

## Calculating G-theory Quantities Using SPSS Dropdown Menus

In this document I explain how to use SPSS to obtain G-theory quantities using SPSS dropdown menus. For instructions on using SPSS syntax, see the document “Calculating G-theory Quantities Using SPSS Syntax.”

SPSS does not have the specialized software needed to obtain most G-theory coefficients. Because of this, I created Excel spreadsheets to do this using the variance components obtained from SPSS. The spreadsheet examples are based on data from the tables in Chapter 10 and available in the SPSS data sets “**Table 10.2 data transposed,**” **Table 10.2 data untransposed,** “**Table 10.4 data transposed,**” and “**Table 10.4 data untransposed.**”

Although the Excel spreadsheets show the variance components from these examples, they can easily be modified to use with other data. To do so, simply type or paste in the variance components from the other data into the variance component column, and type in the number of levels for these variance components in the column labeled “levels”. The other quantities will be updated automatically when these values are changed.

Similarly, although the rows in the spreadsheet are labeled as “raters,” “tasks,” and their interactions, this was done only to correspond to the textbook examples. These labels can be changed to correspond to any type of facet, such as occasions or items.

Below I explain how to obtain variance components using SPSS dropdown menus. These variance components can then be entered into the Excel spreadsheets to obtain the G-theory quantities. I first show the commands for a one-facet design and then the commands for a two-facet design.

I begin by demonstrating how to transpose the data set, which is often needed to obtain variance components.

