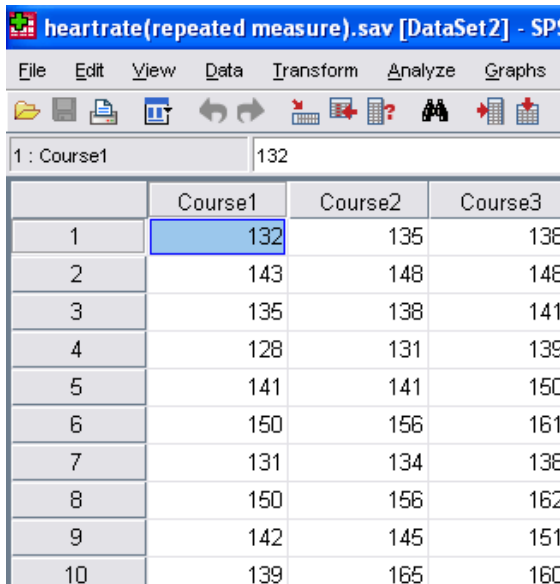


Repeated Measures tutorial

Problem description

An investigator is interested in comparing the cardiovascular fitness of elite runners on three different training courses, each of which covers 10 miles. The courses differ in terms of terrain, Course 1 is flat, Course 2 has graded inclines, and Course 3 includes steep inclines. Each runner's heart rate is monitored at mile 5 of the run on each course. Ten runners are involved, and their heart rates measured on each course are shown below. The data is available at U:_MT Student File Area\hjkim\STAT380\SPSS tutorial\heartrate.sav.

Runner number	Course1	Course2	Course3
1	132	135	138
2	143	148	148
3	135	138	141
4	128	131	139
5	141	141	150
6	150	156	161
7	131	134	138
8	150	156	162
9	142	145	151
10	139	165	160



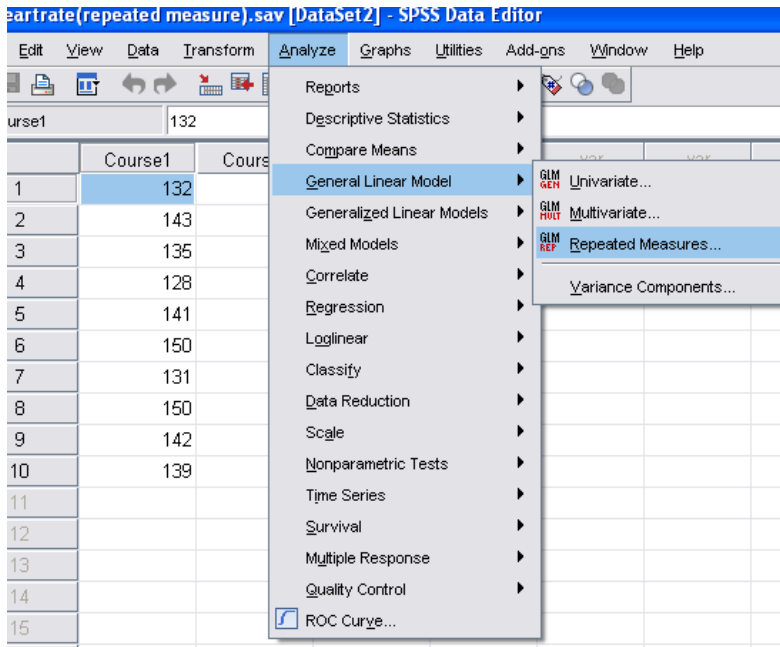
The screenshot shows the SPSS data editor window for 'heartrate(repeated measure).sav [DataSet2]'. The data is organized in a table with columns for Course1, Course2, and Course3, and rows for runners 1 through 10. The value 132 is highlighted in the cell for Runner 1, Course1.

