MATCHED PAIRS T TEST

This test is used to compare the responses to a treatment in a within-groups design (ie, does an SAT prep course improve an individual’s SAT scores?).

A listening test was administered to Spanish teachers before and after an institute designed to improve Spanish listening skills.

The maximum possible score on the test was 36:

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</table>

Determine if the institute improved listening skills at the 5% significance level.

CALCULATE THE DIFFERENCES BETWEEN THE 2 TREATMENTS:

P) STATE POPULATION PARAMETER:

μ = the mean improvement in listening scores for teachers attending the institute (Post – Pre)

H) STATE HYPOTHESES:

H_0 : μ = 0        H_a : μ > 0

A) VERIFY CONDITIONS REQUIRED FOR TEST:

a) SRS- unknown; we may not be able to generalize the results to all teachers attending the institute

b) Normal sampling distribution- normal population or large sample size (n > 40) or justification for normal distribution (n < 40) after omitting outliers

Since the sample size is small, put data (differences) into list and check:

a) modified box plot… indicates no outliers

b) normal probability plot indicates a normal distribution (a histogram shows a slight skew).
T) PERFORM TEST:

a) USING TABLE C:

i) Determine mean (x̄) and standard deviation (s)

\[ x̄ = 1.45 \quad s = 3.2032 \]

ii) Calculate t statistic

\[ t = \frac{x̄ - 0}{s \sqrt{n}} = 2.024 \]

iii) Determine degrees of freedom

\[ df = n - 1 = 20 - 1 = 19 \]

iv) Determine critical t-value

From Table C (df = 19 and α = .05), the critical t value is 1.729.

Since 2.204 > 1.729, P-value < .05.

b) USING CALCULATOR:

STAT ---> TESTS ---> 2:T-Test… P-value = .029

DISTR ---> 5:tcdf (min, max, df) = (2.024, 100, 19) = .0286

S) STATE CONCLUSION:

At \( \alpha = .05 \) significance level, the study gives evidence that listening scores improved after the institute (P-value = .029) but the evidence is not overwhelming (since the results are not significant at \( \alpha = .01 \)) We, nonetheless, reject the null hypothesis.

CONFIDENCE INTERVAL (Use PAIS):

A 90% confidence interval for the mean increase in listening scores can be found using:

STAT ---> TESTS ---> 8: T Interval = (.21, 2.69)

We are 90% confident that the mean increase in the listening scores was between .21 and 2.69 points after teachers participated in the institute.