SPSS for One-Way ANOVA

2.

Example: Evaluation of training programs.

Goal: To see if there is significant difference in learning time using different training methods.

To perform one-way ANOVA, for the data listed in the data table which contain 4 independent random samples:

1. Enter the dependent variable values and the independent variable (factor variable) values in the Date Editor. In the SPSS Data Editor sheet, it contains a data sheet for a one-way layout design with four treatment groups. The data in the following picture were scores from four treatment groups. Method is the factor variable and learning time is the dependent variable.

Lick through the following menu selection: Analyze / Compare Means / One-Way ANOVA.									
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1	10	1		Reg	ression	•	Paire	d-Samples T Te	st
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a table: 3 observations in h sample. od Method Method Method 2 3 4 11 13 18 16 8 23 9 9 25

thod is a treatment, up or independent iable. Learning time is dependent variable.

3. Select the dependent or response variable and put into the **Dependent List** box, and put the method or treatment variable into Factor box.

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	Dependent List:	OK Paste Reset Cancel
	Factor: Training Method (r Contrasts Post Hoc Options	Help

4. Click **Options** button, check **Descriptive** and **Homogeneity-of-Variance box**, and click **Continue** and click **OK**.

SPSS Output:

Descriptives

Learn	ing	j Time													
			95			95%	% Confidence Interval for Mean								
		Ν		Mean		Std. D	eviation	Std. E	rror	Low	er Bound	Upper I	Bound	Minimum	Maximum
M1	Т		3	8.0	00		2.65	1	.53		1.43		14.57	5	10
M2			3	12.0	00		3.61 2.		2.08		3.04		20.96	9	16
М3			3	10.0	00		2.65		.53		3.43		16.57	8	13
M4			3	22.0	00	3.61 2		2.08		13.04		30.96	18	25	
Total		1	2	13.0	00		6.24	1	.80		9.04		16.96	5	25
Test of Homogeneity of Variances															
Learning Time															
Lever	Levene Leve														
Statis .2	267	, un	3	uiz	8	3iy. .8	48				p-valu	e indic	ating	equal vari	ances
Learnii	ng	Time	<u> </u>	una af									p-va	alue indica	ating
Sum of Squares of Mean Square F							F	F Sig. significant							
Between Groups 348.000 3				116	5.000	11.0	600	.003		diff	erence bet	ween			
Within Groups				80.000 8		8	10.000						troo	tmont gro	upe
Total 428.000 11								uea	unent gro	ups.					
	Error bar chart using SPSS graphSide-by-side boxplot using SPSS Explore										S Explore				
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	-10 N	l =	3	3		3	3			0 N =	3	3		3	3
		1	.00	2.00)	3.00	4.0	0			M1	M	2	M3 M	M4
METHOD						Training Method									

Both error bar chart and side-by-side box plot above seem to suggest that the treatment group "four" may be significantly different from treatments 1, 2 and 3.

5. To perform multiple comparisons, in the ANOVA dialog box, click the **Post Hoc...** button and check Tukey or any other method and click **Continue** and **OK**.

SPSS produces two tables. The multiple comparisons table containing confidence intervals can help us to understand the difference between each pairs of means. If interval doesn't cover zero, it implies that the difference between the pair of means are statistically significant.

Multiple Comparisons

Dependent Variable: Learning Time Tukey HSD

		Mean Difference			95% Confide	ence Interval
(I) Training Method	(J) Training Method	(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
M1	M2	-4.00	2.58	.455	-12.27	4.27
	M3	-2.00	2.58	.864	-10.27	6.27
	M4	-14.00*	2.58	.003	-22.27	-5.73
M2	M1	4.00	2.58	.455	-4.27	12.27
	M3	2.00	2.58	.864	-6.27	10.27
	M4	-10.00*	2.58	.020	-18.27	-1.73
M3	M1	2.00	2.58	.864	-6.27	10.27
	M2	-2.00	2.58	.864	-10.27	6.27
	M4	-12.00*	2.58	.007	-20.27	-3.73
M4	M1	14.00*	2.58	.003	5.73	22.27
	M2	10.00*	2.58	.020	1.73	18.27
	M3	12.00*	2.58	.007	3.73	20.27

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

The homogenous subsets table can help us to divide the four groups into homogenous subgroups. Within each subgroup the difference in means is statistically insignificant. The difference between average learning time of Methods 1, 2 and 3 are statistically insignificant and their means are significantly different from the mean from Method 4.

Learning Time

Tukev	HSD ^a
Iukey	HSD

		Subset for alpha = .0		
Training Method	Ν	1	2	
M1	3	8.00		
M3	3	10.00		
M2	3	12.00		
M4	3		22.00	
Sig.		.455	1.000	

Means for groups in homogeneous subsets are displayed. a. Uses Harmonic Mean Sample Size = 3.000.