

## Analysis #2

### Running a 2 X 2 ANOVA

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### Setup of a 2 X 2 ANOVA design

Factor 1: Clause Order

Factor 2: 'auch' vs. 'vorher'

	1st clause	2nd clause	Auch / Vorher	'auch' ps satisfied if...
A	RC	MC	Auch	RC has OS order
B	RC	MC	Vorher	--
C	MC	RC	Auch	MC has OS order
D	MC	RC	Vorher	--

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The screenshot shows the SPSS Data Editor window with a data table and the 'Analyze' menu open. The data table has columns 'a' and 'b' and rows 1 through 24. The 'Analyze' menu is open, showing 'General Linear Model' and 'Repeated Measures...' selected.

### 2 X 2 ANOVA

Under 'Analyze',  
Choose  
'General Linear  
Model' and  
'Repeated Measures'

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The screenshot shows the 'Repeated Measures Define Factor(s)' dialog box. The 'Within-Subject Factor Name' is 'factor1'. The 'Number of Levels' is set to 1. There are buttons for 'Add', 'Change', and 'Remove' for both 'Within-Subject Factor Name' and 'Measure Name'.

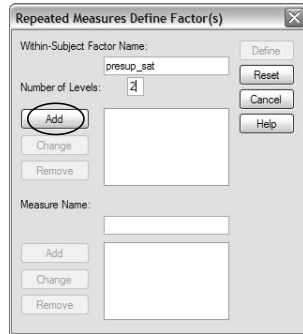
### 2 X 2 ANOVA

This window opens.  
You have to name  
your factors and enter  
the number of levels.

Your first factor  
should be the one that  
remains constant in  
your first two  
conditions.

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## 2 X 2 ANOVA

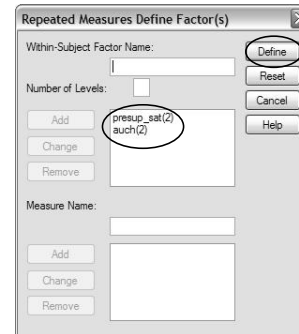


Then you click 'Add'

Do the same thing for the second factor.

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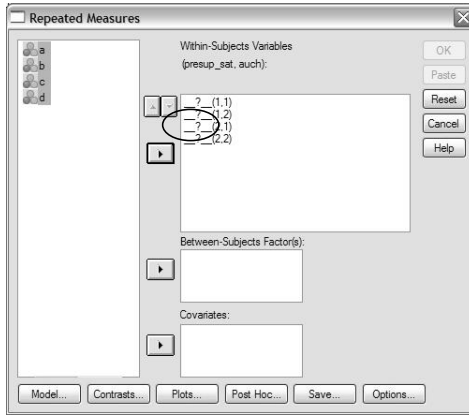
## 2 X 2 ANOVA



Now that your factors are labeled, Click 'define'.

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## 2 X 2 ANOVA

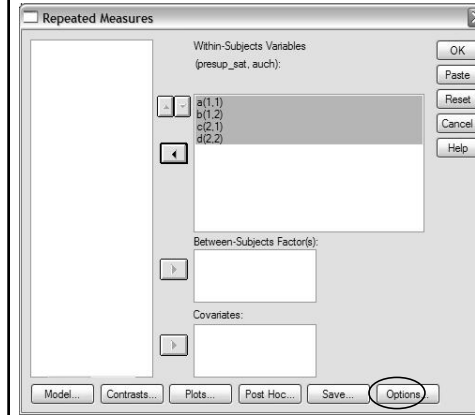


If you entered your factors in the right order, you can simply highlight all 4 factors and click on the arrow.

The numbers tell you the levels of the factors for each condition.

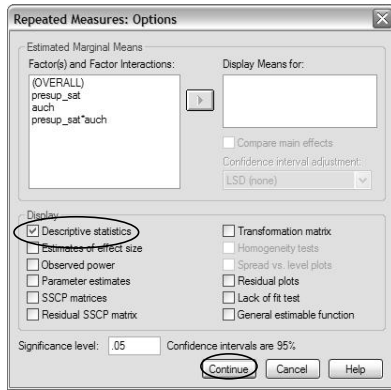
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## 2 X 2 ANOVA



Next, click on 'Options' at the bottom right.

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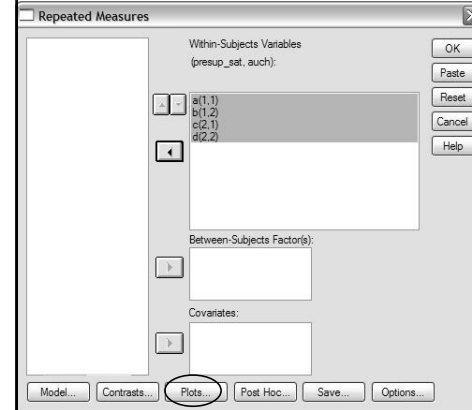
## 2 X 2 ANOVA

Here you can choose all kinds of things.

It is always a good idea to include descriptive statistics.

Then click 'continue'

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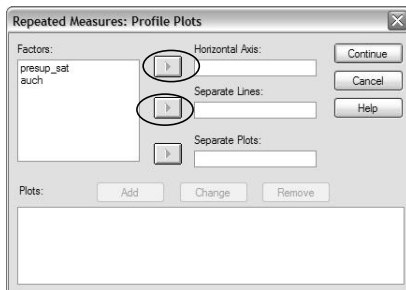


## 2 X 2 ANOVA

Plots are very helpful for interpreting the data, especially when dealing with interactions.

