

Introductory research methods and Statistics in Psychology

Mann-Whitney Test – EWT

We will analyse the results of the Eyewitness Memory experiment using these two tests. You will use the data you collected in class in place of the data used below.

Structuring the data file

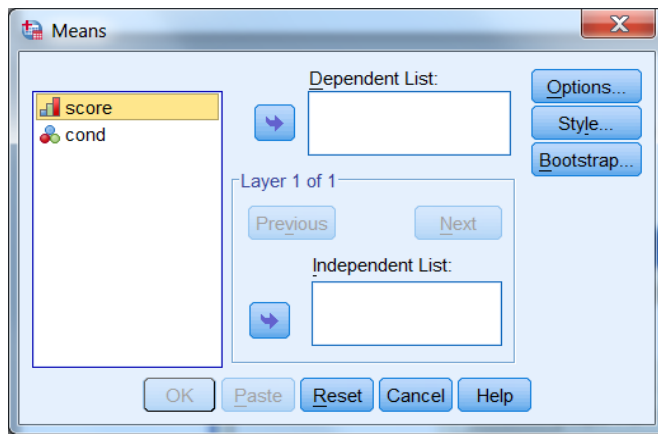
The design here is unrelated - subjects were allocated to just one of the experimental conditions, and the number of correctly answered questions was recorded. Therefore we just have one score from each subject. We cannot input the data from each condition into two columns as in the previous workshop, as SPSS will treat this type of data file as a related design (remember, the rows in each column represent a single participant). In this case what SPSS needs to know is

- A/ Each participant's score (i.e. no. of correct answers).
- B/ The condition in which they participated

The data for A can be inputted into the first column (I have called this 'score'). For B we will use a coding variable - a numerical code that represents the condition to which a given participant belongs. In the example below I have denoted the conditions by the values **1** (chronological) and **2** (random). Hence, the data file looks as follows:

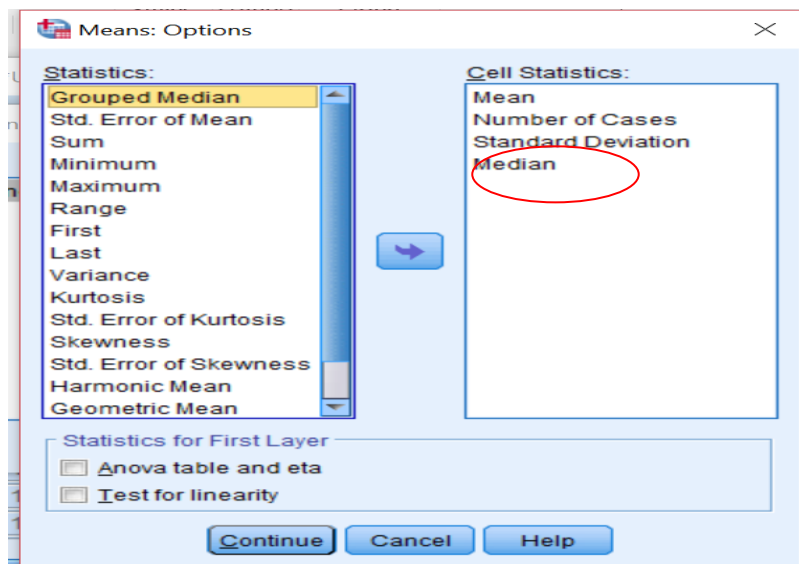
	score	cond
1	8.00	1.00
2	9.00	1.00
3	10.00	1.00
4	8.00	1.00
5	10.00	1.00
6	11.00	1.00
7	8.00	1.00
8	8.00	1.00
9	10.00	1.00
10	7.00	1.00
11	11.00	1.00
12	9.00	1.00
13	10.00	1.00
14	9.00	1.00
15	7.00	1.00
16	8.00	2.00
17	7.00	2.00
18	8.00	2.00
19	6.00	2.00
20	5.00	2.00
21	7.00	2.00

Before going on to do the tests, I suggest that you first obtain descriptive statistics for each condition. You have already used the Descriptive Statistics menu to obtain such information. However with an unrelated design, where you will need to split a column of scores using the coding variable, there is another facility for obtaining means. From the **Analyse** menu, select **Compare Means**, and from the sub-menu, select **Means...** The following dialogue box will appear:



You have to specify the **Dependent list** - i.e. the scores you want to do the analysis on, and the Independent List, the factor you want to split your scores by. In the above example I want to split *score* by *cond*, so select *score* and use the ► button to move this to the **Dependent List** box. Select *cond* and move this to the **Independent List** box.

