

## SPSS Chapter 7 Example 2 - Paired-Samples t Test

A student project investigated the design of controls for an instrument panel. 25 right-handed students were asked to turn two identical knobs, one with a right-hand thread and another with a left-hand thread, a fixed distance and the time for this task was measured in seconds.

The following data is used:

Subject	Right Thread	Left Thread	Subject	Right Thread	Left Thread
1	113	137	14	107	87
2	105	105	15	118	166
3	130	133	16	103	146
4	101	108	17	111	123
5	138	115	18	104	135
6	118	170	19	111	112
7	87	103	20	89	93
8	116	145	21	78	76
9	75	78	22	100	116
10	96	107	23	89	78
11	122	84	24	85	101
12	103	148	25	88	123
13	116	147			

We are testing the following:

$$H_0: \mu_R - \mu_L = 0$$

$$H_a: \mu_R - \mu_L < 0$$

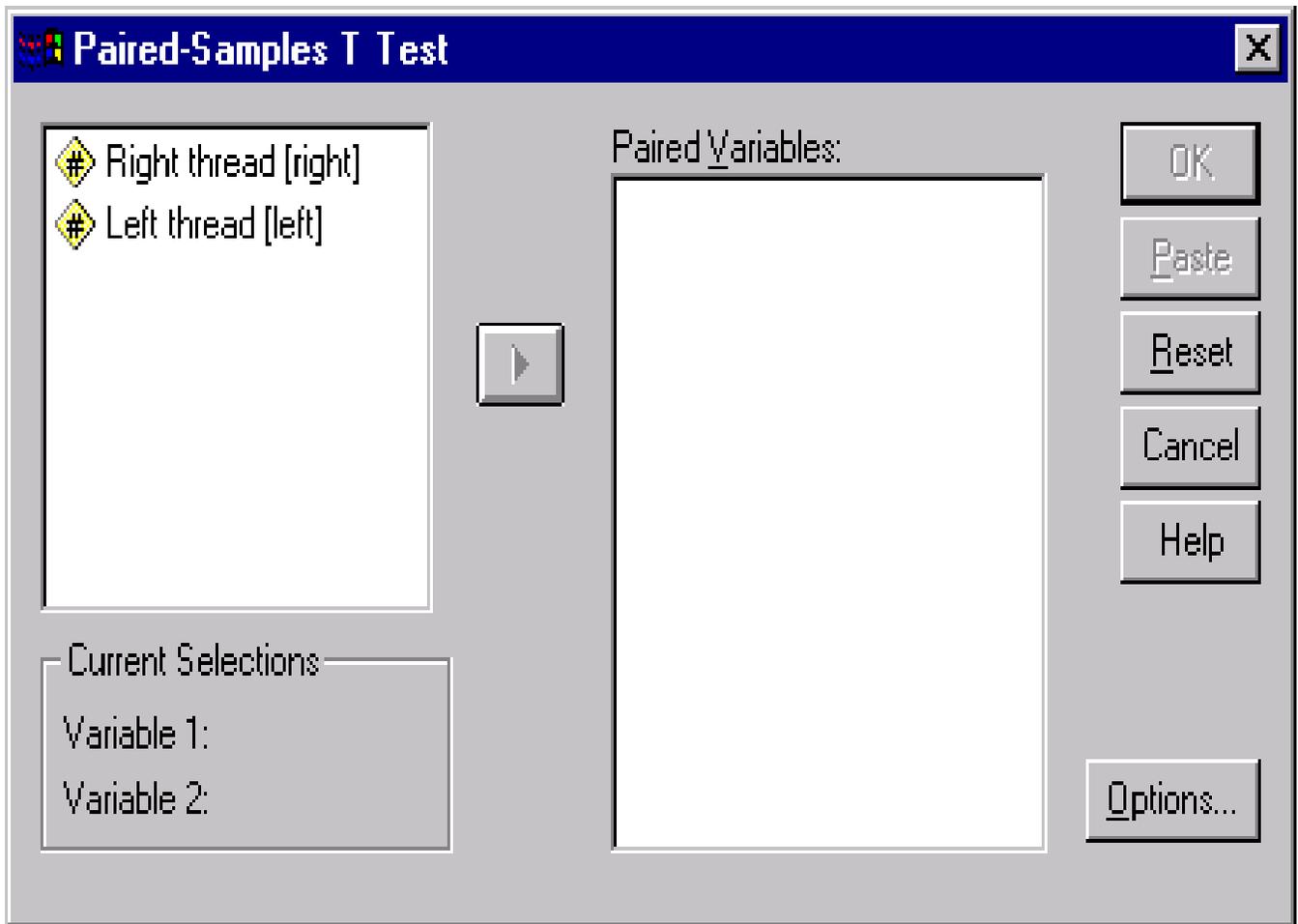
The data were entered in SPSS and look like the following:

The screenshot shows the SPSS Data Editor window for a file named 'P532'. The window title bar includes the SPSS logo and the text 'P532 - SPSS Data Editor'. Below the title bar is a menu bar with options: File, Edit, View, Data, Transform, Statistics, Graphs, Utilities, Window, and Help. A toolbar with various icons is located below the menu bar. The main data grid has a column labeled '1:right' with a value of '113' in the first row. The data is organized into columns: 'right', 'left', and four columns labeled 'var'. The 'right' column contains the following values for rows 1 through 12: 113, 105, 130, 101, 138, 118, 87, 116, 75, 96, 122, 103. The 'left' column contains the following values for rows 1 through 12: 137, 105, 133, 108, 115, 170, 103, 145, 78, 107, 84, 148. The status bar at the bottom of the window displays 'SPSS Processor is ready'.

	right	left	var	var	var	var
1	113	137				
2	105	105				
3	130	133				
4	101	108				
5	138	115				
6	118	170				
7	87	103				
8	116	145				
9	75	78				
10	96	107				
11	122	84				
12	103	148				

*Follow these steps to perform this inferential statistic:*

1. Click **Analyze**, click **Compare Means**, and click **Paired-Samples t Test**. The following window will appear.



2. Click “**right**” (a.k.a. “**right thread**”) and it will appear next to *Variable 1* in the box entitled *Current Selections*.
3. Click “**left**” (a.k.a. “**left thread**”) and it will appear next to *Variable 2* in the box entitled *Current Selections*.
4. Click ► and “**right-left**” will appear in the box entitled *Paired Variables*.
5. A 95% confidence interval is the default for the Paired-Samples t Test. If you wish to change the confidence level, click **Options**, change “**95**” to the desired confidence level in the box entitled *Confidence Interval*, and click **Continue**.
6. Click **OK**.

The SPSS output for this example of the Paired-Samples t Test is the following:

### Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Right thread	104.12	25	15.80	3.16
Left thread	117.44	25	27.26	5.45

There are 25 pairs in this problem. The means are given above.

### Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 Right thread & Left thread	25	.542	.005

### Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Right thread -Left thread	-13.32	22.94	4.59	-22.79	-3.85	-2.904	24	.008

The difference between the right and left thread is -.13.32. The t statistic is testing  $H_0: \mu_R - \mu_L = 0$ , which in this example is  $t = -2.904$  with 24 degrees of freedom. The p-value is .008, and this is strong evidence against  $H_0$  that both right and left threads are equally difficult to thread. Note however the alternative hypothesis is One sided therefor we divide the probability by two(.008/2=.004). The pvalue is Smaller , .004 ,providing strong evidence against the null hypothesis.