Cochran's Q Test -- Analysis of k-Within-Groups Data with a Qualitative (binary) DV

Application: To compare the patterns of responses to two or more qualitative variables obtained from dependent samples (repeated measures or matched groups). The two or more scores might be the same variable measured at two or more different times, under two or more different circumstances, or two or more comparable variables measured at the same time.

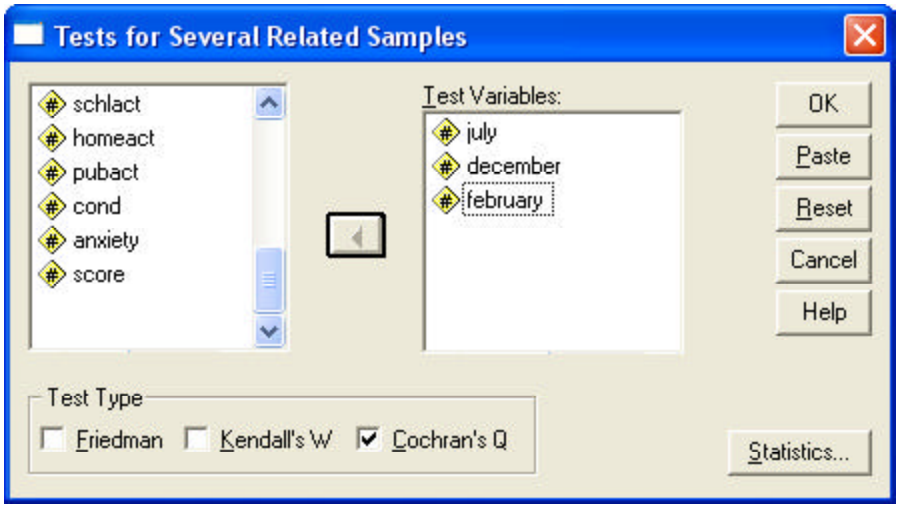
We will use a different set of data for this topic. The researcher returned to the pet stores during February, July and December of the next year and recorded if the shop displayed only snakes or lizards, or both smakes and lizards.

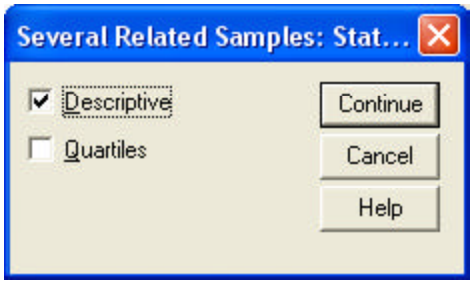
Research Hypothesis: The researcher hypothesized that pet shops would be more likely to display both types of reptiles prior to Valentine's Day (Feb) and Christmas (Dec) than during the summer (July).

H0: Stores are equally likely to display both types of reptiles during each time of the year.

Statistics ➔ Nonparametric Tests ➔ K Related Samples

- highlight each variable (be sure it is **binary**) and click the arrow
- check the "Cochran's Q" selection
- "Statistics" — check that you want "Descriptives"





Frequencies

	Value	
	1	2
FEB	8	4
JULY	9	3
DEC	2	10

Test Statistics

N	12
Cochran's Q	7.818[a]
df	2
Asymp. Sig.	.020

a. 1 is treated as a success.

This is the p-value.

There is a systematic difference in the types of reptiles displayed during the three different times of the year. However, this omnibus or overall significance test does not provide specific information about the pattern of differences across the three conditions.

In order to compare the pattern across the three conditions with the research hypothesis, we will need to obtain all of the pairwise comparisons among the three conditions of the design

The number of pairwise comparisons is computed as (k * (k-1)) / 2 which, for this analysis is (3*2)/2 = 3

When completing multiple comparisons, it is important to protect against Alpha inflation (increasing chance of a Type I error as the number of comparisons increases). SPSS doesn't offer any type of "HSD" or other pariwise comparison, but since it provided exact p-values, we can apply a Bonferonnization of the p < .05 rule.

Our goal is to have no more than a 5% chance of a Type I error across the pairwise comparisons. To do this, we will literally divide .05 by the number of comparisons, and use that "Bonferronized" p-value to make each of our pairwise comparisons. For this analysis, that Bonferronized p-value would be: .05 / 3 = .0167.

We will now rerun the Cochran's test for each of the three pairwise comparions (just change which variables appear in the analysis window)

February vs. July

Frequencies

	Value	
	1	2
FEB	8	4
JULY	9	3

Test Statistics

N	12
Cochran's Q	.200[a]
df	1
Asymp. Sig.	.655

a. 1 is treated as a success.

July vs. December

Frequencies

	Value	
	1	2
JULY	9	3
DEC	2	10

Test Statistics

N	12
Cochran's Q	6.000[a]
df	1
Asymp. Sig.	.014

a. 2 is treated as a success.

February vs. December

Frequencies

	Value	
	1	2
DEC	2	10
FEB	8	4

Test Statistics

N	12
Cochran's Q	4.455[a]
df	1
Asymp. Sig.	.035

a. 1 is treated as a success.

Reporting the Results

The percentage of stores that displayed both snakes and lizards was 33% during February, 25% during during July and 83% during December, Q(2) = 7.818, p = .02). Parwise comparions using Bonferroni correct P = .0167) revealed that more stores displayed both types of reptiles during December than during July, Q(1)=6.00, p = .014, but that there was an equivalent number of stores displaying both types of reptile during February and July, Q(1) = .200, p = .655, and during February and December, Q(1)=4.455, p = .035. Thus, the research hypothesis that both types of reptiles would be displayed prior to Valentine's day and Christmas than during the summer received only partial support.