SPSS Chapter 12 Example 1 - One-Way Analysis of Variance (ANOVA)

A study of reading comprehension in children compared three methods of instruction, known as basal, DRTA, and strategies (denoted as "Strat" in this example). A measure of reading comprehension (the "**comp**" variable seen below) was received after the instruction was completed. We are interested in comparing the reading comprehension of the three instruction groups. We are testing

H_0: $\mu_B=\mu_D=\mu_S$

H_a: $\mu_B\neq\mu_D\neq\mu_S$

After opening the file, the data appear in the SPSS Data Editor window just like the following (please note that for the variable entitled ***Group***, basal=1, DRTA=2 and strategies=3):

P754 - SPSS Data Editor

File Edit View Data Transform Statistics Graphs Utilities Window Help

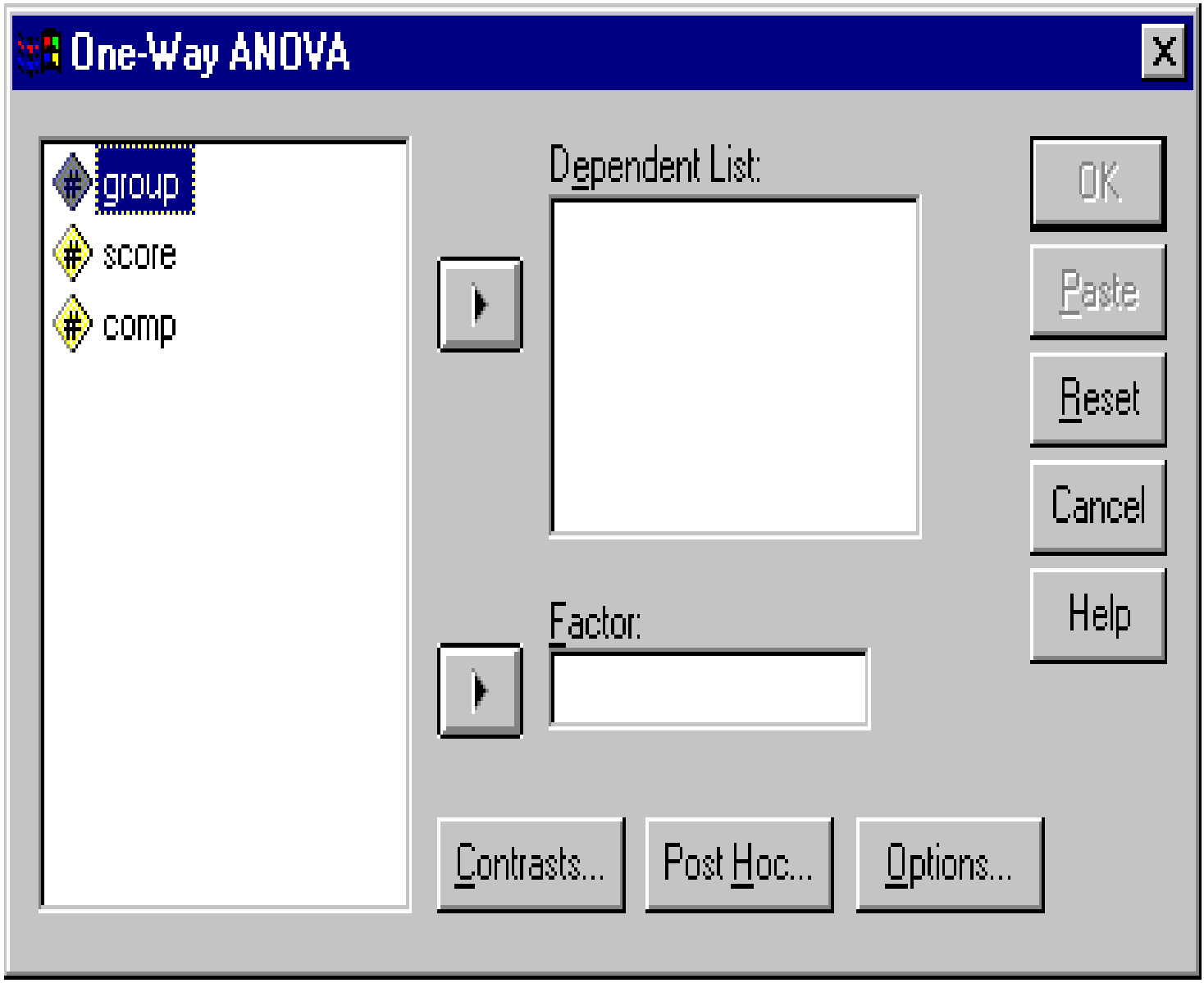
1:group 1

	group	score	comp	var	var	var
1	1	4	41			
2	1	6	41			
3	1	9	43			
4	1	12	46			
5	1	16	46			
6	1	15	45			
7	1	14	45			
8	1	12	32			
9	1	12	33			
10	1	8	39			
11	1	13	42			
12	1	9	45			

SPSS Processor is ready

Follow these steps to perform a One-Way ANOVA:

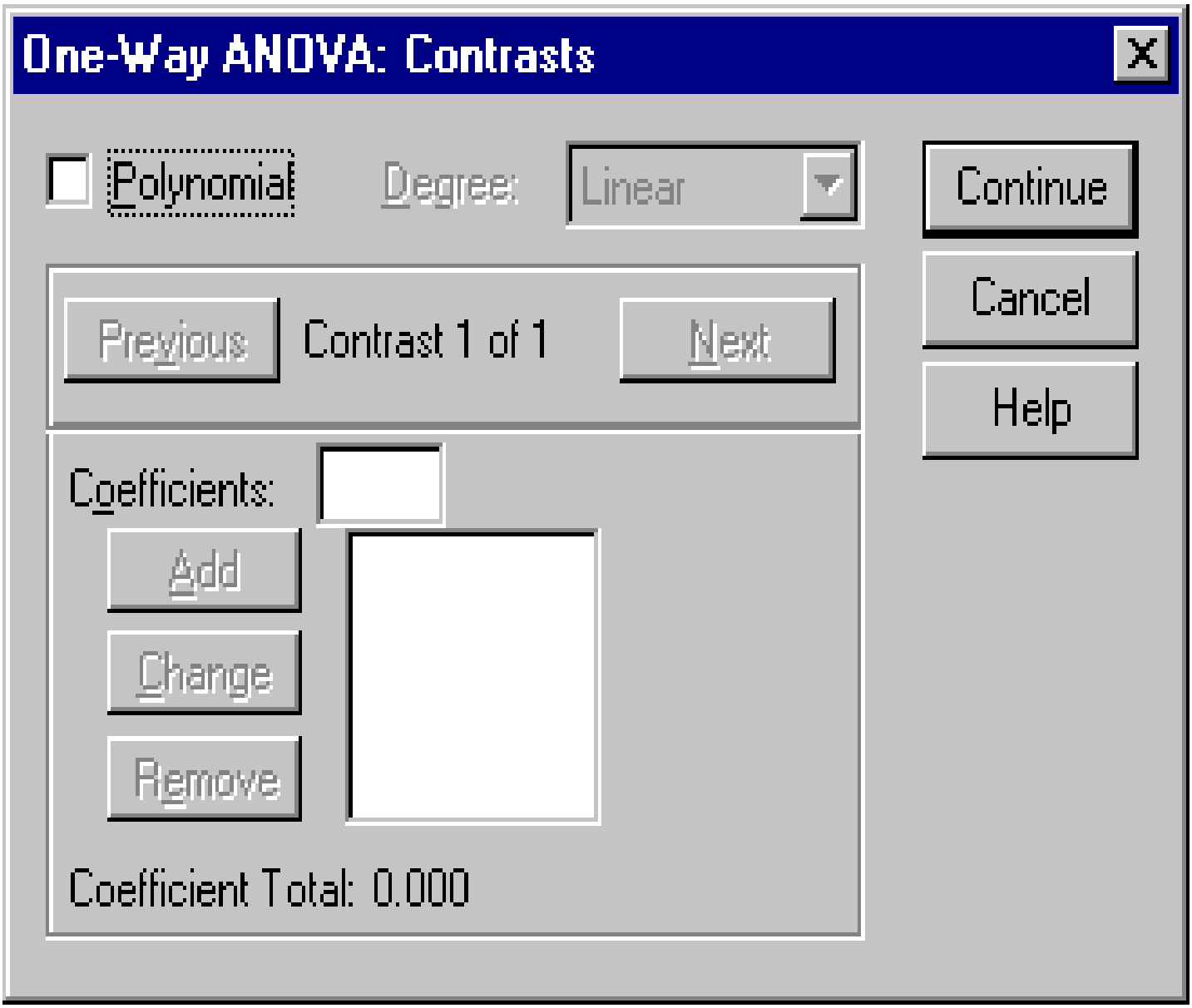
1. Click **Analyze**, click **Compare Means**, and click **One-Way ANOVA**. The following window will appear.



