Kruskal-Wallis Test for Independent Samples

This test is similar to a oneway between subjects ANOVA. The dependent variable, however, is based upon ranks, or ordinal data. Thus, the study would have one independent variable with **three or more** levels. There would be different participants at each level of the independent variable and the dependent variable would be measured on an ordinal scale (or be ratio or interval scale data that was transformed into ranked data). Note the similarity of this test to that of the Mann-Whitney U. The difference in the present problem is that there are **more than two levels** of the independent variable. (When there are **3** or more levels of the independent variable, the Kruskal-Wallis is a more appropriate test).

For example, suppose you had a group of professional golfers from a) the senior tour, b) the LPGA or women's tour, and c) the men's regular tour. Suppose the golfers from these three tours all competed in a common tournament. You then record the finishing position of all the players in the tournament. You obtain the following data in which the numbers in each column are the finishing positions (ranks) of the golfer in the common tournament.

Name & Finishing Position of Player on LPGA Tour		Name & Finishing Position of Player on Senior Tour		Name & Finishing Position of Player on Regular Tour	
Lopez	**12**	Palmer	**7**	Woods	**8**
Inkster	**15**	Irwin	**5**	Lehman	**2**
Rankin	**10**	Floyd	**9**	Stewart	**4**
Sorenstam	**14**	Nicholas	**3**	Daly	**6**
Haynie	**13**	Player	**11**	Els	**1**

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Tour**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Golfing Tour**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **LPGA Tour**
   d. Click on **Add** button: 1 = "LPGA Tour" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**

    f.   Click on the white box next to the word **Value Label** and type in **Senior Tour**

    g.   Click on **Add** button: 2 = "Senior Tour" will appear in bottom white box also

    h.   Click on the white box next to the word **Value**, type in the number **3**

    i.   Click on the white box next to the word **Value Label** and type in **Regular** Tour

    j.   Click on **Add** button: 3 = "Regular Tour" will appear in bottom white box also

    k.   Click **OK**

8.   Click on the white cell in **Row 2** under the word **Name** and type in the word **Finish**

9.   Click on the white cell in **Row 2** under the word **Label** and type in **Finishing Position**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

10.   Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Tour** and Column 2 named **Finish**.

11.   Enter the data for each of the 5 payers on the three tours as follows. Mouse to the top cell under the first column which is Tour and enter the following:

1 tab 12
1 tab 15
1 tab 10
1 tab 14
1 tab 13
2 tab 7
2 tab 5
2 tab 9
2 tab 3
2 tab 11
3 tab 8
3 tab 2
3 tab 4
3 tab 6
3 tab 1

> The ones, twos, and threes in the first column are the codes for which tour the golfer is on where 1 = LPGA Tour, 2 = Senior Tour, and 3 = Regular Tour. The numbers in the second column represent the golfer's finishing position in the golf tournament.

Data Analysis

1.   Click on **Analyze** at top of screen then

    a.   Click on **Non-Parametric** Tests then

    b.   Click on **K Independent Samples**

2.   Highlight the dependent variable which is **finish** by clicking on it then

    a.   Click on **arrow >** to transfer this name to the **Test Variable List** box

3.   Highlight the independent variable which is **Tour** by clicking on it then

    a.   Click on **arrow >** to transfer this name to the **Group Variable** Box. The following should then appear **Tour [? ?]**

4.   Click on **Define** Groups button

    a.   Type in a **1** in the **Minimum** box

    b.   Click on the **Maximum** box and enter a **3**

    c.   Click **Continue** button

5.   Click on White square next to **Kruskal-Wallis** to place a check mark in the box if one is not already there

6.   Click **OK.** Doing this will result in analysis being conducted. These results are below.

Ranks

	Golfing Tour	N	Mean Rank
Finishing Position	LPGA	5	12.80
	Senior	5	7.00
	Regular	5	4.20
	Total	15	

Test Statistics[a,b]

	Finishing Position
Chi-Square	9.620
df	2
Asymp. Sig.	.008

a. Kruskal Wallis Test

b. Grouping Variable: Golfing Tour

7. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no difference in the finishing rank positions of professional golfers on the regular, senior and LPGA tour when playing in a common tournament.

H_{alt}: There will be a difference in the finishing rank positions of professional golfers on the regular, senior, and LPGA tour when playing in a common tournament.

8. **Interpretation and APA writing template for Results Above:**

A Kruskal-Wallis test was conducted to determine whether the finishing position of golfers in a common tournament varied as a function of whether they normally played on the regular, seniors, or LPGA tour. Results of that analysis indicated that whether the golfer was on the regular, senior, or LPGA tour was related to their finishing position in a common tournament, $\chi^2 (2) = 9.62$, $p < .05$. A post hoc rank sums test indicated that players on the LPGA finished significantly lower than either players on the senior tour, $z = -2.40$, $p < .05$, or the regular tour, $z = -2.61$, $p < .05$. However, players on the senior and regular tour did not differ significantly from one another in terms of finishing positions, $z = -1.35$, $p > .05$.