Chapter 15
Trend Test for Continuous Data (30 Patients)

1 General Purpose

Trend tests are wonderful, because they provide markedly better sensitivity for demonstrating incremental effects from incremental treatment dosages, than traditional statistical tests.

2 Schematic Overview of Type of Data File

Outcome	predictor
.	.
.	.
.	.
.	.
.	.
.	.
.	.
.	.
.	.

The outcome variable is continuous, the predictor variable is categorical, and can be measured either as nominal (just like names) or as ordinal variable (a stepping pattern not necessarily with equal intervals). In the Variable View of SPSS "Measure" may, therefore, be changed into nominal or ordinal, but, since we assume an incremental function the default measure scale is OK as well.

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3 Primary Scientific Question

Do incremental treatment dosages cause incremental beneficial outcome effects.

4 Data Example

In a parallel-group study of three incremental dosages of antihypertensive treatments.

The mean reduction of mean blood pressure per group is tested.

Outcome (mean blood pressure, mm Hg)	Treatment group
113,00	1,00
131,00	1,00
112,00	1,00
132,00	1,00
114,00	1,00
130,00	1,00
115,00	1,00
129,00	1,00
122,00	1,00
118,00	2,00

5 Trend Analysis for Continuous Data

The entire data file is in extras.springer.com, and is entitled "chapter15trend-continuous". We will, first, perform a one way analysis of variance (ANOVA) (see also Chap. 13) to see, if there are any significant differences in the data. If not, we will perform a trend test using simple linear regression. For analysis the statistical model One Way ANOVA in the module Compare Means is required. Command:

Analyze....Compare Means....One-Way ANOVA....Dependent List: blood pressure Factor: treatment. . .click OK.

ANOVA
VAR00002

	Sum of squares	df	Mean square	F	Sig.
Between groups	246,667	2	123,333	2,035	,150
Within groups	1636,000	27	60,593		
Total	1882,667	29			

The above table shows that there is no significant difference in efficacy between the treatment dosages, and so, sadly, this is a negative study. However, a trend test having just 1° of freedom has more sensitivity than a usual one way ANOVA, and it could, therefore, be statistically significant even so. For analysis the model Linear in the module Regression is required.

Command:
Analyze....Regression....Linear....Dependent: blood pressure....Independent(s): treatment....click OK.

ANOVA[a]

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	245,000	1	245,000	4,189	,050[b]
	Residual	1637,667	28	58,488		
	Total	1882,667	29			

[a]Dependent Variable: VAR00002
[b]Predictors: (Constant), VAR00001

Coefficients[a]

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	125,333	3,694		33,927	,000
	Treatment	−3,500	1,710	−,361	−2,047	,050

[a]Dependent Variable: blood pressure

Four tables are given, we will only use the third and fourth ones as shown above. The tables show that treatment dosage is a significant predictor of treatment response wit a p-value of 0,05. There is, thus, a significantly incremental response with incremental dosages.

6 Conclusion

Trend tests are wonderful, because they provide markedly better sensitivity for demonstrating incremental effects from incremental treatment dosages, than traditional statistical tests do. One way ANOVA using 2 degrees of freedom was not significant in the example given, while linear regression using 1 degrees of freedom was significant at $p = 0{,}05$.

7 Note

More background, theoretical, and mathematical information of trend testing is given in Statistics applied to clinical studies 5th edition, Chap. 27, Springer Heidelberg Germany, 2012, from the same authors.