

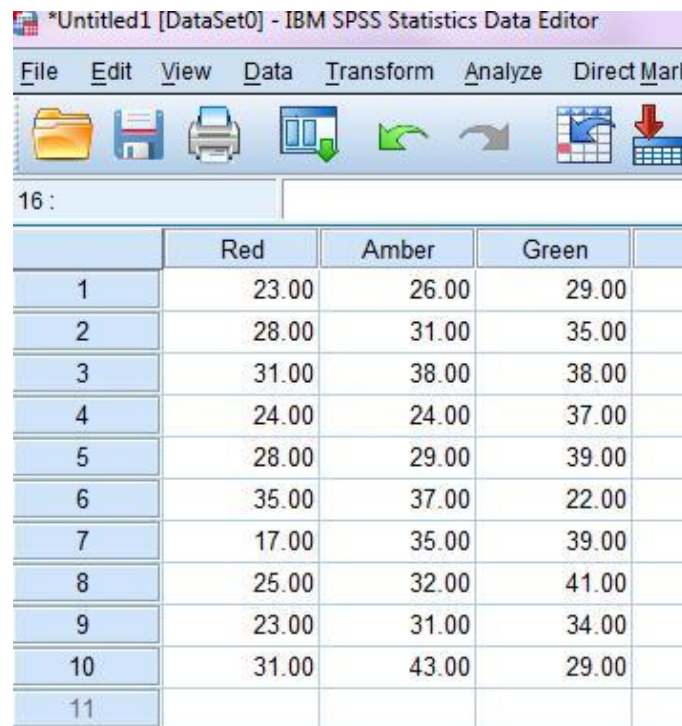
One-way repeated measures ANOVA (Within subjects)

Here you have the opportunity to practice a repeated-measures one way ANOVA. This type of analysis is used when we have one within subjects IV with more than 2 conditions/levels to compare.

We will be using sample data from a hypothetical study looking to explore the effect of traffic light colours on reaction times.

Step 1:

Create the three variables to represent the three colour conditions in the 'variable view'. These should be 'red', 'amber' and 'green'. Once you have named the conditions/levels, input the data for reaction times as shown below in the 'data view':



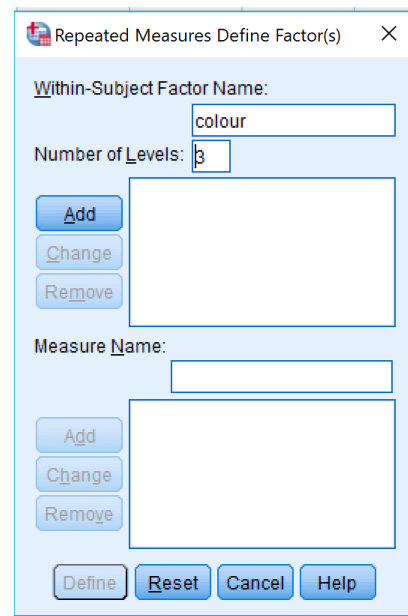
	Red	Amber	Green
1	23.00	26.00	29.00
2	28.00	31.00	35.00
3	31.00	38.00	38.00
4	24.00	24.00	37.00
5	28.00	29.00	39.00
6	35.00	37.00	22.00
7	17.00	35.00	39.00
8	25.00	32.00	41.00
9	23.00	31.00	34.00
10	31.00	43.00	29.00
11			

Notice how we define our 'within' variable across three columns, which represent the three conditions of the variable. In order to carry out our analysis of the effect of the variable 'colour', we need to compare values for all of our conditions.

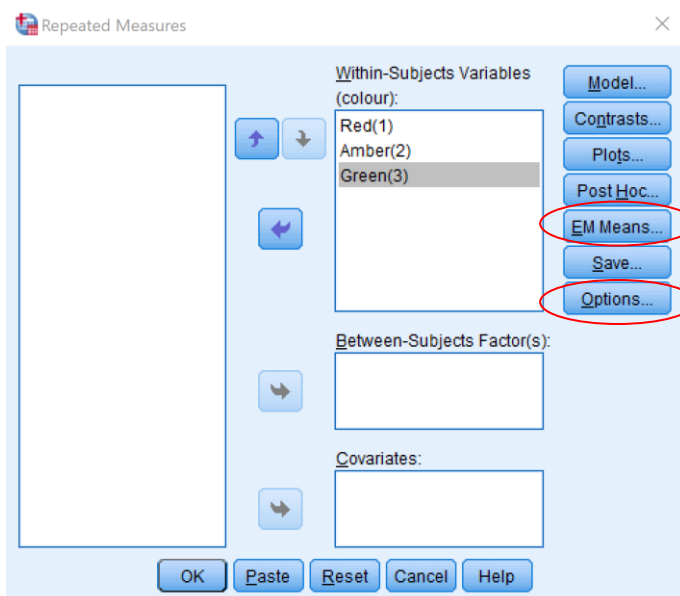
Step 2:

Select 'Analyze' on the top menu bar, hover over 'General Linear Model' and select the 'Repeated Measures' option. You will need to define the repeated measures variable of

colour, and tell SPSS that there are 3 levels/conditions for this variable as shown below. Press the 'Add' button then the 'Define' button to continue defining this variable.



