

Select Analyze: General Linear Model: Univariate

The screenshot shows the SPSS Data Editor interface with the 'Analyze' menu open. The menu path is: Analyze > General Linear Model > Univariate... The data grid shows variables 'material' and 'tem' with values for rows 9 through 36. The status bar at the bottom indicates 'Data View' and 'SPSS Processor is ready'.

Row	material	tem
9	Nickel Cadmium	70
10	Nickel Cadmium	70
11	Nickel Cadmium	70
12	Nickel Cadmium	70
13	Lead	70
14	Lead	70
15	Lead	70
16	Lead	70
17	Acetate	126
18	Acetate	122
19	Acetate	106
20	Acetate	115
21	Nickel Cadmium	174
22	Nickel Cadmium	120
23	Nickel Cadmium	150
24	Nickel Cadmium	139
25	Lead	20
26	Lead	70
27	Lead	82
28	Lead	58
29	Acetate	25
30	Acetate	70
31	Acetate	58
32	Acetate	45
33	Nickel Cadmium	96
34	Nickel Cadmium	104
35	Nickel Cadmium	82
36	Nickel Cadmium	60

Choose the Response (*Dependent Variable*) and Factor and Blocking variables (*Fixed Factor(s)*)

The screenshot shows the SPSS Data Editor window with a dataset named 'Batteries.sav [DataSet2]'. The dataset contains 36 rows of data with columns for 'material', 'temp', and 'life'. The 'life' column is highlighted, and its value for the 26th row is 70. The 'Univariate' dialog box is open, showing the following settings:

- Dependent Variable: Battery Life [hr] [life]
- Fixed Factor(s): temp, material
- Random Factor(s):
- Covariate(s):
- WLS Weight:

The dialog box also includes buttons for Model..., Contrasts..., Plots..., Post Hoc..., Save..., Options..., OK, Reset, Cancel, and Help.

Case #	material	temp	life
9	Nickel Cadmium	15	138
10	Nickel Cadmium	15	110
11	Nickel Cadmium	15	168
12	Nickel Cadmium	15	160
13	Lead	70	34
14	Lead	70	40
15	Lead	70	80
16	Lead	70	75
17	Acetate	70	126
18	Acetate	70	122
19	Acetate	70	106
20	Acetate	70	115
21	Nickel Cadmium	70	174
22	Nickel Cadmium	70	120
23	Nickel Cadmium	70	150
24	Nickel Cadmium	70	139
25	Lead	125	20
26	Lead	125	70
27	Lead	125	82
28	Lead	125	58
29	Acetate	125	25
30	Acetate	125	70
31	Acetate	125	58
32	Acetate	125	45
33	Nickel Cadmium	125	96
34	Nickel Cadmium	125	104
35	Nickel Cadmium	125	82
36	Nickel Cadmium	125	60

Press the *Model* button; leave the *Full Factorial* toggle selected; press Continue

The screenshot shows the SPSS Data Editor window with a dataset named 'Batteries.sav'. The data table has columns for 'material', 'temp', and 'life'. The 'life' column contains values ranging from 20 to 168. A dialog box titled 'Univariate: Model' is open, showing the 'Specify Model' section with 'Full factorial' selected. The 'Factors & Covariates' list contains 'temp(F)' and 'material(F)'. The 'Sum of squares' is set to 'Type III' and 'Include intercept in model' is checked. The 'Continue' button is highlighted.

	material	temp	life	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.	var.
9	Nickel Cadmium	15	138																				
10	Nickel Cadmium	15	110																				
11	Nickel Cadmium	15	168																				
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13	Lead	70	34																				
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Press the *Options* button. Select *Homogeneity tests*. Then press *Continue*.

The screenshot shows the SPSS Data Editor window with a dataset named 'Batteries.sav'. The data table has columns for 'material', 'temp', and 'life'. The 'life' column contains values ranging from 20 to 174. A dialog box titled 'Univariate: Options' is open, showing the 'Estimated Marginal Means' section with 'Factor(s) and Factor Interactions' set to '(OVERALL)', 'temp', 'material', and 'temp*material'. The 'Display Means for' section is empty. The 'Display' section has 'Homogeneity tests' checked. The 'Significance level' is set to .05 and 'Confidence intervals are 95%'. The 'Continue' button is highlighted.

material	temp	life
Nickel Cadmium	15	138
Nickel Cadmium	15	110
Nickel Cadmium	15	168
Nickel Cadmium	15	160
Lead	70	34
Lead	70	40
Lead	70	80
Lead	70	75
Acetate	70	126
Acetate	70	122
Acetate	70	106
Acetate	70	115
Nickel Cadmium	70	174
Nickel Cadmium	70	120
Nickel Cadmium	70	150
Nickel Cadmium	70	139
Lead	125	20
Lead	125	70
Lead	125	82
Lead	125	58
Acetate	125	25
Acetate	125	70
Acetate	125	58
Acetate	125	45
Nickel Cadmium	125	96
Nickel Cadmium	125	104
Nickel Cadmium	125	82
Nickel Cadmium	125	60

