

Conditions

The paired t-test

Based upon the results of a manual dexterity test, two matched groups of female college students were formed. One group of students was asked to drive an automobile simulator after having consumed three bottles of beer in one hour. The second group of students drove the same simulator after consuming three bottles of nonalcoholic beer in the same time period. The number of errors per minute was recorded in the simulator as shown below. Is there a significant decrease in the errors per minute recording of the nonalcoholic group? Use an alpha level of 0.01.

Alcohol 6 4 9 3 15 5 9 7 6 8
Non-alcohol 5 5 6 0 8 2 4 2 8 4

Solution

This test is used when the samples are dependent; that is, when there is only one sample that has been tested twice (repeated measures) or when there are two samples that have been matched or "paired". This is an example of a paired difference test.

$$t = \frac{\bar{X}_D - \mu_0}{s_D / \sqrt{n}}$$

Alcohol	Non-alcohol	Difference
6	5	1
4	5	-1
9	6	3
3	0	3
15	8	7
5	2	3
9	4	5
7	2	5
6	8	-2
8	4	4
M_D		2.8
S_D		2.780887
t		3.184012

The degrees of freedom:

$$k = n - 1 = 8$$

The p-value for 0.01:

$$p = 3.3554$$

For this alpha level, the H0 is approved.