Chapter 1
One-Sample Continuous Data (One-Sample T-Test, One-Sample Wilcoxon Signed Rank Test, 10 Patients)

1 General Purpose

Because biological processes are full of variations, statistical tests give no certainties, only chances. Particularly, the chance that a prior hypothesis is true. What hypothesis? Often, a nullhypothesis, which means no difference in your data from a zero effect. A zero effect indicates that a factor, like an intervention or medical treatment does not have any effect. The one sample t-test is adequate for assessment.

2 Schematic Overview of Type of Data File

Outcome
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.
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3 Primary Scientific Question

Is the mean outcome value significantly different from the value zero.

T.J. Cleophas, A.H. Zwinderman, *SPSS for Starters and 2nd Levelers*,
DOI 10.1007/978-3-319-20600-4_1

4 Data Example

The reduction of mean blood pressure after treatment is measured in a sample of patients. We wish to know whether the mean reduction is significantly larger than zero.

Outcome
3
4
−1
3
2
−2
4
3
−1
2
outcome = decrease of mean blood pressure after treatment (mm Hg)

5 Analysis: One-Sample T-Test

The data file is in extras.springer.com, and is entitled "chapter1onesample-continuous". Open it in SPSS. For analysis the module Compare Means is required. It consists of the following statistical models:

Means,
One-Sample T-Test,
Independent-Samples T-Test,
Paired-Samples T-Test and
One Way ANOVA

Command:
Analyze....Compare Means....One-Sample T-Test....Test Variable(s): enter "mean blood pressure reduction"....click OK.

In the output sheets is the underneath table.

One-sample test

	Test value = 0					
					95 % confidence interval of the difference	
	t	df	Sig. (2-tailed)	Mean difference	Lower	Upper
VAR00001	2,429	9	,038	1,70000	,1165	3,2835

It shows that the t-value equals 2,429, which means that with 10–1 = 9 degrees of freedom a significant effect is obtained at p = 0,038. The reduction of mean blood pressure has an average value of 1,7000 mm Hg, and this average reduction is significantly larger than a reduction of 0,00 mm Hg.

6 Alternative Analysis: One-Sample Wilcoxon Signed Rank Test

If the data do not follow a Gaussian distribution, this method will be required, but with Gaussian distributions it may be applied even so.

Command:
Analyze....Nonparametric tests....One Sample Nonparametric Tests....click Fields ....Test Fields: enter "mean blood pressure reduction"....click Settings....click Choose Tests....mark Customize Tests....mark Compare median to hypothesized ....Hypothesized median: type "0,00"....click Run.

The underneath table is in the output sheet. The median of the mean blood pressure reductions is significantly different from zero. The treatment is, obviously, successful. The p-value is very similar to that of the above one sample t-test.

Hypotheses test summary

	Null hypothesis	Test	Sig.	Decision
1	The median of mean blood pressure reduction equals 0,000.	One-Sample Wilcoxon Signed Rank Test	,035	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05

7 Conclusion

The significant effects indicate that the nullhypothesis of no effect can be rejected. The treatment performs better than no treatment. It may be prudent to use non-parametric tests, if normality is doubtful or can not be proven like with small data as those in the current example.

8 Note

The theories of null hypotheses and frequency distributions are reviewed in Statistics applied to clinical studies 5th edition, Chaps. 1 and 2, entitled "Hypotheses data stratification" and "The analysis of efficacy data", Springer Heidelberg Germany, 2012, from the same authors.