	Course1	Course2	Course3
1	132	135	138
2	143	148	148
3	135	138	141
4	128	131	139
5	141	141	150
6	150	156	161
7	131	134	138
8	150	156	162
9	142	145	151
10	139	165	160

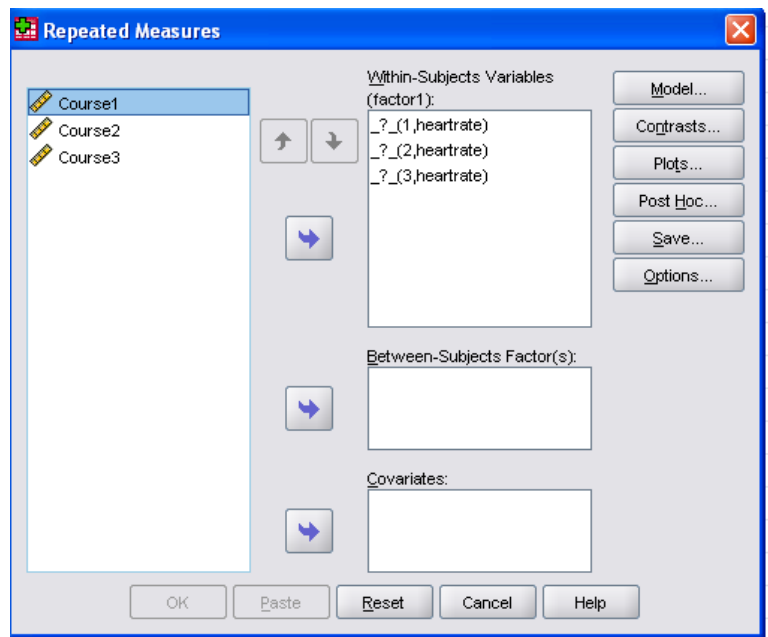
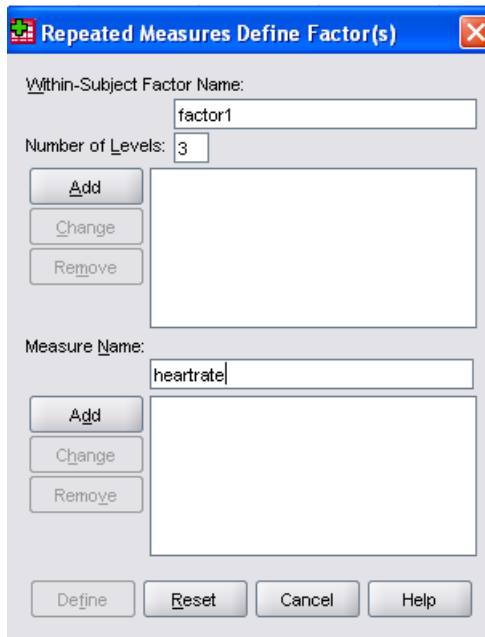
In SPSS, the data should be entered as picture on left.

Repeated Measure ANOVA

Click on **Analyze-General linear model-Repeated measures** in the pull down menus to start the process.



We need to define which of our variables is the dependent variable and which is the factor variable. In the Repeated Measures Define Factor window, write the number of treatment on number of levels. Here the number of treatment is 3. Click Add button. Also write the name of the response variable in Measure Name. Click Add button. Then Click Define button. This will lead us to the next window, Repeated Measures. After moving each of them to the proper field we hit OK and the analysis window will appear with the ANOVA output. Move Course1, Course2, and Course 3 to Within-Subject variables (factor1) using left side arrow. Click OK button.



Output

Recall that the null hypothesis in ANOVA is that the means of all the groups are the same and the alternative is that at least one is different. So for our example with 3 treatment groups

$$H_o : \mu_1 = \mu_2 = \mu_3$$

H_A : At least one mean is different

Tests of Within-Subjects Effects

Measure:heartrate

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
factor1	Sphericity Assumed	476.467	2	238.233	15.601	.000
	Greenhouse-Geisser	476.467	1.270	375.146	15.601	.001
	Huynh-Feldt	476.467	1.384	344.184	15.601	.001
	Lower-bound	476.467	1.000	476.467	15.601	.003
Error(factor1)	Sphericity Assumed	274.867	18	15.270		
	Greenhouse-Geisser	274.867	11.431	24.046		
	Huynh-Feldt	274.867	12.459	22.062		
	Lower-bound	274.867	9.000	30.541		

We will use the Sphericity Assumed line. Here SSb is 476.476 and SSw is 274.867. The p-value is .000 and thus we reject the null hypothesis and conclude that there is significant difference in runner's heart rate among the courses.