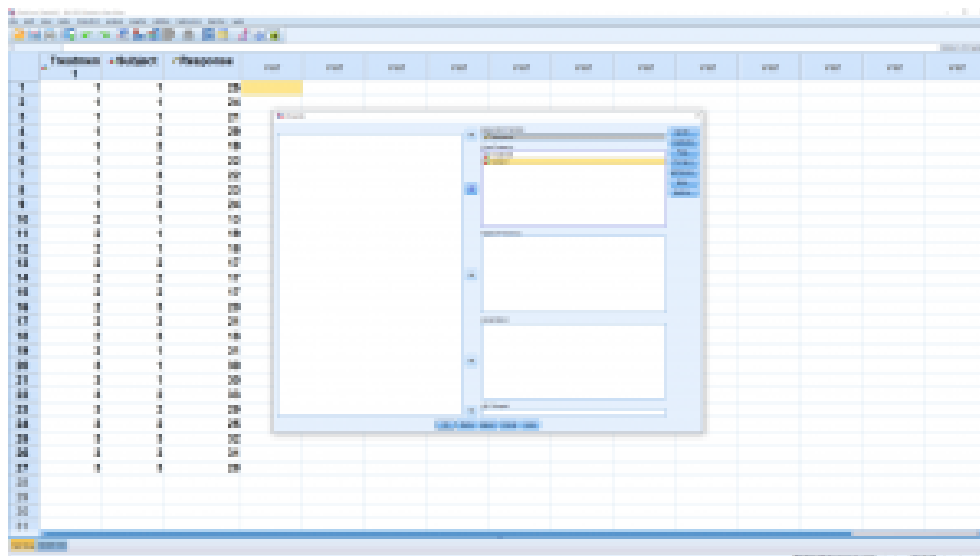


12.5: SPSS Lesson 9- Two-way ANOVA

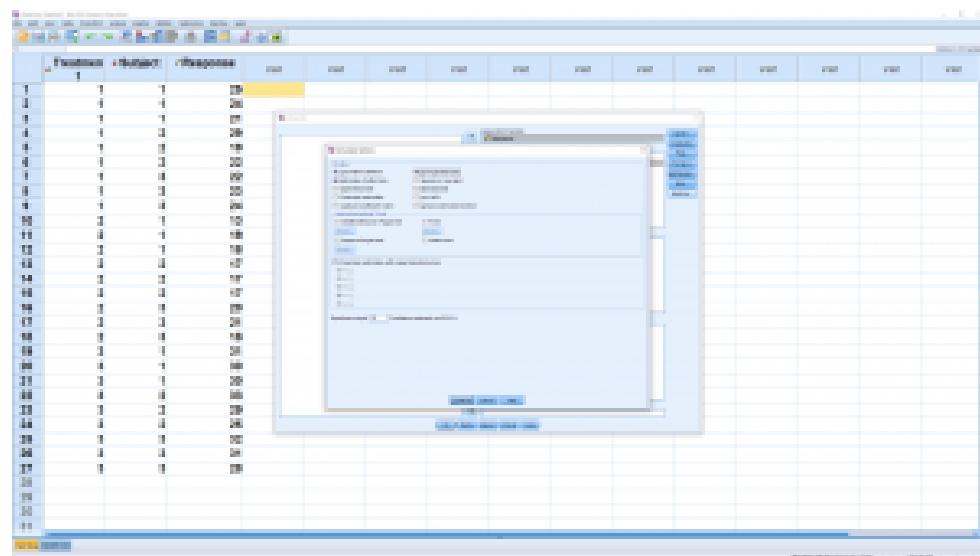
From the [Data Sets](#), open the file “Relief.sav” :

Treatment	Subject	Response
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1	2	1.0
1	3	1.0
1	4	1.0
1	5	1.0
1	6	1.0
1	7	1.0
1	8	1.0
1	9	1.0
1	10	1.0
1	11	1.0
1	12	1.0
1	13	1.0
1	14	1.0
1	15	1.0
1	16	1.0
1	17	1.0
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1	19	1.0
1	20	1.0
1	21	1.0
1	22	1.0
1	23	1.0
1	24	1.0
1	25	1.0
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1	33	1.0
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1	35	1.0
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1	39	1.0
1	40	1.0
1	41	1.0
1	42	1.0
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1	44	1.0
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1	451	1.0



