Friedman's Two-way Analysis By Ranks -- Analysis of k-Within-Group Data with a Quantitative DV

Application: To compare the distributions of scores of two or more quantitative variables (which are either ordinal or nonnormally distributed or from a too-small sample) obtained from dependent samples (repeated measures or matched groups). The scores might be the same variable measured at different times or under different conditions, comparable variables measured at the same time, or some combination. Friedmen's is often used as a nonparametric substitute for the dependent (repeated measures, within-subject) ANOVA .

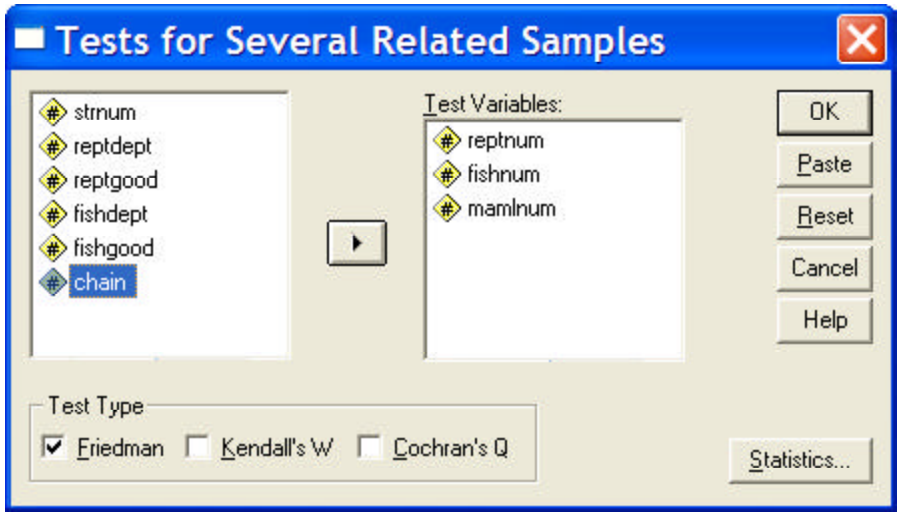
Research Hypothesis: The researcher's hypothesis was that stores would tend to display more fish than other types of animals, fewer reptiles, and an intermediate number of mammals.

H0: Pet stores display the same number of reptiles, fish and mammals.

Step 1: Obtain univariate statistics and omnibus test comparing all "k" groups.

Analyze/Statistics ➔ Nonparametric Tests ➔ K Dependent Samples

- highlight each of the three or more quantitative response variables and click the arrow to move them to the "Test Variables" window
- be sure "Friedman" is checked
- Click statistics and be sure "Quartiles" is checked



Output

Descriptive Statistics

	N	Percentiles		
		25th	50th (Median)	75th
'number of reptiles at store'	12	4.25	10.00	13.50
'number of fish at store'	12	17.00	21.50	31.75
'number of mammals'	12	9.50	19.50	33.50

Test Statistics [a]

N	12
Chi-Square	16.167
df	2
Asymp. Sig.	.000

a. Friedman Test

This is the p-value.

There is an overall difference among the IV conditions. Having found an overall effect, we now need to complete pairwise comparisons to determine if the pattern of differences among the conditions supports the research hypothesis.

Step 2: Since there is an overall difference among the groups, we will need pairwise comparisons to identify which groups are differ ent from which others (output shown below is abbreviated).

Analyze/Statistics ➔ Nonparametric Tests ➔ K Dependent Samples

- for each pairwise ananysis...
  - highlight **two** of the response variables and click the arrow to move them to the "Test Variables" window
  - Be sure to obtain all pairs of variables (conditions)
- be sure "Friedman" is checked for each pairwise analysis

Notice each analysis includes only two variables (conditions).

For #Reptiles vs. # Fish

Test Statistics [a]

N	12
Chi-Square	12.000
df	1
Asymp. Sig.	.001

a. Friedman Test

There is a difference between the number of fish and reptiles displayed.

For #Reptiles vs. # Mammals

Test Statistics [a]

N	12
Chi-Square	8.333
df	1
Asymp. Sig.	.004

a. Friedman Test

There is a difference between the number of reptiles and mammals displayed.

For #Fish vs. # Mammals

Test Statistics [a]

N	12
Chi-Square	1.333
df	1
Asymp. Sig.	.248

a. Friedman Test

There is no difference between the number of fish and mammals displayed.

Reporting Results:

Table 1 summarizes the data for the numbers of animals displayed at the stores. There was a significant difference among the distributions of the three types of animals (based on Friedman's test, $\underline{X}^2(2) = 16.120$, $\underline{p} = .001$). Pairwise Friedman's tests ($p < .05$) revealed that, as hypothesized, fewer reptiles were displayed than either fish or mammals. However, contrary to the research hypothesis, there was not a difference in the median number of fish and mammals displayed.

Table 1.
Summary of the number of animals of each type displayed in the pet stores.

	Type of Animal		
	Fish	Mammals	Reptiles
Median	21.50	19.50	10.00
1st Quartile	17.00	9.50	4.25
3rd Quartile	31.75	33.50	13.50