Press the *Plots* button; we will produce the means plots

The screenshot shows the SPSS Data Editor window with a data table and the 'Univariate: Profile Plots' dialog box open. The data table has columns for 'material', 'temp', and 'life'. The dialog box has 'material' and 'temp' listed under 'Factors'. The 'Horizontal Axis' is set to 'life'. The 'Separate Lines' and 'Separate Plots' options are also visible.

	material	temp	life	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var
9	Nickel Cadmium	15	138																					
10	Nickel Cadmium	15	110																					
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Univariate: Profile Plots

Factors: material, temp

Horizontal Axis: life

Separate Lines:

Separate Plots:

Plots: Add Change Remove

Buttons: Continue, Cancel, Help, OK, Reset, Cancel, Help

Highlight **temp** for the *Horizontal Axis*, and **material** for the *Separate Lines*.
Click *Add*

The screenshot shows the SPSS Data Editor window with a data table and the Univariate: Profile Plots dialog box open. The data table has columns for material, temp, and life, with rows for various battery types and temperatures. The dialog box is configured with 'material' and 'temp' as factors, 'temp' as the horizontal axis, and 'material' as the variable for separate lines. The 'Add' button in the Plots section is highlighted.

	material	temp	life	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var
9	Nickel Cadmium	15	138																				
10	Nickel Cadmium	15	110																				
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Univariate: Profile Plots

Factors: material, temp

Horizontal Axis: temp

Separate Lines: material

Separate Plots:

Plots: Add Change Remove

OK Reset Cancel Help

Highlight **material** for the *Horizontal Axis*, and **temp** for the *Separate Lines*.
Click *Add*, then *Continue*.

The screenshot shows the SPSS Data Editor window with a data table and the 'Univariate: Profile Plots' dialog box open. The data table has columns for 'material', 'temp', and 'life'. The dialog box shows 'material' selected for the Horizontal Axis and 'temp' selected for Separate Lines. The 'Plots' list contains 'temp*material'.

	material	temp	life	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var	var
9	Nickel Cadmium	15	138																	
10	Nickel Cadmium	15	110																	
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Click OK and the output is generated

The screenshot displays the SPSS Data Editor window with a dataset named 'Batteries.sav'. The data table includes columns for 'material', 'temp', and 'life'. The 'life' column represents battery life in hours. The data is as follows:

Case #	material	temp	life
9	Nickel Cadmium	15	138
10	Nickel Cadmium	15	110
11	Nickel Cadmium	15	168
12	Nickel Cadmium	15	160
13	Lead	70	34
14	Lead	70	40
15	Lead	70	80
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30	Acetate	125	70
31	Acetate	125	58
32	Acetate	125	45
33	Nickel Cadmium	125	96
34	Nickel Cadmium	125	104
35	Nickel Cadmium	125	82
36	Nickel Cadmium	125	60

The SPSS Viewer window shows the 'Univariate Analysis of Variance' output for the dependent variable 'Battery Life (hr)'. The analysis includes the following tables:

Between-Subjects Factors

Factor	Value	Label	N
temp	1	15	12
	2	70	12
	3	125	12
material	1	Lead	12
	2	Acetate	12
	3	Nickel Cadmium	12

Levene's Test of Equality of Error Variances^a

Dependent Variable: Battery Life (hr)

F	df1	df2	Sig.
1.058	8	27	.420

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Design: Intercept+temp+material+temp * material

Tests of Between-Subjects Effects

Dependent Variable: Battery Life (hr)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	59154.000 ^a	8	7394.250	11.103	.000
Intercept	398792.250	1	398792.250	598.829	.000
temp	39083.167	2	19541.583	29.344	.000
material	10633.167	2	5316.583	7.983	.002
temp * material	9427.667	4	2356.917	3.542	.010

SPSS Processor is ready

To fit the model WITHOUT interaction, use the model window to select *Custom* (not *Full factorial*), and then the two variables as *main effects*.

The screenshot shows the SPSS Data Editor window with the 'Univariate: Model' dialog box open. The dialog is configured as follows:

- Specify Model: Full factorial, Custom
- Factors & Covariates: temp(F), material(F)
- Model: temp, material
- Build Term(s): (disabled), (selected)
- Sum of squares: Type III
- Include intercept in model

The background data table is partially visible, showing variables like Lead, Acetate, Nickel, and Cadmium with their respective values.

Case	Lead	Acetate	Nickel	Cadmium
28	125	58		
29	125	25		
30	125	70		
31	125	58		
32	125	45		
33	125	96		
34	125	104		
35	125	82		
36	125	60		