### One-facet Design

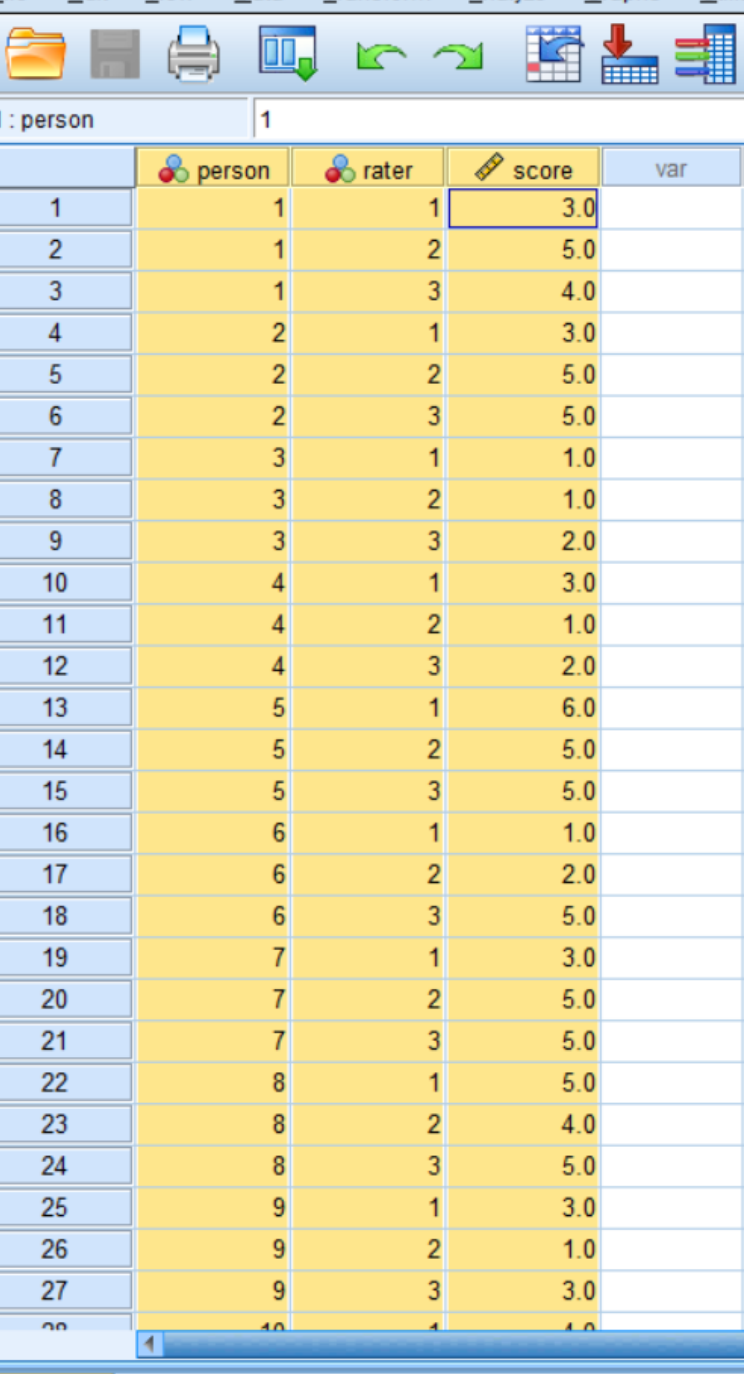
#### *Transposing the Data*

Most data sets will need to be transposed prior to obtaining the variance components. This is because data is usually entered in “wide” format, with one row for each person, as shown below:

Table 10-2 data untransposed.sav [Dataset4] - IBM SPSS Statistics Data Editor

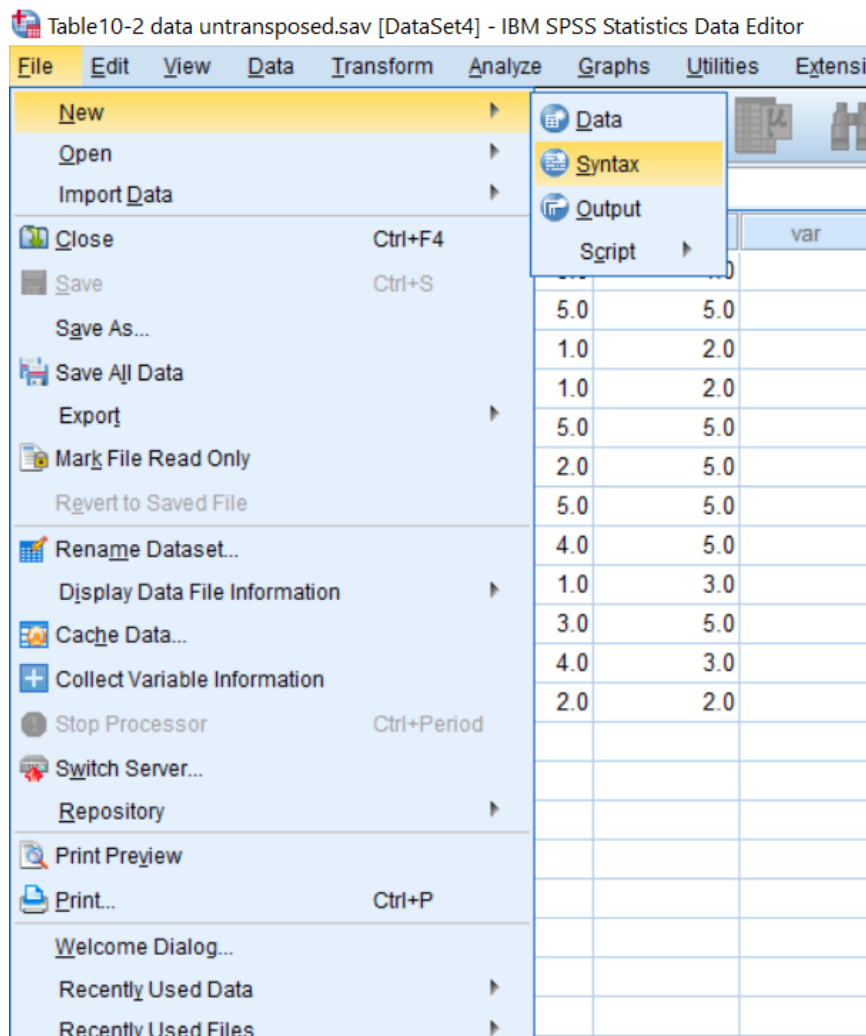
e Edit View Data Transform Analyze Graphs Utilities Extension					
person 4					
	person	rater1	rater2	rater3	var
1	1	3.0	5.0	4.0	
2	2	3.0	5.0	5.0	
3	3	1.0	1.0	2.0	
4	4	3.0	1.0	2.0	
5	5	6.0	5.0	5.0	
6	6	1.0	2.0	5.0	
7	7	3.0	5.0	5.0	
8	8	5.0	4.0	5.0	
9	9	3.0	1.0	3.0	
10	10	4.0	3.0	5.0	
11	11	3.0	4.0	3.0	
12	12	2.0	2.0	2.0	
13					

