Kruskal-Wallis One-Way ANOVA

One-Way, Fixed-Effects Analysis of Variance assumes that error (residual) scores are normally distributed, that subjects are randomly selected from the population and assigned to treatments, and that the error scores are equally distributed in the populations representing the treatments. The scale of measurement for the dependent variable is assumed to be interval or ratio. But what can you do if, in fact, your measure is only ordinal (for example like most classroom tests), and you cannot assume normally distributed, homoscedastic error distributions?

Why, of course, you convert the scores to ranks and ask if the sum of rank scores in each treatment group are the same within sampling error! The Kruskal-Wallis One-Way Analysis of variance converts the dependent score for each subject in the study to a rank from 1 to N. It then examines the ranks attained by subjects in each of the treatment groups. Then a test statistic which is distributed as Chi-Squared with degrees of freedom equal to the number of treatment groups minus one is obtained from:

$$H = \frac{12}{N(N+1)} \sum_{j=1}^{K} Rj2 / nj - 3(N+1)$$

where N is the total number of subjects in the experiment, nj is the number of subjects in the jth treatment, K is the number of treatments and Rj is the sum of ranks in the jth treatment.

The Statistics / NonParametric / Kruskal-Wallis One-Way ANOVA option on your menu will permit analysis of data in a data file. At least two variables should be defined for each case - a variable recording the treatment group for the case and a variable containing the dependent variable score.

The file labeled kwanova.LAZ is used to demonstrate this LazStats procedure.

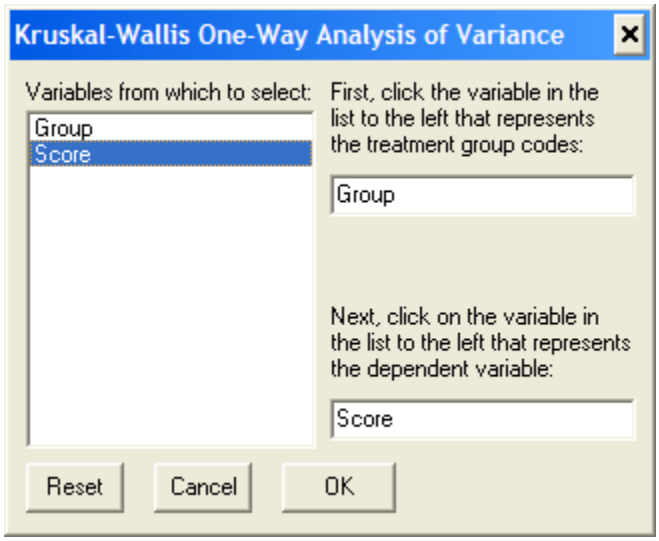

Figure 1. The Kruskal-Wallis One-Way ANOVA Form

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Kruskal - Wallis One-Way Analysis of Variance
See pages 184-194 in S. Siegel's Nonparametric Statistics for the
Behavioral Sciences

     Score      Rank      Group
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61.00	1.00	1
82.00	2.00	2
83.00	3.00	1
96.00	4.00	1
101.00	5.00	1
109.00	6.00	2
115.00	7.00	3
124.00	8.00	2
128.00	9.00	1
132.00	10.00	2
135.00	11.00	2
147.00	12.00	3
149.00	13.00	3
166.00	14.00	3

Sum of Ranks in each Group

Group	Sum	No. in Group
1	22.00	5
2	37.00	5
3	46.00	4

No. of tied rank groups = 0
Statisic H uncorrected for ties = 6.4057
Correction for Ties = 1.0000
Statistic H corrected for ties = 6.4057
Corrected H is approx. chi-square with 2 D.F. and probability = 0.0406