

A sport writer wished to see if a football filled with helium travel farther, on average, than a football filled with air. To test this, the writer used 18 adult male volunteers. These volunteers were randomly divided into two groups of nine (9) subjects each. Both groups kicked the football to the recommended pressure. The mean yardage for group 1 was $X_{(\text{bar})1}=30$ yards, with a standard deviation of $S_1=8$ yard. The mean yardage for group 2 was $X_{(\text{bar})2}=26$ yards, with a standard deviation of $S_2=6$ yard. Follow the five steps hypothesis testing to test whether there is a significant difference between the distance traveled by footballs filled with helium and with air at 95% level.

Ans.

- **To Test**
 $H_0 : \mu_1 = \mu_2$ Vs $H_1 : \mu_1 > \mu_2$ (two tailed test)
- **Level of Significance**
 $\alpha = 0.05$

- **Test Statistics:**

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \text{ follows Student's t distribution with d.f. } = n_1 + n_2 - 2 = 16 \text{ df}$$

where

$$\bar{x}_1 = 30 \quad \bar{x}_2 = 26 \quad n_1 = 9 \quad n_2 = 9 \quad s_1 = 8 \quad s_2 = 6$$

$$S^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 2)s_2^2}{n_1 + n_2 - 2} = 50$$

$$t = 1.2$$

- **P-value** = $P(t > 1.2) = 0.1238$
 Since the P-value $0.1238 > 0.05$, we do not reject H_0 .
 It is statistically not significant.
- **Conclusion**

At the 5% level of significance, the data does not provides enough evidence to reject the null hypothesis. Thus we conclude that there is no significant difference between the distance traveled by footballs filled with helium and with air at 95% level.

Hypothesis Test: Independent Groups (t-test, pooled variance)

30	26	mean
8	6	std. dev.

9	9	n
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16	df
4.000	difference (-)
50.000	pooled variance
7.071	pooled std. dev.
3.333	standard error of difference
0	hypothesized difference
1.20	t
.1238	p-value (one-tailed, upper)

You are going to test the hypothesis whether there is a gender differences in political party affiliation. Answer the following questions:

1. What are the variables in this testing?

Ans. The variables in this testing are gender and political party affiliation.

2. What hypothesis testing formula do you apply to test the differences? Why?

Ans. We would use Chi square test of independence of attributes to see if gender and political party affiliation are related or not.

Test Statistics

$$\chi^2 = \sum \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \text{ follows Chi Square with } (r-1)(c-1) \text{ d.f}$$

Where

r = no. of rows c = no of columns O_{ij} =observed value in ith row and jth column
 E_{ij} =expected value in ith row and jth column

3. What would be the Ho and H1 in this hypothesis testing?

H0 : There is no gender differences in political party affiliation

H1 : There is significant gender differences in political party affiliation