2. Click "**comp**" (a.k.a. "**comprehension score**") and click ▸ to move "**comp**" into the box entitled ***Dependent List***.

3. Click "**group**" and click ▸ to move "**group**" into the box entitled ***Factor***.

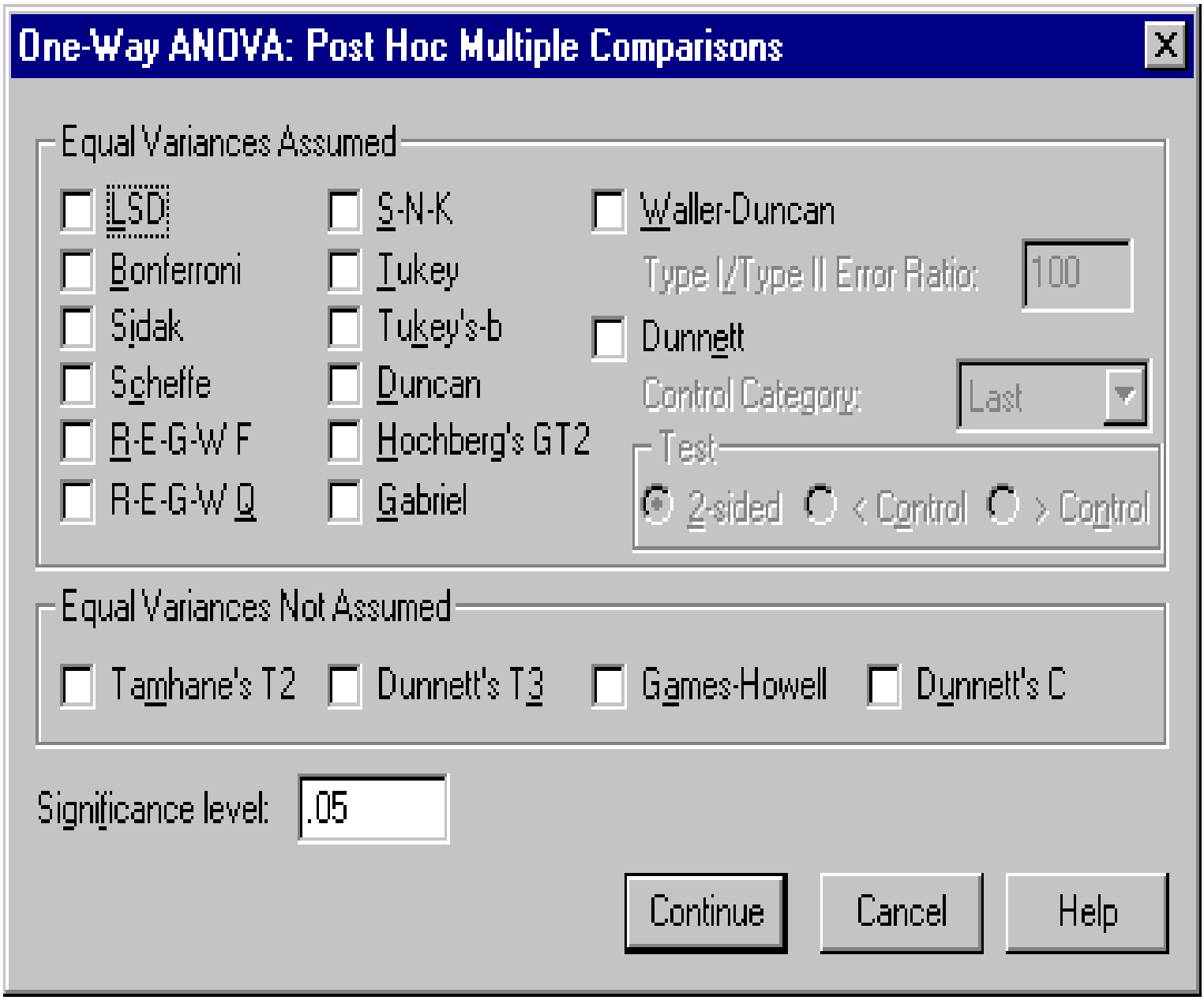
4. To calculate contrasts, click the button entitled **Contrasts** and the following window will appear.