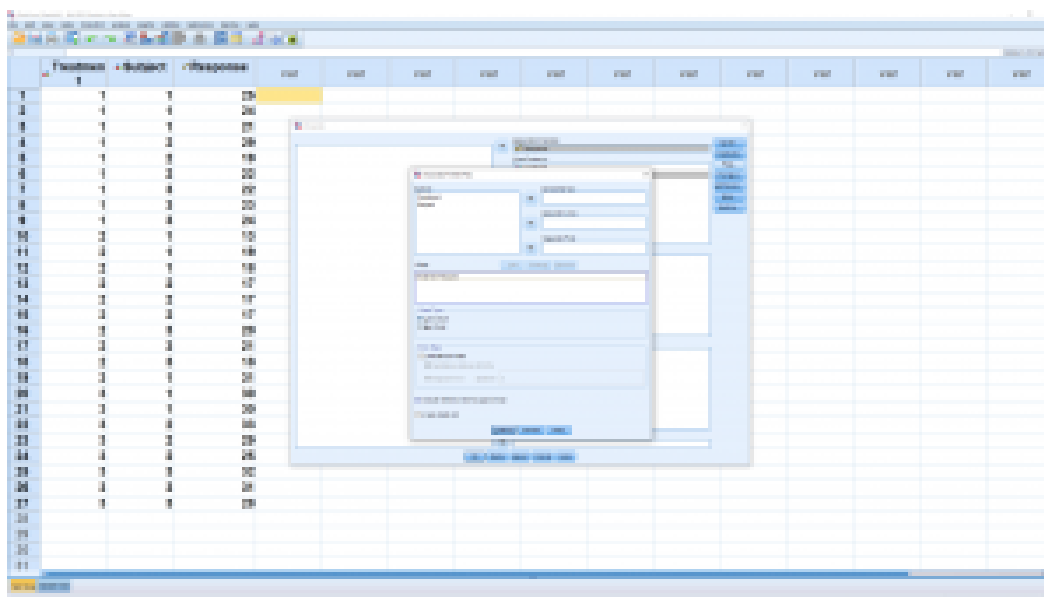
SPSS screenshot © International Business Machines Corporation.

where we have entered the independent variable, the factors, into the Fixed Factor box and the dependent variable into the dependent box. The submenus setups will be left pretty much alone, as with the one-way ANOVA. There are post-hoc tests available but we will not worry about that for this course. In the Model menu, there is a check box for “intercept” which, if checked, will result in an extra line in the ANOVA table output that we will need to ignore. We will look at the output, below, that is generated if that box is checked. In the Options menu, check off Descriptive statistics (this will give cell means), Estimates of effect size (this will give η^2) and Homogeneity tests (Levine’s test for homoscedasticity) :



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The Plots menu is where you set up the profile plot output. Recall that you can view the 3D profile plot from two directions: along the A factor axis with the B factor plotted as separate lines or along the B factor axis with the A factor as horizontal lines. Here is what the menu looks like just before you hit the Add button :



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Finally, hit the OK button to get the output. First comes the descriptive statistics where you can see the cell means and sample standard deviations :

Between-Subjects Factors

		N
Treatment	1	9
	2	9
	3	9
Subject	1	9
	2	9
	3	9

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Example Statistics

Source	Treatment	Block	Total	df
Corrected Model	15075.704	85.287	15160.991	1
Intercept	15075.704	85.287	15160.991	1
Subject	7.185	3.593	10.778	2
Treatment	85.287	11.809	97.096	2
Subject * Treatment	12.815	4.44	17.255	4
Error	130.000	7.222	137.222	16
Total	15688.000	27	15955.000	27
Corrected Total	812.298	26	838.298	26