To obtain variance components in SPSS, the data must be transposed to create a variable “rater” with three levels corresponding to the three raters, and a variable “score” that contains the scores for each person from each rater. In the new data set, there will be three rows for each person, one row for each rater and that rater’s score, as shown below (data are cut off at the bottom):

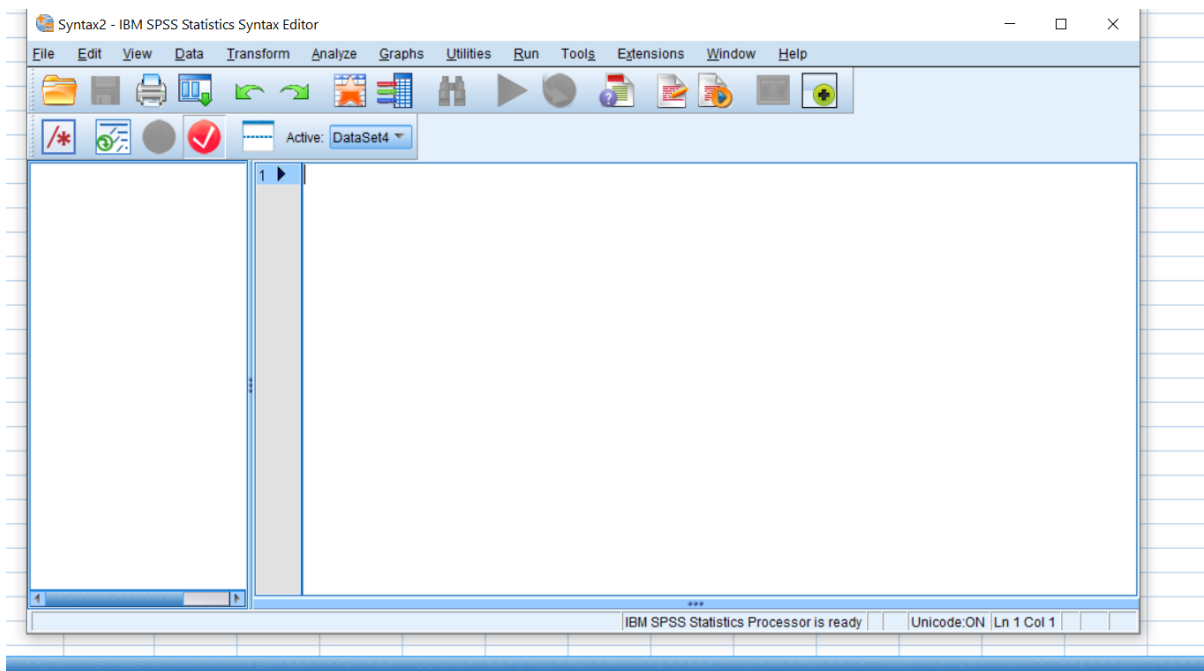


	person	rater	score	var
1	1	1	3.0	
2	1	2	5.0	
3	1	3	4.0	
4	2	1	3.0	
5	2	2	5.0	
6	2	3	5.0	
7	3	1	1.0	
8	3	2	1.0	
9	3	3	2.0	
10	4	1	3.0	
11	4	2	1.0	
12	4	3	2.0	
13	5	1	6.0	
14	5	2	5.0	
15	5	3	5.0	
16	6	1	1.0	
17	6	2	2.0	
18	6	3	5.0	
19	7	1	3.0	
20	7	2	5.0	
21	7	3	5.0	
22	8	1	5.0	
23	8	2	4.0	
24	8	3	5.0	
25	9	1	3.0	
26	9	2	1.0	
27	9	3	3.0	
28	10	1	4.0	

Transposing data is most easily done using SPSS syntax. To do this, go to the **FILE** menu in the upper left-hand corner, choose **NEW**, and then choose **SYNTAX**.



This will open the window below:



In the blank space on the right, type or paste in the commands below (don't forget the period after the last line):

### **VARSTOCASES**

```
/MAKE score FROM rater1 rater2 rater3  
/INDEX=rater(3)  
/KEEP = person  
/NULL = KEEP.
```

The command **VARSTOCASES** causes SPSS to transpose the data.