5. We are interested in two contrasts: basal vs. DRTA and strategies (-2, 1, 1) as well as DRTA vs. strategies (0, 1, -1). The coefficients of each contrast are entered separately in the box entitled ***Coefficients***. After the first coefficient is entered (i.e., -2), click **Add**. Enter the remaining coefficients of the first contrast (i.e., 1 and 1) in the same manner. Click **Next** to enter the second contrast.

6. Repeat step 5 for the second contrast, then click **Continue**.

7. To calculate post hoc multiple comparisons, click the button entitled **Post Hoc** and the following window will appear.



8. Click **LSD** and **Bonferroni** so that a checkmark (✓) appears in the boxes before those multiple comparisons. Click **Continue**.

9. Click **OK**.

The SPSS output for this example of the One-Way ANOVA is the following:

ANOVA
comp

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	357.303	2	178.652	4.481	.015
Within Groups	2511.682	63	39.868		
Total	2868.985	65			

The null hypothesis of equal means is rejected. F(2,63)=4.481,p=.015.The researcher knows that there is at least one difference among the means. Pre-planned comparisons which are orthogonal can also be tested. See the notes for an interpretation of each contrast.

Contrast Coefficients

	Group		
Contrast	basal	DRTA	strat
1	-2	1	1
2	0	1	-1

The orthogonal comparisons are tested in the table below. Under the null hypothesis the contrast=0, the alternative hypothesis indicates the contrast is not equal 0. Contrast one is significant p=.009 however contrast two is not significant p=.202. The average of the d and s groups is different from the b group. The d and s groups do not differ.

Contrast Tests

		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
comp	Assume equal variances	1	4.455	1.649	2.702	63	.009
		2	2.455	1.904	1.289	63	.202
	Does not assume equal variances	1	4.455	1.563	2.851	47.945	.006
		2	2.455	1.998	1.228	39.661	.227

The multiple comparisons are given on the next table. The tests both indicate that the b and d group means differ.

Multiple Comparisons
Dependent Variable: comp

	(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
LSD	basal	DRTA	-5.682*	1.904	.004	-9.486	-1.877
		strat	-3.227	1.904	.095	-7.032	.577
	DRTA	basal	5.682*	1.904	.004	1.877	9.486
		strat	2.455	1.904	.202	-1.350	6.259
	strat	basal	3.227	1.904	.095	-.577	7.032
		DRTA	-2.455	1.904	.202	-6.259	1.350
Bonferroni	basal	DRTA	5.682*	1.904	.012	-10.364	-.999
		strat	-3.227	1.904	.285	-7.910	1.455
	DRTA	basal	5.682*	1.904	.012	.999	10.364
		strat	2.455	1.904	.606	-2.228	7.137
	strat	basal	3.227	1.904	.285	-1.455	7.910
		DRTA	-2.455	1.904	.606	-7.137	2.228

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