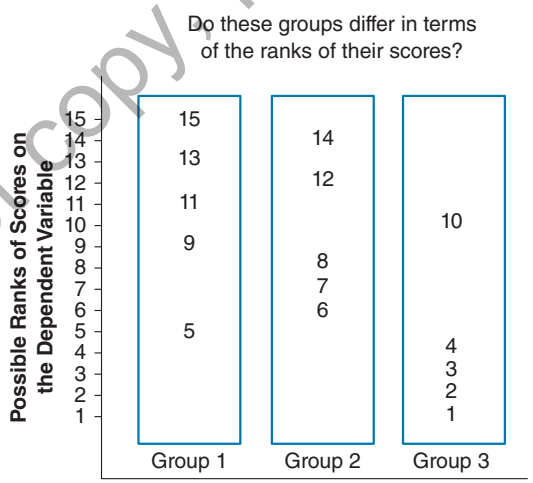
MODULE 10

Kruskal-Wallis Test

Independent Variables	1
Level of Measurement	Nominal
Number of Levels	2+
Number of Groups	2+
Dependent Variables	**1**
Level of Measurement	Ordinal
Number of Levels	Many
Measurement Occasions	**1**

Research Design

The Kruskal-Wallis test works when two or more groups of people (or things) are compared on the same ordinal level dependent variable. Because groups or categories are used for the comparison, the independent variable is a nominal level variable. The strategy is to assign ranks to all the scores on the dependent variable by putting them in order and then place those ranks into the different groups or categories defined by the independent variable. The total ranks in each group are compared statistically.



Primary Statistical Question

Do the groups differ in terms of their summed rank scores?

Example of a Study That Would Use the Kruskal-Wallis Test

In our discussion of the **Mann-Whitney test** (see Module 7), we described a study about a health promotion program for older people offered in a variety of senior centers. A different research question in that study involved a nominal independent variable with four categories and a dependent variable at the ordinal level, so a Kruskal-Wallis analysis was conducted. The independent variable was *participation level*, which was divided into four levels (*low attendance*, *some attendance*, *good attendance*, and *high attendance*). The dependent variable was an index of *social isolation*, the total score of eight items that asked about loneliness, interactions with society, and so on. The study involved 176 people.

Analysis

Most of the values used in the analysis cannot be shown here, but all 176 scores on the social isolation index were ranked, 1 through 176, and the ranks were grouped by the four attendance categories. The total rankings in the four groups were analyzed using Kruskal-Wallis's equations. The resulting value, a "KW," was 9.78, which was significant at $p \leq .01$ for this sample size. Those who attended less had higher scores on the social isolation index.

Things to Consider

- The Kruskal-Wallis *KW* is sometimes reported as a chi-squared because researchers are more familiar with that. They are different values, though, and have different associated probabilities. The Kruskal-Wallis analysis provides for easy conversion to an equivalent chi-squared value. Before computer software, it was easier to look up critical values for the chi-squared test than for a Kruskal-Wallis analysis of variance, so this conversion has become common.
- Notice in the example study that if the independent variable is actually higher than nominal level, it is ordinal. If the researcher framed the analysis as the correlational relationship between attendance and social isolation instead of differences between groups, then a **Spearman correlation coefficient** (see Module 25) would have been the "right" statistic to use.
- The Kruskal-Wallis approach is a great alternative to **analysis of variance** (see Module 11) when you are not 100% sure that your dependent variable is at the interval level or is normally distributed in the population.
- The research design for the Kruskal-Wallis test is the same as the design for which the **median test** (see Module 9) is appropriate. The median test, however, does not make use of all the rank order information available in the data as the analysis is based only on whether each score is above or below the overall median. If your ordinal variable can be meaningfully ordered all along its range, the Kruskal-Wallis is best to use because it uses all the ranking information. Statisticians refer to statistics that take more information into account as more *powerful*, and the Kruskal-Wallis is more powerful than the median test.

Real-Life Study That Inspired This Example

Watkins, A. J., & Kligman, E. W. (1993). Attendance patterns of older adults in a health promotion program. *Public Health Reports, 108,* 86–90.