

# Instructions for carrying out statistical procedures and tests using SPSS

These instructions are closely linked to the author's book:

**Essential Statistics for the Pharmaceutical Sciences**  
**John Wiley & Sons Ltd <http://eu.wiley.com>**  
**2007**  
**ISBN: 978-0-470-03468-2**

For all references to chapters or tables, see the above book.

**Using SPSS to add a Tukey's test to a  
one-way analysis of variance**

## Using SPSS to perform a add a Tukey's test to a one-way analysis of variance

**Example: Table 13.1 Effect of catalyst on yield (Percentage of theoretical maximum)**

For the general theory of Tukey's test, see Chapter 13.

Enter the data exactly as described for a [one-analysis of variance](#).

Follow the menus

*Analyze / Compare Means / One-Way ANOVA ...*

Move 'Yield' into the 'Dependent List' box and 'Catalyst' into the 'Factor' box.

Click on the 'Post Hoc ...' button and check for 'Tukey'.

Click 'Continue' and 'OK'.

The output will then be as with the ANOVA alone, but with the following additional material (See next page):

### Multiple Comparisons

Dependent Variable: Yield  
Tukey HSD

(I) Catalyst	(J) Catalyst	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pt	Pd	-6.6800(*)	.6212	.000	-8.539	-4.821
	Ir	-1.1800	.6212	.349	-3.039	.679
	Pd/Ir	-2.9600(*)	.6212	.001	-4.819	-1.101
	Rh	-.4400	.6212	.952	-2.299	1.419
Pd	Pt	6.6800(*)	.6212	.000	4.821	8.539
	Ir	5.5000(*)	.6212	.000	3.641	7.359
	Pd/Ir	3.7200(*)	.6212	.000	1.861	5.579
	Rh	6.2400(*)	.6212	.000	4.381	8.099
Ir	Pt	1.1800	.6212	.349	-.679	3.039
	Pd	-5.5000(*)	.6212	.000	-7.359	-3.641
	Pd/Ir	-1.7800	.6212	.065	-3.639	.079
	Rh	.7400	.6212	.756	-1.119	2.599
Pd/Ir	Pt	2.9600(*)	.6212	.001	1.101	4.819
	Pd	-3.7200(*)	.6212	.000	-5.579	-1.861
	Ir	1.7800	.6212	.065	-.079	3.639
	Rh	2.5200(*)	.6212	.005	.661	4.379
Rh	Pt	.4400	.6212	.952	-1.419	2.299
	Pd	-6.2400(*)	.6212	.000	-8.099	-4.381
	Ir	-.7400	.6212	.756	-2.599	1.119
	Pd/Ir	-2.5200(*)	.6212	.005	-4.379	-.661

\* The mean difference is significant at the .05 level.

Every possible pair of catalyst are contrasted.

In the first block, Platinum is compared to all four others and the P values (Column headed 'Sig.')

show that it differs significantly from palladium and palladium/iridium alloy. In the final two columns, limits are provided for a confidence interval for the difference between each pair of catalysts. The ensuing blocks do the same job for each catalyst in turn.

The final output (Headed 'Homogeneous Subsets') summarises the results in the same manner as Figure 13.4 in the book.

### Yield

Tukey HSD

Catalyst	N	Subset for alpha = .05		
		1	2	3
Pt	5	10.740		
Rh	5	11.180		
Ir	5	11.920	11.920	
Pd/Ir	5		13.700	
Pd	5			17.420
Sig.		.349	.065	1.000

Means for groups in homogeneous subsets are displayed.

a Uses Harmonic Mean Sample Size = 5.000.

Platinum, rhodium and iridium form a block (Yellow) that are the least effective and cannot be distinguished one from another.

Then Iridium and palladium/iridium alloy (Blue) are of intermediate activity and are indistinguishable.

Finally, Palladium (Grey) stands alone, the most active and significantly different from all others.