

INDEPENDENT t-TEST:

A CASE STUDY: Functional Well-Being between Place Data

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Dr. D S Dhakre & Prof. D Bhattacharya
Visva Bharati, Sriniketan, West Bengal, India

An independent t-test, also known as a two-sample t-test, is a statistical hypothesis test used to determine if there is a significant difference between the means of two independent groups. It is based on the t-distribution and is commonly used when comparing the means of a continuous variable between two distinct groups.

Here's how the independent t-test works:

1. Null Hypothesis (H_0): The null hypothesis typically states that there is no significant difference between the means of the two groups. Mathematically, $H_0: \mu_1 = \mu_2$, where μ_1 and μ_2 are the population means of Group 1 and Group 2, respectively.

2. Alternative Hypothesis (H_1): The alternative hypothesis proposes that there is a significant difference between the means of the two groups. Depending on the direction of interest, H_1 could be $\mu_1 \neq \mu_2$ (two-tailed test), $\mu_1 > \mu_2$ (one-tailed test for Group 1 mean being greater), or $\mu_1 < \mu_2$ (one-tailed test for Group 1 mean being smaller).

3. Assumptions:

- The data in each group should be independent of each other.
- Each group should follow approximately a normal distribution.
- The variances of the two groups should be approximately equal (homogeneity of variances assumption). If this assumption is violated, a modified version of the t-test (Welch's t-test) can be used.

4. Test Statistic: The test statistic for the independent t-test is calculated as:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where:

$\bar{X}_1$ and $\bar{X}_2$ are the sample means of Group 1 and Group 2, respectively.

- s_p is the pooled standard deviation, calculated as $s_p = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$

- n_1 and n_2 are the sample sizes of Group 1 and Group 2, respectively.

- s_1^2 and s_2^2 are the sample variances of Group 1 and Group 2, respectively.

5. Decision: Compare the calculated t-value to the critical t-value from the t-distribution table or use software to obtain the p-value. If the p-value is less than the significance level (often denoted as α , typically 0.05), then there is sufficient evidence to reject the null hypothesis and conclude that there is a significant difference between the means of the two groups.

The independent t-test is widely used in various fields, including psychology, biology, medicine, and social sciences, to compare means between two distinct groups and determine if the observed differences are statistically significant.

The Problem

To investigate, employees belong to Rural are Functional Well-being compare to Urban employee

Data

Download **Survey Data** file form the given link <https://dsdhakre.in/Datafiles.html>

Hypothesis

H_0 : There is no significance difference in Functional Well-being between Urban and Rural

H_1 : There is significance difference in Functional Well-being between Urban and Rural