Next move the three conditions of the variable across into the 'Within-subjects variables' box. (There are no between subjects variables for this ANOVA, so leave that box empty).

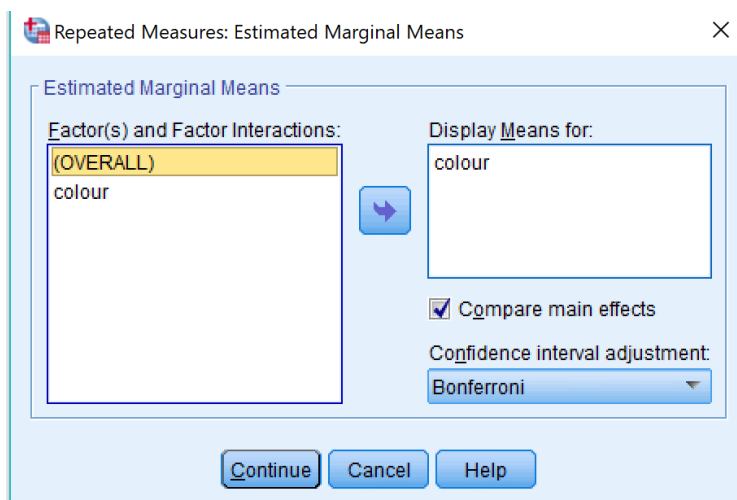
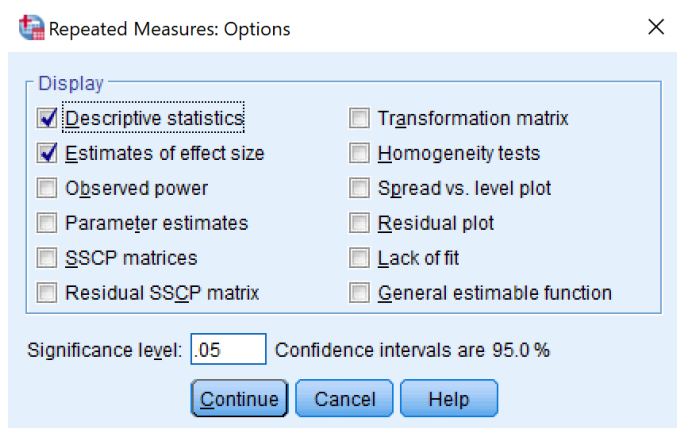


Step 3:

Select 'Options' and then ensure 'Descriptive statistics' and 'estimates of effect size' are selected as shown below. Click Continue.

Next, select 'EM Means' and move the variable 'colour' across into the 'Display Means for' box.

We want to request that SPSS carries out a comparison between each of the conditions separately, so select the 'Compare main effects' tickbox, and the Bonferroni adjustment from the drop down box (as below). Click Continue.



Finally, Click 'OK' within the 'Repeated Measures' dialogue box to carry out the analysis.

Step 4: Report and interpret results.

SPSS will produce the following output tables:

Descriptive Statistics

In this table the descriptives (means, SD's and N) are shown for the three different conditions of your study. This is useful for referring back to in order to understand where (if) differences have been shown to be significant or non-significant.

Mauchly's Test of Sphericity

The assumption of sphericity requires, overall, that the variance of the population difference scores for any two conditions are the same as the variance of the population difference scores for any two other conditions. This is an assumption that is often violated when using repeated measures designs, and we can assess whether this has been violated by looking at the **Sig.** value contained within this output box. Note here that we want the Sig. value to be MORE THAN .05 (i.e., we have not got significant differences between the variances across the three conditions).

Tests of Within-Subjects Effects

Once sphericity has been confirmed, we can decide which row of data to report and interpret from this output table. For this example, we use the information provided in the top row (colour – Sphericity Assumed).

The top row of this output will give you the first df, the F-value and the significance value for reporting the effect of the variable 'colour' across all three conditions (the main effect). For ANOVA we need to report two values from the degrees of freedom (df) column –the second df value comes from the 'Error(colour)' row of the output.

The format for reporting the results of ANOVA is:

$$F(df, df) = F\text{-value}, p < 0.05 \text{ or } p > 0.05 \text{ (} p = _ \text{ if you prefer)}$$

For example: $F(2, 18) = 4.73, p < .05$

Pairwise Comparisons

As we also requested for SPSS to compare between each of the conditions (rather than just a general comparison effect across all three conditions), this is shown in the 'Pairwise comparisons' table. Here you can read across table for the comparison of each specific condition (1, 2 or 3) against another specific condition (1, 2, or 3). Check the significance value for each row to see whether each of these comparisons is significant. (e.g. condition 1 compared to condition 2).

For example, in our output we can see that the difference between the mean scores in condition 1 (Red) and condition 2 (Amber) are significant ($p = .02$). It is here that we can refer back to our descriptive statistics table and report the direction of this difference. Repeat for the remaining pairs of conditions.