Click onto options – make sure that you move median from the left to the right box – as below.



Click **continue**, then **OK** and SPSS will perform the required analysis.

The first part of the output - *case processing summary* can be ignored, scroll down to the table *Report* which will contain the figures of interest:

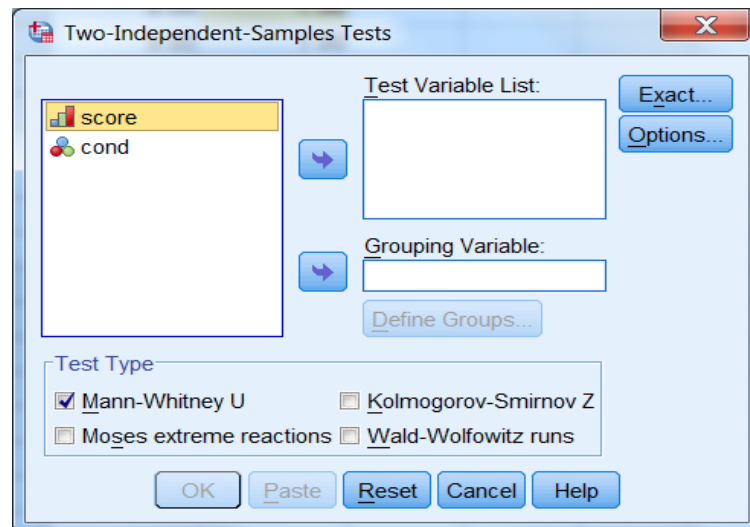
Report				
score				
cond	Mean	N	Std. Deviation	Median
chronological	9.0000	15	1.30931	9.0000
random	6.0667	15	1.22280	6.0000
Total	7.5333	30	1.94286	7.5000

We can see that group 1 answered a mean of 9 questions correctly, group 2 only gained a mean of 6 correct answers, so the direction of the results is in accordance with the hypothesis.

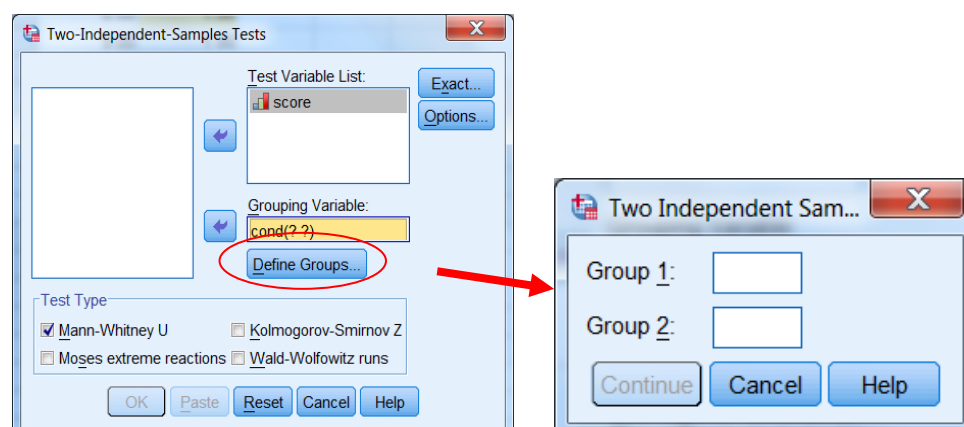
Are the means of *your* results in accordance with the hypothesis – has the group predicted to have a higher score performed accordingly?

