilcoxon signed rank test.

In comparing p-value, it shows that the p-value(=0.02)is lesser than the α-value(0.05),we reject the null hypothesis that the training doesn't increase the typing speed of the secertaries at 5% level of significance.It means that the secertaries are benefited by the typing training .

The average typing speed before training was 69.27 and the average after training is 71.53 which shows that the average typing speed is increased after training and increment is significant.

Lab – 7

Recent studies of the private practices of physicians who saw no Medicaid patients suggested that the median length of each patient visit was 22 minutes. It is believed that the median visit length in practices with a large Medicaid load is shorter than 22 minutes. A random sample of 20 visits in practices with a large Medicaid load yielded, in order, the following visit lengths:

9.4	13.4	15.6	16.2	16.4	16.8	18.1	18.7	18.9	19.1
19.3	20.1	20.4	21.6	21.9	23.4	23.5	24.8	24.9	26.8

Based on these data, is there sufficient evidence to conclude that the median visit length in practices with a large Medicaid load is shorter than 22 minutes?

SOLUTION

Sign Test for Median: Visit Length

η : median of Visit Length

Descriptive Statistics

Sample	N	Median
Visit Length	20	19.2

Test

Null Hypothesis : H_0: $\eta = 22$

Alternative Hypothesis : H_1: $\eta < 22$

Sample	Number < 22	Number = 22	Number > 22	P-Value
Visit Length	15	0	5	0.021

Wilcoxon Signed Rank Test: Visit Length

η : median of Visit Length

Descriptive Statistics

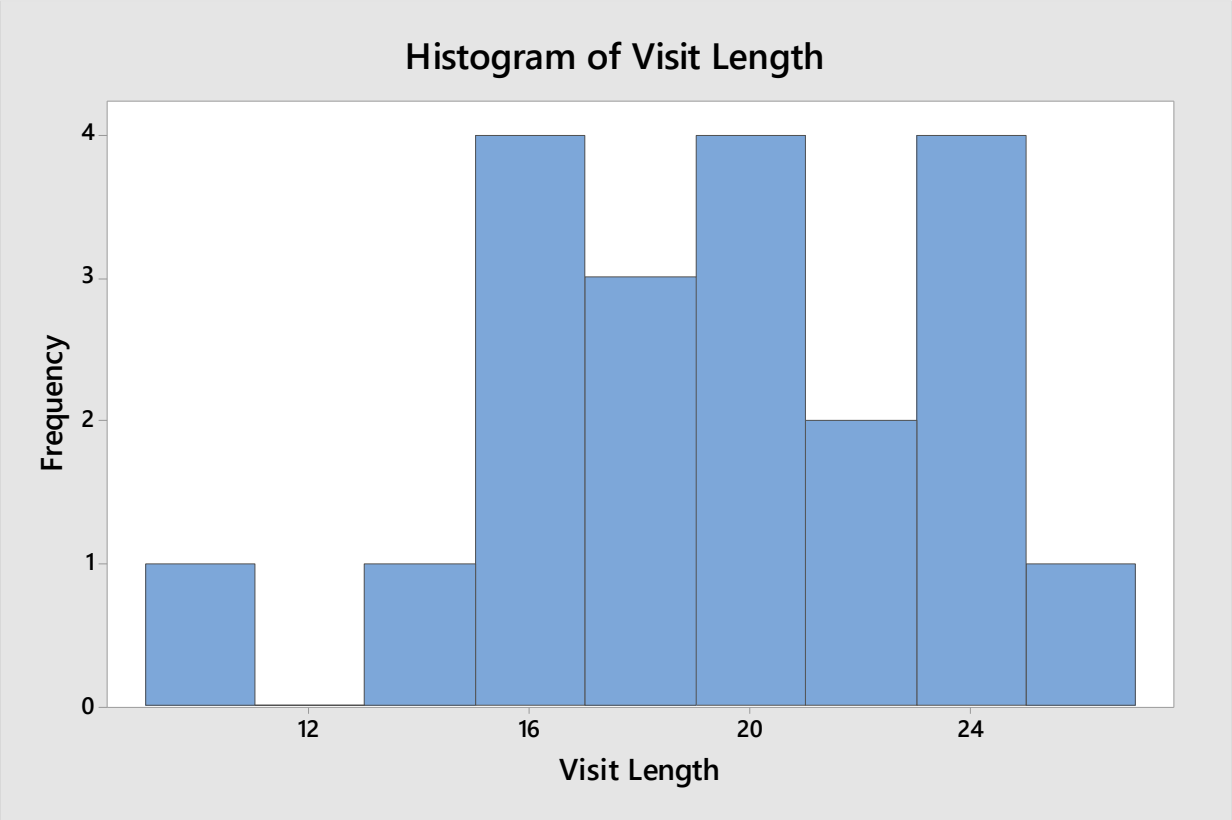
Sample	N	Median
Visit Length	20	19.2

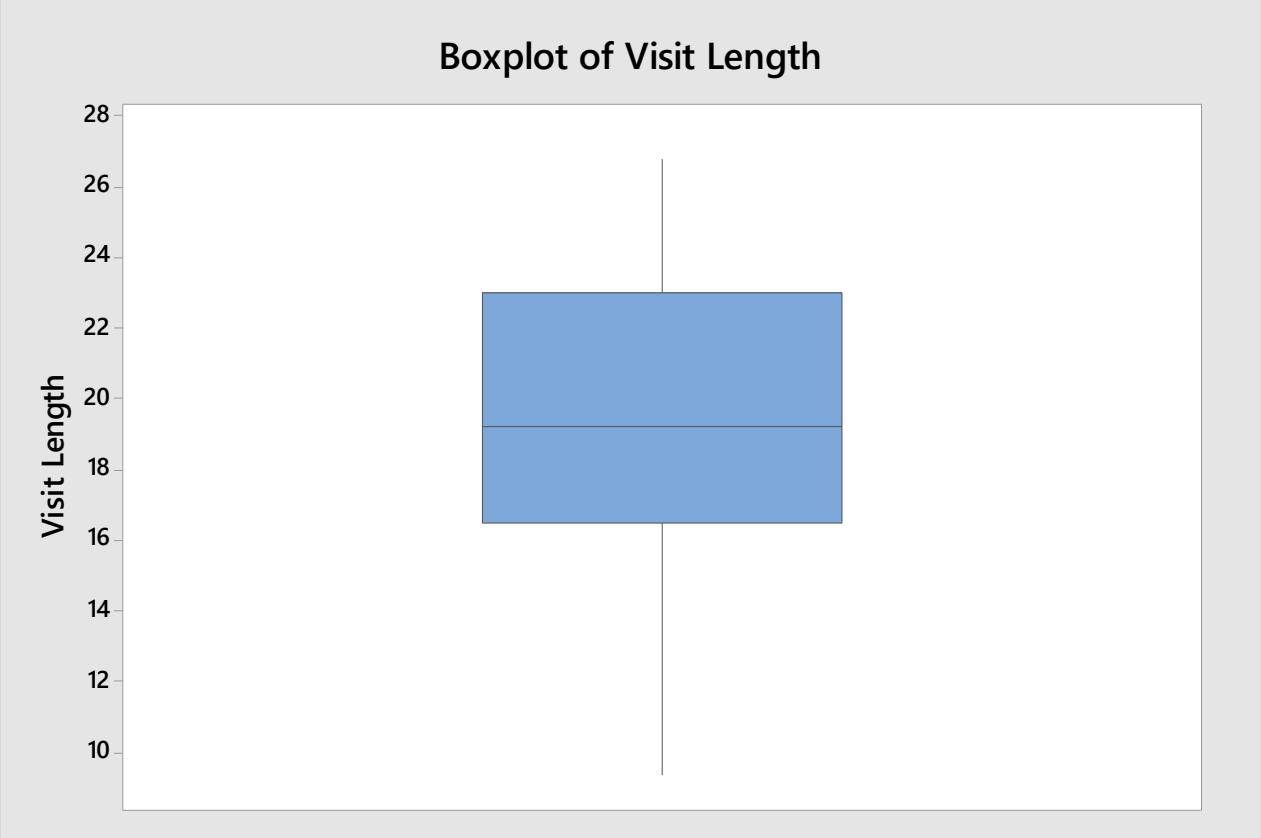
Test

Null Hypothesis : H_0: $\eta = 22$

Alternative Hypothesis : H_1: $\eta < 22$

Sample	N for Test	Wilcoxon Statistic	P-Value
Visit Length	20	38.50	0.007





The box and whisker plot shows that the distribution is right skewed which also provides evidence that median visit length is shorter. Shorter visit length is more frequent

Conclusion

1. **Sign Test :** the p-value = 0.021 < α - value = 0.05, we conclude that the median waiting time is significantly lower than the 22. The median time in the sample is 19.2 minutes. There is sufficient evidence to conclude that the median visit length in practice with a large Medicaid load is shorter than 22 minutes.
2. **Wilcoxon signed rank test :** The p - value = 0.007 < α - value (0.05), the test also confirms that the median visit length is significantly lower than 22 minutes.