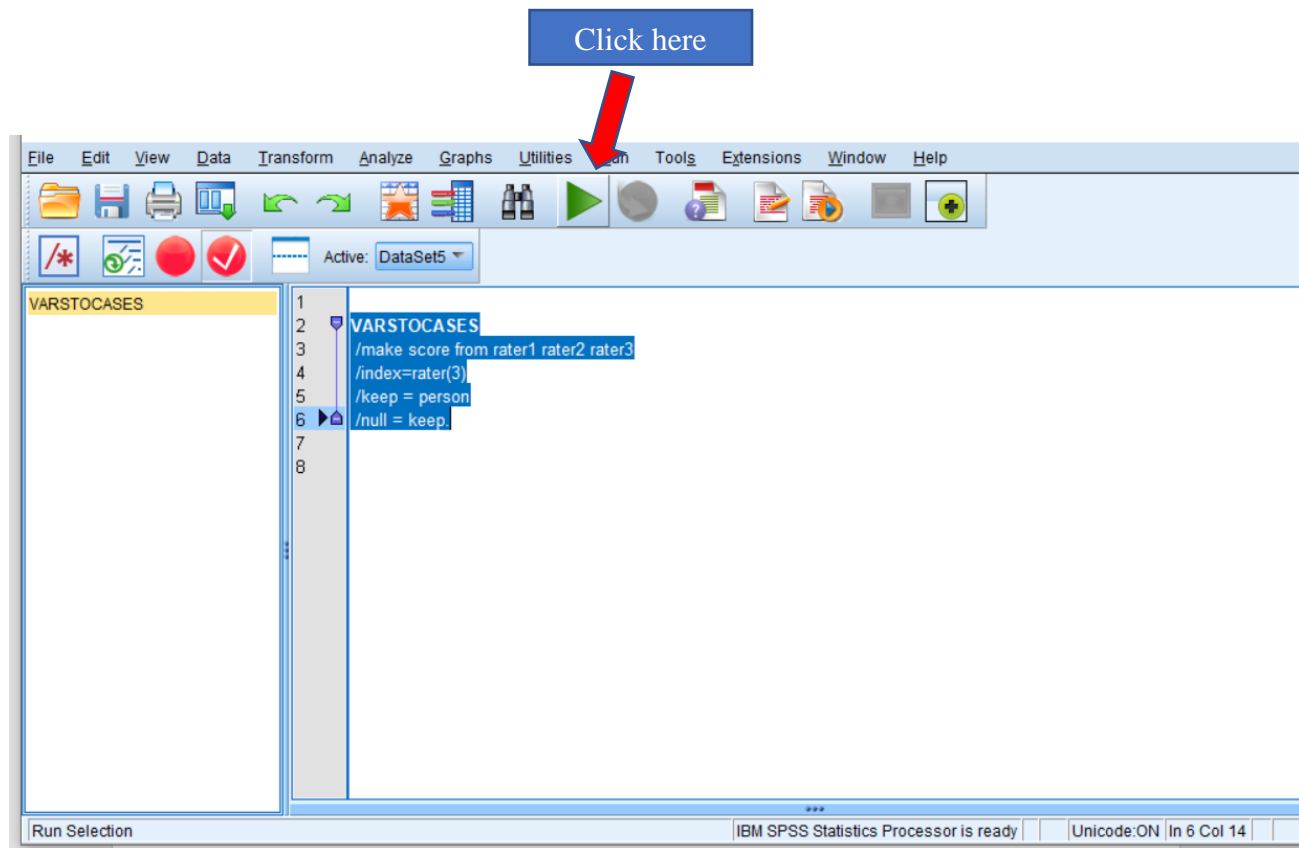
The subcommand "**MAKE score FROM rater1 rater2 rater3**" creates the variable "score" as the values of rater1, rater2, and rater3. If there are more raters, simply type in the additional names on this line. If the facet of interest consists of tasks, occasions, etc., the name "rater" can be changed accordingly.

The next line ("**INDEX=rater(3)**") creates the variable "rater" with values of 1, 2, and 3, corresponding to the three raters. If there are more than three levels of the facet of interest, change the value of 3 to the appropriate value.

The subcommand "**KEEP = person**" specifies that the existing variable "person" should be kept in the dataset.