The Mann-Whitney Test

From **Analyse**, select **Nonparametric Tests, Legacy Dialogs** and from the sub-menu, select **2 Independent Samples...** This will produce the following dialogue box:



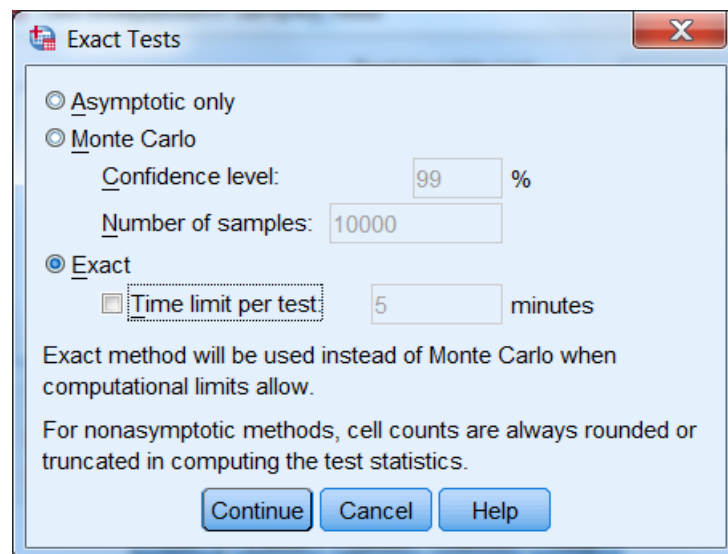
From the list of variables in your data file, you will need to specify the **Test Variable List**. This refers to the variable containing the data you wish to analyse (i.e. the dependent measure). In the above case, it is the *score* variable, so use the ► button to move this to the test variable list. In order to do the test you will have to split the *score* variable by the condition they belong to, so select *cond* and move this into the **Grouping Variable** box. When you do this, the **Define Groups...** button will become active. Click on this to obtain the following:



You need to specify the values used in your coding variable - these are simply **1** for **Group 1** and **2** for **Group 2**, so enter these, and click **Continue** to return to the main dialogue box

There are a number of statistics tests that you can do using this menu, but by default SPSS has already selected the Mann-Whitney test for you, so you do not need to do anything here. In addition to selecting the type of statistical test, you also have to

specify the type of significance test you are going to employ. To do this, click on the **Exact...** button. The following dialogue box will appear:



There are generally two types of test that you would do here. If you have a large data set, the **Asymptotic** test should be used. However if you have a small data set (as will be the case for your data set), the **Exact** test would give a more accurate result, so select this option. Then click **Continue**, and in the main dialogue box, click **OK**. SPSS will then perform the test.

The first part of the output gives information about the rankings of the scores, however the most important part is the Test Statistics table, which you can see by scrolling down:

Test Statistics^a

	score
Mann-Whitney U	12.000
Wilcoxon W	132.000
Z	-4.220
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^b
Exact Sig. (2-tailed)	.000
Exact Sig. (1-tailed)	.000
Point Probability	.000

a. Grouping Variable: cond

b. Not corrected for ties.

First you have the **Mann-Whitney U** value (in this case 12). The *Wilcoxon W* and *Z* values can be ignored.

These values are followed by a number of *significance* values. One of the useful things about using SPSS is that it removes the need to compare our observed value with a critical value in the appropriate statistical tables. This is because SPSS works

out the exact probability that our observed result was obtained by chance alone. For a result to be significant, this probability should be less than or equal to .05, i.e. less than a 5% probability of a chance result. So all you have to do above is select the appropriate probability. This depends on the prediction you have made. In our experiment, the prediction was one-tailed (as we predicted that participants a specific condition would obtain higher scores). Hence we should select the **Exact Sig. (1-tailed)** value. This value of .001 is considerably less than .05, so hence we can reject the null hypothesis and conclude that the difference between the conditions is statistically significant

To report this result

A Mann-Whitney test indicated that the number of correct answers was greater for chronological ordered questions ($Mdn = 9$) than randomly ordered questions ($Mdn = 9$), $U = 12$, $p = .000$.

What is the appropriate significance value for your experiment? What does the output indicate about your results?

Lastly, don't forget to save your data and results files.