Tests of Between-Subjects Effects

The important ANOVA table output looks like :

Tests of Between-Subjects Effects

Dependent Variable: Response

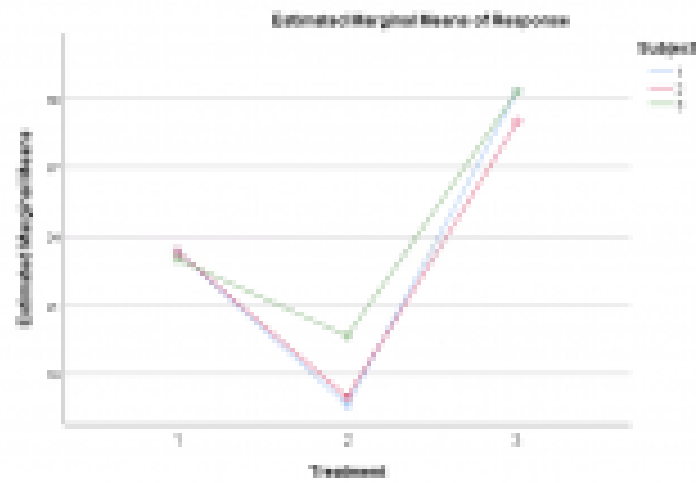
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	682.298 ^a	6	113.883	11.809	.000
Intercept	15075.704	1	15075.704	2087.405	.000
Subject	7.185	2	3.593	.467	.616
Treatment	85.288	2	42.644	4.551	.000
Subject * Treatment	12.815	4	3.204	.414	.776
Error	130.000	16	8.125		
Total	15688.000	27			
Corrected Total	812.298	26			

a. R Squared = .840 (Adjusted R Squared = .769)

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As usual, ignore the Corrected Model, the Intercept and the Total source lines. Factor A is the gender source line, factor B is the method source line, treatment*group is the $A \times B$ interaction source and Error is the within variance source. The Corrected Total is the correct total of the A , B , $A \times B$ and error SS and degrees of freedom. Interpretation is the thing you want out of this so looking at the p values we see that there is no main effect of A , group, there is a main effect of B , method and there is an interaction. No A , B and $A \times B$. The η^2 of the ANOVA as a whole shows up on the corrected model line and is the same as the r^2 reported at the bottom of the table, $\eta^2 = r^2 = 0.840$; it is a measure of how well the data fit the group means – a measure of how well the data fit the ANOVA model. We'll explore the general linear ANOVA model in Chapter 17.

The profile plots come out as :

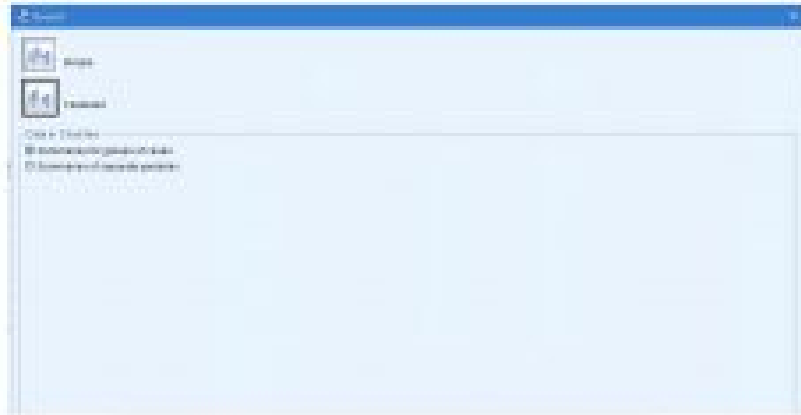


SPSS screenshot © International Business Machines Corporation.

Look at the two line plot on the left and we clearly see the interaction in the “non-parallel” lines. Look at that interaction in another way: look at the difference, the separation, between the group values for each of the 3 methods and image a profile plot of those values. A one-way ANOVA on those values (remember, this is what the interaction hypothesis test does) finds a significant difference; in particular the difference between groups is greater for group 2 than for the other groups.