Finally, the subcommand "**NULL=KEEP**" specifies that a new row should be created even if a person's ratings from all raters are missing. In this case, the variable "score" will be missing for that person.

After typing or pasting in all the commands, highlight them all and click on the right arrow key at the top of the screen:

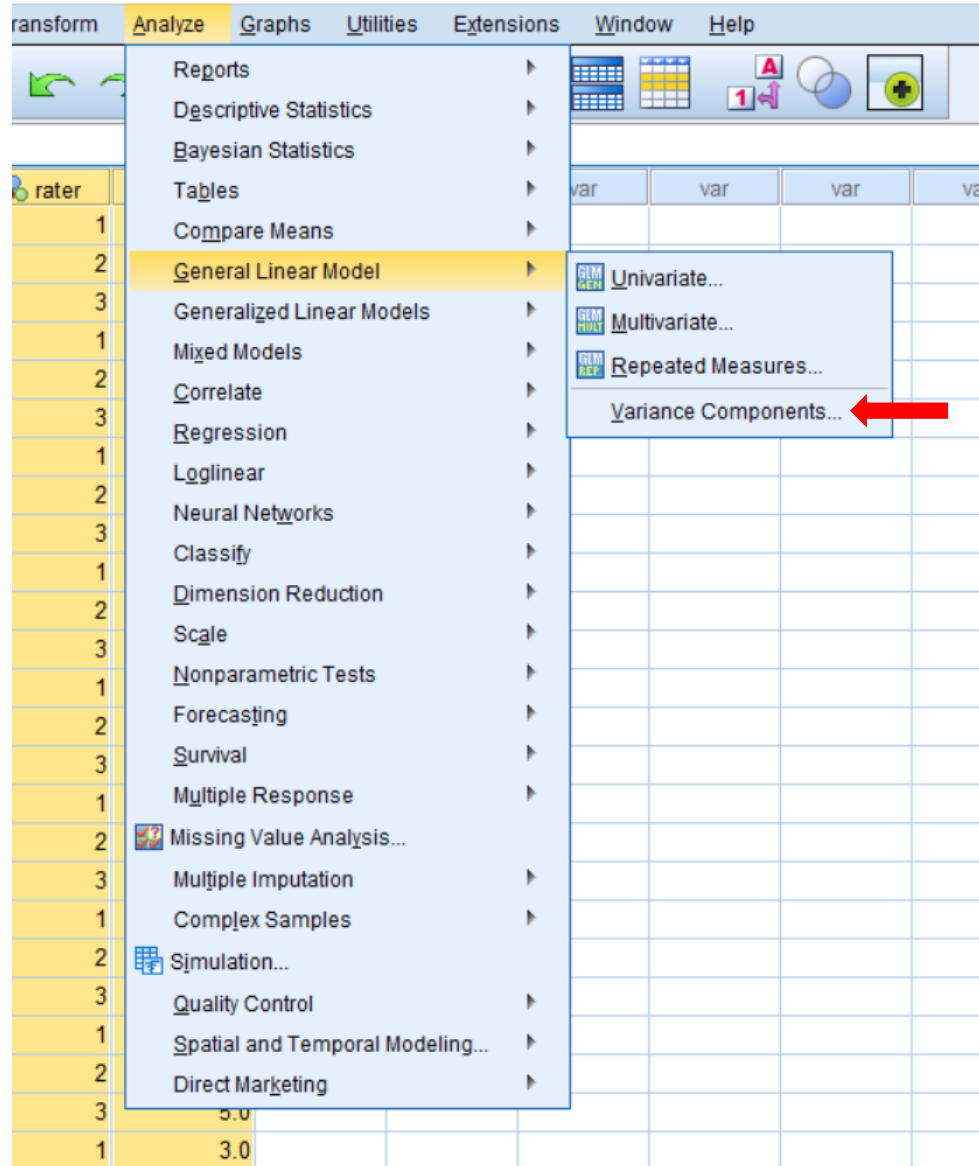


The transposed data shown previously should now appear. Save the new data set under a new name to use in obtaining the variance components.