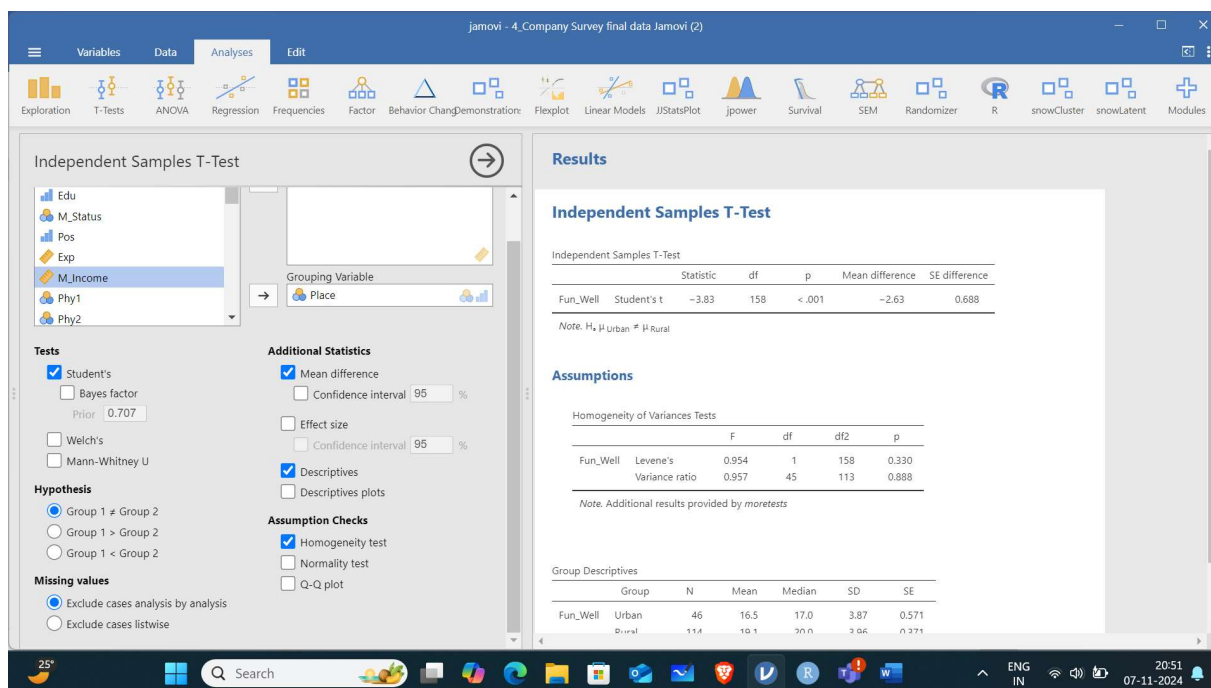
Step

The screenshot shows the Jamovi software interface. The 'Analyses' menu is open, displaying various statistical tests. The data table has columns for 'Res', 'Dept', 'B_Train', 'A_Train', and 'Train_Sc'. The 'Results' panel is empty.

Res	Dept	B_Train	A_Train	Train_Sc
1	Production	7.5	8.0	
2	Marketing	9.5	8.0	
3	Purchase & Store	9.5	10.0	
4	Production	9.5	7.5	
5	HR	6.5	6.0	
6	Production	7.0	9.0	
7	Purchase & Store	4.0	10.0	
8	Marketing	9.0	9.5	
9	Production	9.5	8.0	
10	Marketing	9.5	9.0	
11	Marketing	9.5	10.0	
12	Marketing	9.5	9.5	
13	Finance	9.5	7.5	
14	Marketing	9.5	9.0	
15	Marketing	9.5	7.5	
16	Production	9.0	9.5	
17	HR	9.5	8.0	
18	Finance	7.5	6.0	
19	Marketing	9.5	10.0	
20	Purchase & Store	2.0	8.0	
21	Purchase & Store	2.0	9.0	
22	HR	7.0	9.0	
23	Finance	7.5	8.0	
24	Finance	9.5	9.5	
25	Marketing	9.0	10.0	
26	Finance	7.5	9.0	

The screenshot shows the Jamovi software interface. The 'Analyses' menu is open, and 'Independent Samples T-Test' is selected. The data table is the same as in the previous screenshot. The 'Results' panel is empty.

Res	Dept	B_Train	A_Train	Train_Sc
1	Production	7.5	8.0	
2	Marketing	9.5	8.0	
3	Purchase & Store	9.5	10.0	
4	Production	9.5	7.5	
5	HR	6.5	6.0	
6	Production	7.0	9.0	
7	Purchase & Store	4.0	10.0	
8	Marketing	9.0	9.5	
9	Production	9.5	8.0	
10	Marketing	9.5	9.0	
11	Marketing	9.5	10.0	
12	Marketing	9.5	9.5	
13	Finance	9.5	7.5	
14	Marketing	9.5	9.0	
15	Marketing	9.5	7.5	
16	Production	9.0	9.5	
17	HR	9.5	8.0	
18	Finance	7.5	6.0	
19	Marketing	9.5	10.0	
20	Purchase & Store	2.0	8.0	
21	Purchase & Store	2.0	9.0	
22	HR	7.0	9.0	
23	Finance	7.5	8.0	
24	Finance	9.5	9.5	
25	Marketing	9.0	10.0	
26	Finance	7.5	9.0	



Reporting

Place	N	Mean	Sd	df	t	p-value
Rural	114	19.1	3.96	158	-3.827	0.000
Urban	46	16.5	3.87			

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
Functional Wellbeing	.954	.330	-3.83	158	.000	-2.63	.688	-3.99	-1.27

An independent-sample t-test was conducted to compare the Functionally well-being for Rural and Urban employees. There were significant difference [$t(158) = -3.827, p = .00$] in the scores with mean score for Rural [$M = 19.1, Sd = 3.96$] was higher than Urban [$M = 16.5, Sd = 3.87$]. The magnitude of the difference in the means [mean difference = -2.632, 95% *CI*: -3.990 to -1.273] was significant. Hence H_1 was supported. Hence, the mean score shows that the employees who belong to rural is high Functionally well-being than the urban employees.