

SPSS Instructions for paired t-test

This example uses material from the STARS project (www.stars.ac.uk)

To carry out a paired t-test, you need to be able to do the following using SPSS:

- Carry out a paired t-test
- For each individual in the sample, calculate d , the difference between the two measurements to be compared
- Check that the values of d support the Normality assumption underlying the test

The data file for this example is *upgrade3.sav*. You need to download and save this file for use in the example.

Open SPSS and the data file

On the Brookes PC network, select Start > All programs > Statistics > SPSS, choosing version 15.0.

If necessary, when SPSS has loaded, click Cancel to avoid a tutorial session.

To open the data file, *upgrade3.sav*, select File > Open and then navigate to the folder where you have downloaded and saved the file for this example, and open it.

The worksheet contains 3 variables, recording the birth rates achieved by a sample of UK fertility clinics:

<i>clinic</i>	A number used to identify clinics
<i>under38</i>	Birth rate for women below 38 years of age
<i>br38plus</i>	Birth rate for women aged 38 and over.

Carry out a paired t-test

- Select **Analyse > Compare means > Paired-Samples T Test**
- Click on *under38*
- Click on *br38plus*, then click on the **▶** symbol
- Click on **OK**

SPSS generates three tables. Check that your output is the same.

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	under38	23.642	33	6.0280	1.0493
	br38plus	10.900	33	4.8065	.8367

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	under38 & br38plus	33	.309	.081

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	under38 - br38plus	12.7422	6.4462	1.1221	10.4565	15.0279	11.355	32	.000

The next steps are used to check that the data supports the assumptions underlying the test.

Find the differences between two measurements being compared

- Select **Transform > Compute**
- In the box labelled Target variable type D
- Click in the box labelled Arithmetic expression, then click on under38 and on \blacktriangleright , click on the minus sign in the buttons below the arithmetic expression box, then click on br38plus and on \blacktriangleright

The arithmetic expression box should now read under38-br38plus

- Click on **OK**.

SPSS calculates, for each clinic in the sample, the difference between the birth rates for women in different age groups

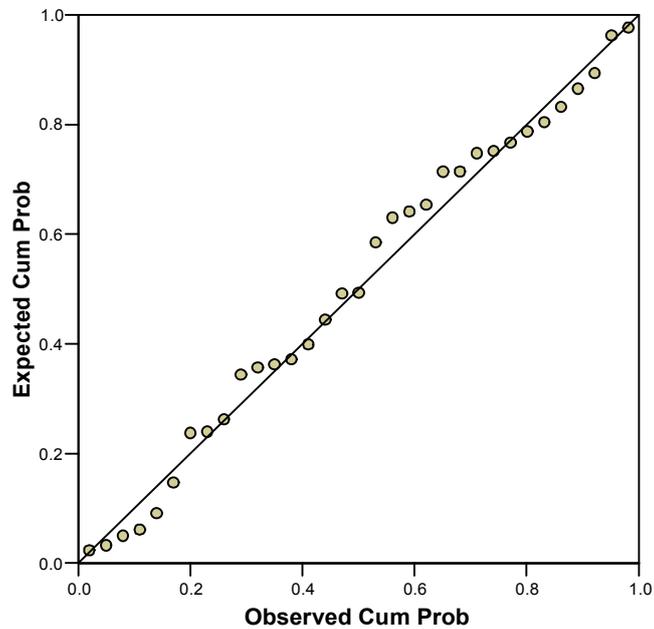
The paired t-test assumes that these differences are Normally distributed. To check this visually, use a P-P plot.

To draw a P-P plot

- Select **Analyse > Descriptive statistics > P-P plots**
- Select D and click on \blacktriangleright
- Click on **OK**.

SPSS generates two graphs, the first is shown below and the second can be disregarded. Check that your output looks like this:

Normal P-P Plot of D



Can you use the output to answer the following questions?

First look at the tables

- 1 What are the hypotheses for the paired t-test ?
- 2 Can you identify the test statistic, degrees of freedom and the P-value for the paired t-test?
- 3 What do you conclude?

Now look at the P-P plot for checking the distribution of D

- 4 Does the data support the assumption of Normality?

Answers

- 1 Null: mean birth rate for women under 38 is the same as the mean birth rate for women aged 38 and over
Alternative: mean birth rate for women under 38 is not the same as the mean birth rate for women aged 38 and over
- 2 Test statistic: $t=11.355$
Degrees of freedom (df) = 32
Because SPSS allows only three decimal places for reporting the P-value, very small values are displayed as 0.000. We report this as 'P<0.001'.
- 3 The data provides statistically significant evidence that the mean birth rates differ between women aged under 38 and women aged 38 and over (paired t-test, $t= 11.355$, $df=32$, $P<0.001$).
- 4 The points shown on the P-P plot are reasonably close to the diagonal and hence support the assumption that differences between the relevant birth rates are Normally distributed. This reassures us that the conclusion of the test can be relied on.