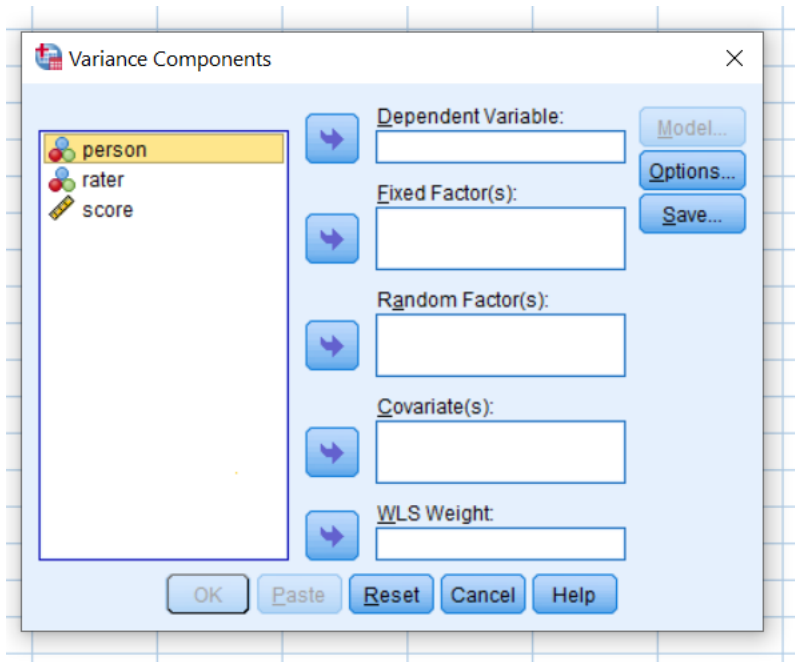
### ***Obtaining the Variance Components for the One-facet Data***

With the transposed data set open, choose **ANALYZE**, then **GENERAL LINEAR MODEL**, and then **VARIANCE COMPONENTS**.

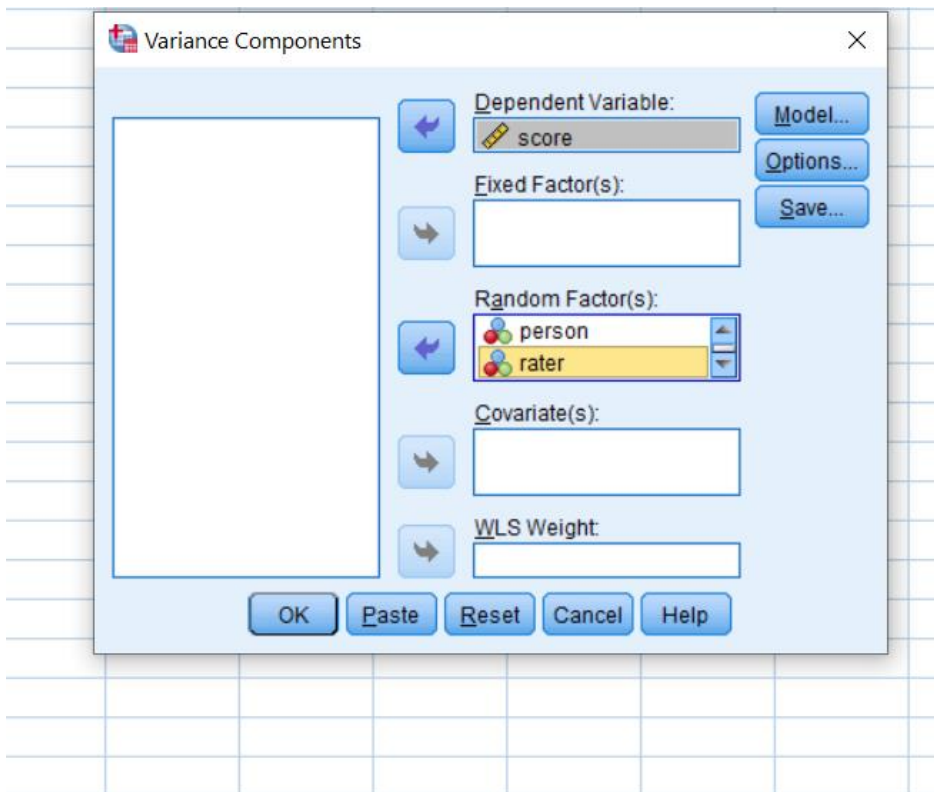
/ [DataSet5] - IBM SPSS Statistics Data Editor



This will bring up the menu below:



The dependent variable is “score.” Choose “person” and “rater” as the random factors. (If one or more facets are fixed, enter them into the fixed factors box). Then click on **OK**.



