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 with a maximum score of 36 was administered to Spanish teachers before and after an institute designed to improve Spanish listening skills.

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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:

H₀ : μ = 0  
Hₐ : μ > 0

A) VERIFY CONDITIONS REQUIRED FOR TEST:

a) Random

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 > 30) or justification for normal distribution (n < 30) 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).

c) Independence

N > 10n > 10(20) > 200 Spanish teachers attending institute… probably?
T) PERFORM TEST:

a) USING TABLE B:

i) Determine mean ($\bar{x}$) and standard deviation ($s$)

$$\bar{x} = 1.45 \quad s = 3.2032$$

ii) Calculate $t$ statistic

$$t = \frac{\bar{x} - 0}{\frac{s}{\sqrt{n}}} = 2.024$$

iii) Determine degrees of freedom

$$df = n - 1 = 20 - 1 = 19$$

iv) Determine critical $t$-value and $P$-value

From Table B $(df = 19$ and $\alpha = .05)$, the critical $t$ value is 1.729.

Since $2.024 > 1.729$, $P$-value < .05.

b) USING CALCULATOR:

STAT $\rightarrow$ TESTS $\rightarrow$ T-Test… $P$-value = .029

DISTR $\rightarrow$: 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:

\[
\text{STAT} \rightarrow \text{TESTS} \rightarrow \text{T Interval} = (0.21, 2.69)
\]

*We are 90% confident that the mean increase in the listening scores was between 0.21 and 2.69 points after teachers participated in the institute.*