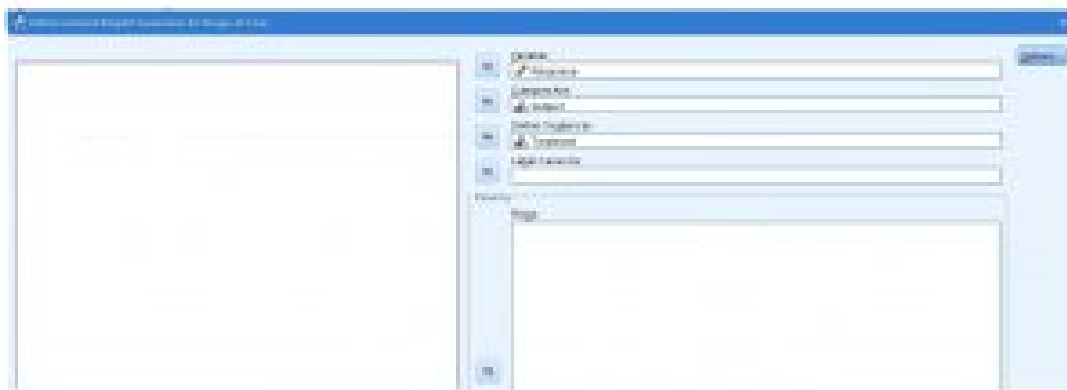
Plotting this the other way, as on the right above, we see the interaction manifest as non-parallel lines, but the difference of differences angle is harder to see. What you need to do to see it is, for each of the groups, look at the average difference of methods with the mean of the methods. There is a significant difference between the average difference value for the groups. The main effect of method shows up as a significant difference between the center of the three lines.

If you want to present a profile plot in a paper, you should show some error bars. Here’s how to get such a plot out of SPSS: first pick Graphs → Legacy Dialogs → Error Bars (pick boxplots to do boxplots). Then pick clustered with “Summaries are for groups of cases” :



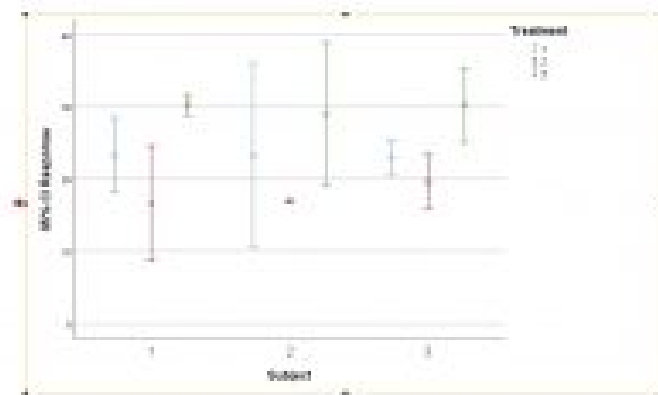
SPSS screenshot © International Business Machines Corporation.

Set up the plot as follows :



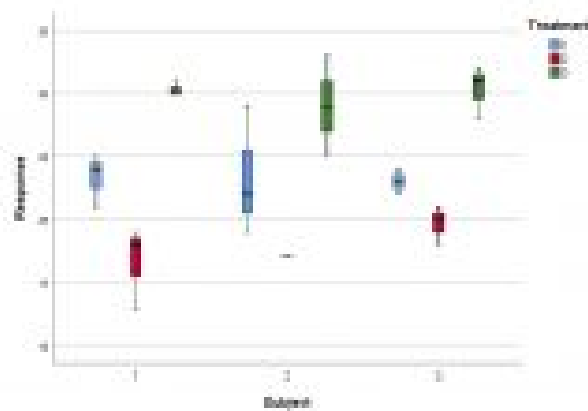
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The resulting plot is not that great (there's no way here to create the lines):



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The boxplot version looks a little better, at least there are clearer colors there to show the line factor:



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Compare this boxplot profile plot to the profile plot that came from running the two-way ANOVA.

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