This will result in the output below:



### Factor Level Information

		N
person	1	3
	2	3
	3	3
	4	3
	5	3
	6	3
	7	3
	8	3
	9	3
	10	3
	11	3
	12	3
rater	1	12
	2	12
	3	12

Dependent Variable: score

### Variance Estimates

Component	Estimate
Var(person)	1.283
Var(rater)	.088
Var(person * rater)	.967
Var(Error)	.000 <sup>a</sup>

Dependent Variable: score

Method: Minimum Norm

Quadratic Unbiased

Estimation (Weight = 1 for

Random Effects and Residual)

a. This estimate is set to zero because it is redundant.

The Factor Level Information specifies that there are 12 people in the data set, each with three ratings (this is the “N”). There are three raters, each rating 12 people.

The variance component estimates shown in the second table are the same as those in the excel spreadsheet for the one-facet crossed design and in Table 10.3 in the text (NOTE THAT IN PRINTINGS 1 AND 2 OF THE BOOK, THESE VALUES ARE

INCORRECT IN THE TABLE. GO TO THE ERRATA SHEET ON THIS WEBSITE TO OBTAIN THE CORRECTED TABLE).

The variance component values can be entered into the spreadsheet in the appropriate column.

## Two-facet Design

The commands for the two-facet design are analogous to those for the one-facet design.

### *Transposing the Data*

Commands to transpose the data for the two-facet design are slightly more complex than those for the one-facet design. The data for the values in Table 10.4 are in the data set “**Table 10.4 data untransposed.**” The untransposed data are shown below:

Table 10.4 data untransposed.sav [DataSet16] - IBM SPSS Statistics Data Editor

	person	R1Task1	R1Task2	R1Task3	R2Task1	R2Task2	R2Task3	R3Task1	R3Task2	R3Task3	var
1	1	3.0	3.0	3.0	5.0	5.0	5.0	4.0	4.0	5.0	
2	2	3.0	2.0	4.0	5.0	5.0	5.0	5.0	3.0	5.0	
3	3	1.0	1.0	2.0	1.0	3.0	3.0	2.0	3.0	4.0	
4	4	3.0	2.0	2.0	1.0	3.0	2.0	2.0	1.0	1.0	
5	5	6.0	6.0	6.0	5.0	5.0	6.0	5.0	4.0	3.0	
6	6	1.0	2.0	1.0	2.0	1.0	1.0	5.0	3.0	2.0	
7	7	3.0	2.0	3.0	5.0	1.0	2.0	5.0	4.0	5.0	
8	8	5.0	4.0	6.0	4.0	3.0	5.0	5.0	4.0	6.0	
9	9	3.0	2.0	3.0	1.0	3.0	1.0	3.0	1.0	3.0	
10	10	4.0	3.0	4.0	3.0	3.0	3.0	5.0	4.0	2.0	
11	11	3.0	2.0	5.0	4.0	3.0	4.0	3.0	2.0	3.0	
12	12	2.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	4.0	
13											
14											

Each person has nine scores: ratings from three raters (labeled R1, R2, R3) on three tasks (Task1, Task2, and Task3). The label R1Task1 refers to the rating by Rater 1 on Task 1, and so on.

What is needed is a transposed data set with new variables for rater, task, and score. This can be obtained by running the syntax below with the data set “**Table 10.4 data untransposed.sav**” open in SPSS.

### **VARSTOCASES**

**/MAKE** score **FROM** R1Task1 R1Task2 R1Task3 R2Task1 R2Task2 R2Task3 R3Task1 R3Task2 R3Task3

**/INDEX=rater(3) task(3)**  
**/KEEP = person**  
**/NULL = KEEP.**

The commands are similar to those for the one-facet design, except that now there are two index variables, rater, which goes from 1 – 3, and task, which also goes from 1 – 3. The order of the variables in the untransposed data set is that all three tasks for Rater 1 are first, then all three tasks for Rater 2, then all three tasks for Rater 3. SPSS assumes that the variable listed first on the **MAKE** subcommand is the first index and the second variable is the second index. This means that SPSS will assume that the first three variables listed on the **MAKE** subcommand will be those for Rater 1, Tasks 1 – 3, the next three variables will be those for Rater 2, Tasks 1 – 3, and so on.

