

Hypothesis Testing Using Two Related Samples - The Dependent-Groups t-Test

When the two groups (or samples) of scores are not independent of each other, either because a **repeated measures design** (within-subjects design) or a **matched-subjects design** was used, then the independent t-test must be abandoned in favor of the **dependent t-test**, also called the **correlated-groups t-test** or the **related-samples t-test**. The relevant formulas for calculating the test are:

$$t = \frac{M_D - \mu_D}{s_{M_D}}, \text{ where } s_{M_D} = \frac{s_d}{\sqrt{n}} = \sqrt{\frac{s_d^2}{n}}, \text{ df} = n - 1$$

$$\text{Cohen's } d = \frac{M_D}{s_d}, \quad r^2 = \frac{t^2}{t^2 + df}$$

Dr. Fraud claims that smokers who spend a month listening for one hour a day to his audio tapes containing subliminal messages to stop smoking will show a reduction in their cigarette consumption. A random sample of smokers is selected. The number of cigarettes each person smokes on the day before beginning the audio tape program and the number of cigarettes smoked on the day following completion of the audio tape program will be recorded.

Question: What is the name of this research design? How many subjects will be required if the researcher desires 9 scores per condition?

Step 1) State the null and alternative hypotheses.

H₀:

H₁:

Step 2) Establish a decision criterion (set alpha).

Step 3) Go out and collect the data, calculate summary statistics, and calculate the value of the test statistic.

The following data were collected as part of this study:

<u>Before</u>	<u>After</u>
30	35
20	28
15	17
22	25
35	33
18	18
24	28
40	43
26	25

Step 4) Make a statistical decision concerning the null hypothesis.

Step 5) Write a conclusion describing the result of the statistical analysis.

Is there a difference in life satisfaction between pet owners and nonpet owners? A researcher decides to conduct a study to find out. She selects a sample of six pet owners and matches them to six nonpet owners. The matching variables are income, marital status, number of close friendships, and general health. She then administers a life satisfaction inventory to all subjects.

Question: What is the name of this research design? How many subjects will be required if the researcher desires 6 scores per condition?

Step 1) State the null and alternative hypotheses.

H₀:

H₁:

Step 2) Establish a decision criterion (set alpha).

Step 3) Go out and collect the data, calculate summary statistics, and calculate the value of the test statistic.

The following data were collected as part of this study:

<u>pet owners</u>	<u>nonpet owners</u>
35	30
29	29
30	31
39	31
37	27
35	27

Step 4) Make a statistical decision concerning the null hypothesis.

Step 5) Write a conclusion describing the result of the statistical analysis.