1

**Practical No: 05**

**OBJECT:**

**(a)** The following values are the lengths (cm) of 30 steel rods selected for lab test form a factory. 125, 120, 121, 123, 122, 130, 124, 122, 120, 122, 118, 119, 123, 124, 122, 124, 121, 122, 138, 149, 123, 128, 122, 130, 120, 122, 124, 134, 137, 128,

Test whether this sample of size 30 has come from a population whose mean length is 125 cm. Use one sample t-test.

**(b)** Two new drug A and B are given to two independent groups of 10 and 12 patients with heart

disease respectively. The reduction of blood pressure due to the two new drugs A and B are given below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Drug A | 7 | 16 | 14 | 9 | 10 | 11 | 6 | 8 | 10 |  | 9 |  |
| Drug B | 10 | 12 | 16 | 14 | 11 | 12 | 13 | 8 | 12 | 5 | 9 | 12 |

Would you conclude that the drug A is less effective than the drug B In reducing the blood pressure of patients with heart disease at 5% level of significance? Use independent sample t-test.

**(c)** Memory capacity of 10 students was tested before and after training, state whether the training was effective or not from the following scores.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Roll No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Before training | 12 | 14 | 11 | 8 | 7 | 10 | 3 | 0 | 5 | 6 |
| After training | 15 | 16 | 10 | 7 | 5 | 12 | 10 | 2 | 3 | 8 |

Use paired t-test.

**WORKING EXPRESSION:**

When the sample size is small (traditionally it is assumed to be less than or equal to 30), then the sampling distribution of the sample mean is assumed to be follow student’s t-distribution. The t distribution is also like normal distribution having shape as in normal distribution but little bit flatter**.**

**(a)**

**Case I: Test of Significance of a Single Mean:**

**Test Statistics:** Under Ho

~ ,

~ (when sample ‘s’ is known)

Where,

x̅ = Sample Mean

µ0 = Specified Population mean

σ = Population Standard Deviation

s = Sample Standard Deviation

n= Sample size

Sample Mean ()

Sample Standard deviation (s) =

**Hypothesis Setting:**

Null Hypothesis (Ho): µ = 125 cm (The average mean length is equal to 125cm.)

Alternative Hypothesis (H1): µ ≠ 125 cm (The average mean length is not equal to 125cm)

**Level of significance**(α) = 5% = 0.05

**(b)**

**Case II: Test of Significance of Difference between Two means:**

**Test Statistics:** Under Ho.

*~*

Where,

S²ₚ = [ +

S²ₚ = (when s₁² and s₂² are given)

Where,

s₁ =

s₂ =

**Hypothesis Setting:**

Null Hypothesis (Ho): µ1 = µ2 (Two population mean are equal.)

Alternative Hypothesis (H1): µ1 < µ2 (The first population mean is less than 2nd population mean.)

**Level of significance**(α) = 5% = 0.05

**(c)**

**Case III: Paired t- Test (Dependent Samples):**

**Test Statistics:** Under Ho.

**~**

Where,

= Mean of the difference =

difference between two pair of observation

Sample standard deviation of difference

**Sample Standard deviation (s) =**

**Hypothesis Setting:**

Null Hypothesis (Ho): **µₓ =µy** (The training is not effective.)

Alternative Hypothesis (H1): **µₓ ≠µy** (The training is effective.)

**Level of significance(α)=** 5% = 0.05

Practical No: 05

Name: Aakash Shrestha

Roll No.: 02

Subject: Statistics

Date: 2080/04/14

Faculty: BSc. CSIT 3rd Semester

**OUTPUT:**

**(a)**

T-TEST

/TESTVAL=125

/MISSING=ANALYSIS

/VARIABLES=Length

/CRITERIA=CI(.95).

**T-Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **One-Sample Statistics** | | | | |
|  | N | Mean | Std. Deviation | Std. Error Mean |
| Length | 30 | 125.2333 | 6.71428 | 1.22585 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **One-Sample Test** | | | | | | |
|  | Test Value = 125 | | | | | |
| t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| Lower | Upper |
| Length | .190 | 29 | .850 | .23333 | -2.2738 | 2.7405 |

**(b)**

T-TEST GROUPS=Type(1 2)

/MISSING=ANALYSIS

/VARIABLES=patients

/CRITERIA=CI(.95).

**T-Test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group Statistics** | | | | | |
|  | There are two drugs | N | Mean | Std. Deviation | Std. Error Mean |
| Patients | Drug A | 10 | 10.0000 | 3.05505 | .96609 |
| Drug B | 12 | 11.1667 | 2.88675 | .83333 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Independent Samples Test** | | | | | | | | | | | |
|  | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
| F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| Lower | Upper |
| Patients | Equal variances assumed | .006 | .941 | -.919 | 20 | .369 | -1.16667 | 1.26897 | -3.81369 | 1.48035 |
| Equal variances not assumed |  |  | -.914 | 18.841 | .372 | -1.16667 | 1.27584 | -3.83856 | 1.50523 |

**(c)**

T-TEST PAIRS=Before\_Training WITH After\_Training (PAIRED)

/CRITERIA=CI(.9500)

/MISSING=ANALYSIS.

**T-Test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Paired Samples Statistics** | | | | | |
|  | | Mean | N | Std. Deviation | Std. Error Mean |
| Pair 1 | Before\_Training | 7.6000 | 10 | 4.29987 | 1.35974 |
| After\_Training | 8.8000 | 10 | 4.73286 | 1.49666 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Paired Samples Correlations** | | | | |
|  | | N | Correlation | Sig. |
| Pair 1 | Before\_Training & After\_Training | 10 | .815 | .004 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Paired Samples Test** | | | | | | | | | | |
|  | | Paired Differences | | | | | t | df | Sig. (2-tailed) | |
| Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | |  |
| Lower | Upper |
| Pair 1 | Before\_Training - After\_Training | -1.200 | 2.78089 | .87939 | -3.18933 | .78933 | -1.365 | 9 | .206 |

**RESULTS:**

**(a)** From one- sample Test table, we obtained the value of tcal= 0.190 and P-value = 0.850 for two tailed test.

**Decision**:

2\*P value = 1.7 > α = 0.05. Hence, we accept Ho. Hence, we can conclude that average mean length is equal to 125cm.

**(b)** From independent sample Test table, we obtained the value of tcal = -0.919 and P-value = 0.369 for left tailed test.

**Decision**:

P value = 0.369 > α = 0.05. Hence, we accept Ho. Hence, we can conclude that drug A is less effective than drug B.

**(c)** From paired sample Test table, we obtained the value of tcal = -1.361 and P-value = 0.206 for two tailed test.

**Decision**:

2\*P value = 0.412 > α = 0.05. Hence, we accept Ho. Hence, we can conclude that training is not effective.

**CONCLUSION:**

**(a)** Hence, we have calculated one -Sample -T-test. The Test value is given 125cm. We have obtained the calculated value of t and p-value at last we conclude that the average mean length is equal to 125 cm.

**(b)** Hence, we have calculated an independent sample test. From the Independent sample t-test we have obtained the calculated value of t and P-value for independent sample test. And we conclude that Drug A is less effective than Drug B.

**(c)** Hence, we have calculated paired sample t-test. We obtained the calculated value of t and P-value for paired T-test. An we conclude that the training was not effective.