Running these commands as demonstrated previously will yield the transposed data set below (note that not all rows are shown):

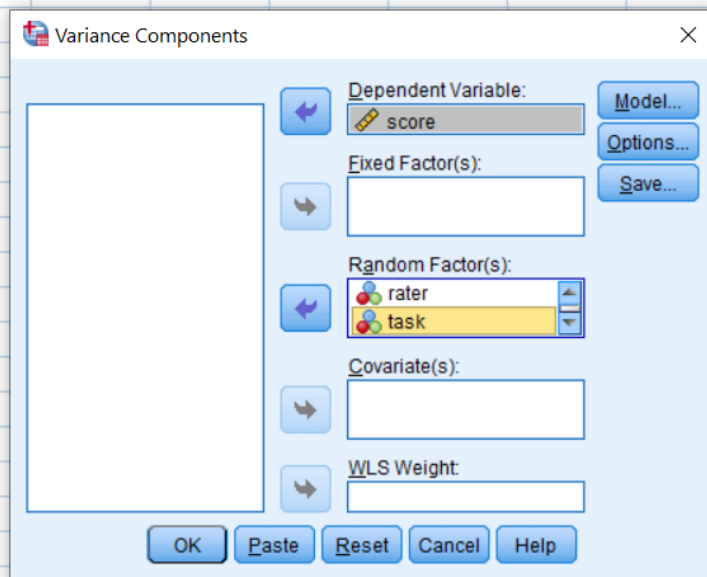
Table 10.4 data transposed.sav [DataSet15] - IBM SPSS Statistics Data Editor

	person	rater	task	score	var	
1	1	1	1	3.0		
2	1	1	2	3.0		
3	1	1	3	3.0		
4	1	2	1	5.0		
5	1	2	2	5.0		
6	1	2	3	5.0		
7	1	3	1	4.0		
8	1	3	2	4.0		
9	1	3	3	5.0		
10	2	1	1	3.0		
11	2	1	2	2.0		
12	2	1	3	4.0		
13	2	2	1	5.0		
14	2	2	2	5.0		
15	2	2	3	5.0		
16	2	3	1	5.0		
17	2	3	2	3.0		
18	2	3	3	5.0		
19	3	1	1	1.0		
20	3	1	2	1.0		
21	3	1	3	2.0		
22	3	2	1	1.0		
23	3	2	2	3.0		

### ***Obtaining the Variance Components for the Two-facet Data***

With the transposed two-facet data set open, choose **ANALYZE**, then **GENERAL LINEAR MODEL**, and then **VARIANCE COMPONENTS**, as before.

For the dependent variable, choose “score,” and choose “person,” “rater,” and “task” as the random factors.



This will result in the two tables below:

### Factor Level Information

		N
person	1	9
	2	9
	3	9
	4	9
	5	9
	6	9
	7	9
	8	9
	9	9
	10	9
	11	9
	12	9
rater	1	36
	2	36
	3	36
task	1	36
	2	36
	3	36

Dependent Variable: score

The table above shows that there are 12 people with nine scores each (3 ratings on each of 3 tasks). There are three raters yielding 36 ratings (ratings from 3 raters for each of 12 people) and ratings on 36 tasks (ratings on 3 tasks from each of 12 people).

The variance components shown below are the same as those in Table 10.4 in the text and in the Excel spreadsheet on the sheet labeled “**Two-facet crossed.**”

### Variance Estimates

Component	Estimate
Var(person)	1.035
Var(rater)	-.004 <sup>a</sup>
Var(task)	.061
Var(person * rater)	.471
Var(person * task)	.120
Var(rater * task)	.012
Var(person * rater * task)	.641
Var(Error)	.000 <sup>b</sup>

Dependent Variable: score

Method: Minimum Norm Quadratic

Unbiased Estimation (Weight = 1 for  
Random Effects and Residual)

- a. For the ANOVA and MINQUE methods, negative variance component estimates may occur. Some possible reasons for their occurrence are: (a) the specified model is not the correct model, or (b) the true value of the variance equals zero.
- b. This estimate is set to zero because it is redundant.