To include a plot, click the 'plots' button.

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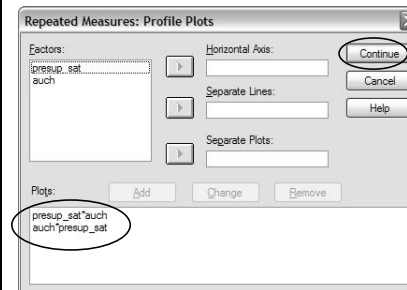


## 2 X 2 ANOVA

You can choose which factor to put on the X-Axis and which factor to draw in separate lines.

Click 'Add' to add a plot.

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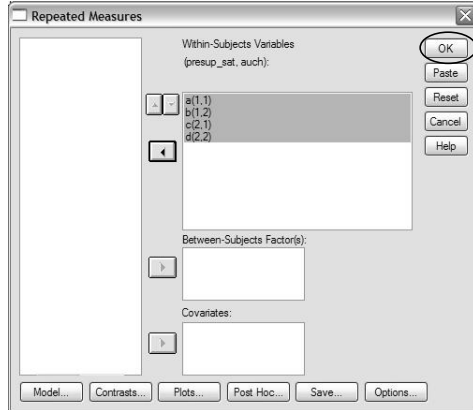
## 2 X 2 ANOVA

I chose to draw plots both ways.

Click 'Continue' to get back to the main menu.

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## 2 X 2 ANOVA



Now you just have to click 'OK' to run the ANOVA.

As always, the output will appear in the SPSS Output Viewer.

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## 2 X 2 ANOVA

### Within-Subjects Factors

Measure: MEASURE_1		
presup_sat	auch	Dependent Variable
1	1	a
	2	b
2	1	c
	2	d

If you checked the 'descriptives' checkbox, the first thing you see is some descriptive statistics, including the means and standard deviations.

Descriptive Statistics			
	Mean	Std. Deviation	N
a	3555	1375	20
b	4911	2157	20
c	5469	1994	20
d	4480	1685	20

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## 2 X 2 ANOVA

### Tests of Within-Subjects Contrasts

Measure: MEASURE_1							
Source	presup_sat	auch	Type III Sum of Squares	df	Mean Square	F	Sig.
presup_sat	Linear		11008435.9	1	11008435.85	11.578	.003
Error(presup_sat)	Linear		18065892.3	19	950836.437		
auch		Linear	673292.092	1	673292.092	.833	.373
Error(auch)	Linear		15349503.0	19	807868.579		
presup_sat * auch	Linear	Linear	27480470.7	1	27480470.70	26.004	.000
Error(presup_sat*auch)	Linear	Linear	20079029.2	19	1056791.010		

Next, you will see lots of complicated looking tables. You can ignore these, and go on to the 'Tests of Within-Subjects Contrasts'-table. This is the standard ANOVA table. Note that for a within-subjects design, you get separate error terms for each source of variance. On the right, you find the F- and p-values.

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## 2 X 2 ANOVA

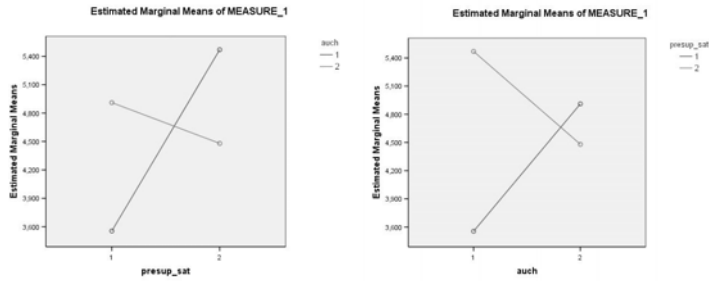
### Tests of Within-Subjects Contrasts

Measure: MEASURE_1							
Source	presup_sat	auch	Type III Sum of Squares	df	Mean Square	F	Sig.
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Error(presup_sat)	Linear		18065892.3	19	950836.437		
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presup_sat * auch	Linear	Linear	27480470.7	1	27480470.70	26.004	.000
Error(presup_sat*auch)	Linear	Linear	20079029.2	19	1056791.010		

In this case, there is a main effect of clause order (presup\_sat) and an interaction. To interpret these properly, it is helpful to look at the graphs, which are displayed further down in the Output Viewer.

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## Interpreting the results of a 2 X 2 ANOVA



As the crossing lines in both of the graphs clearly show, the interaction dominates the main effect.

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## Reporting the results of a 2 X 2 ANOVA

Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	presup_sat	auct	Type III Sum of Squares	df	Mean Square	F	Sig.
presup_sat	Linear		11008435.9	1	11008435.85	11.578	.003
Error(presup_sat)	Linear		18065892.3	19	950836.437		
auct		Linear	673292.092	1	673292.092	.833	.373
Error(auct)		Linear	15349503.0	19	807868.579		
presup_sat * auct	Linear	Linear	27480470.7	1	27480470.70	26.004	.000
Error(presup_sat*auct)	Linear	Linear	20079029.2	19	1056791.010		

A 2x2 ANOVA revealed a main effect of clause order ( $F_1(1,19) = 11.58, p < .01$ ,  $F_2(1,23) = 7.88, p = .01$ ), which was dominated by an interaction ( $F_1(1,19) = 26.00, p < .001$ ,  $F_2(1,23) = 17.81, p < .001$ ).

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## That's that



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