

Roadmap to Data Analysis

IV. Comparing Averages – The t tests

Learning Objectives

- Understand which statistical test to use for comparing averages between two groups
- Understand the differences between the independent t test and dependent (paired) t test
- Understand how to use a t test calculator with example data, and interpret results

Averages...

- For *continuous* variables, i.e. those that increase or decrease steadily, rather than differ by categories, such as
 - Age (but not age *categories* or *ranges*)
 - Total score of the PTSD checklist
 - Number of active clients
 - Proportion of a population

T test—two types

1. The “independent t test”: Between two independent groups, such as
 - Men & women
 - Treatment and comparison groups
2. The “dependent group, or paired group t test”: For one group, measured pre- and post- an intervention
 - This is the one we’ll illustrate in this presentation

Dependent (paired) t test--example

Do socialization groups reduce depression for torture survivors?

- Research design: non-experimental one group pre- post- design
- An 8 week socialization group
- Sample: 20 clients
- Outcome measure: the Center for Epidemiological Studies Depression Scale (CES-D)

Excerpt from CES-D

During the past week:	Rarely or none of the time (less than 1 day)	Some or a little of the time (1–2 days)	Occasionally or a moderate amount of the time (3–4 days)	Most or all of the time (5–7 days)
1. I was bothered by things that usually don't bother me.				
2. I did not feel like eating; my appetite was poor.				
3. I felt that I could not shake off the blues even with help from my family or friends.				
4. I felt that I was just as good as other people.				
5. I had trouble keeping my mind on what I was doing.				
6. I felt depressed.				

Database example

	CES-D Total Score	
Client ID	Pre-	Post-
1	26	25
2	27	22
3	35	34
4	22	25
5	25	32
6	18	18
7	12	10
8	14	14
9	45	28
10	25	20
11	15	16
12	54	30
13	26	25
14	28	26
15	38	30
16	54	35
17	50	20
18	45	25
19	42	32
20	36	22

T test Calculator

- <http://studentsttest.com/>
- Also available via <http://www.healtorture.org/content/basic-statistical-methods>
 - Go to “Basic Statistical Methods”
 - “Paired T-test Calculator Tool”
- Copy and paste excel data in each data box
 - “Group 1” would be the pre- intervention data
 - “Group 2” would be the post- intervention data
- Check “Groups are matched” for paired t test
- Click “Calculate”

Student's T-Test

Free online t-test calculator



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Group 1:

Enter your continuous, numeric data for group 1 in this column.

Enter one number per line.

26
27
35
22
25
18
12
14
45

Mean = 31.85

Standard Deviation = 13.19998

Standard Error = 2.95161

Describe your groups:

- ☐ groups have equal variance
- ☐ groups have unequal variance
- ☒ groups are matched

How many tails?

- ☐ 1-Tailed t-test
- ☒ 2-Tailed t-test

calculate

p = 0.00377

[Clear all data](#)

Group 2:

Enter your continuous, numeric data for group 2 in this column.

Enter one number per line.

25
22
34
25
32
18
10
14
28

Mean = 24.45

Standard Deviation = 6.79377

Standard Error = 1.51913

Student's t-test is a method in statistics to determine the probability (p) that two populations are the same in respect to the variable that you are testing.

This is a free online statistics calculator that computes the p value for Student's t-test.

You can choose the number of tails your t-test has, and you can select a t-test for groups with equal variance, unequal variance, or paired groups, depending on where your data came from.

Student's t-test assumes that your data are continuous and come from a normally distributed population.

If your data are not continuous, or do not come from a normally distributed population, you should consider a different statistical test.

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Interpreting Results

- Mean (average) of pretest scores = 31.85
- Mean (average) of posttest scores = 24.45
- The change from pre- to post- is significantly lower (in the CES-D scale, lower means less depressed), $p = .004$
- The probability that this result is due to chance is less than 4 in a thousand
- You can conclude that the intervention participants showed lowered depression over time
- But remember – because of the non-experimental research design, you haven't really proven that the intervention *caused* the reduction in depression