

# Using the difR1 Special Macro

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The **difR1** macro is designed to set up an Excel workbook suitable for input to the difR library, an R package used to investigate **DIF**, differential item functioning.

An *important* document introducing difR and its relationship to Lertap5 is found in "[Using the difR Package with Lertap5](#)". The steps described in that document remain 100% appropriate and relevant. However, a special Lertap5 "macro" is also available and, for many users, it will likely make it unnecessary to follow the document's detailed instructions (but still read the document – it may help to understand what follows below).

The special macro, known as "**difR1**", essentially completes all of the steps found in the document, with an occasional sidestep here and there (for example, it side-steps using the BinaryItems option).

The purpose of the discussion below is to explain how the difR1 special macro is used.

## Lertap5 special macros

"Macros" (in Excel) are special-purpose, small, dedicated computer programs created by using VBA, the Visual Basic Applications language. An example [is here](#).

All of Lertap5's special macros are housed within an Excel workbook named "[Lertap5MacroSetA.xlam](#)". This workbook is "open source" and in the public domain.

The macros are activated by selecting options found in the "[MacMenu](#)".

The list to the right displays the macros in active use when this document was created<sup>2</sup>.

The difR1 macro will wake up and spring into action by clicking on it.



Figure 1

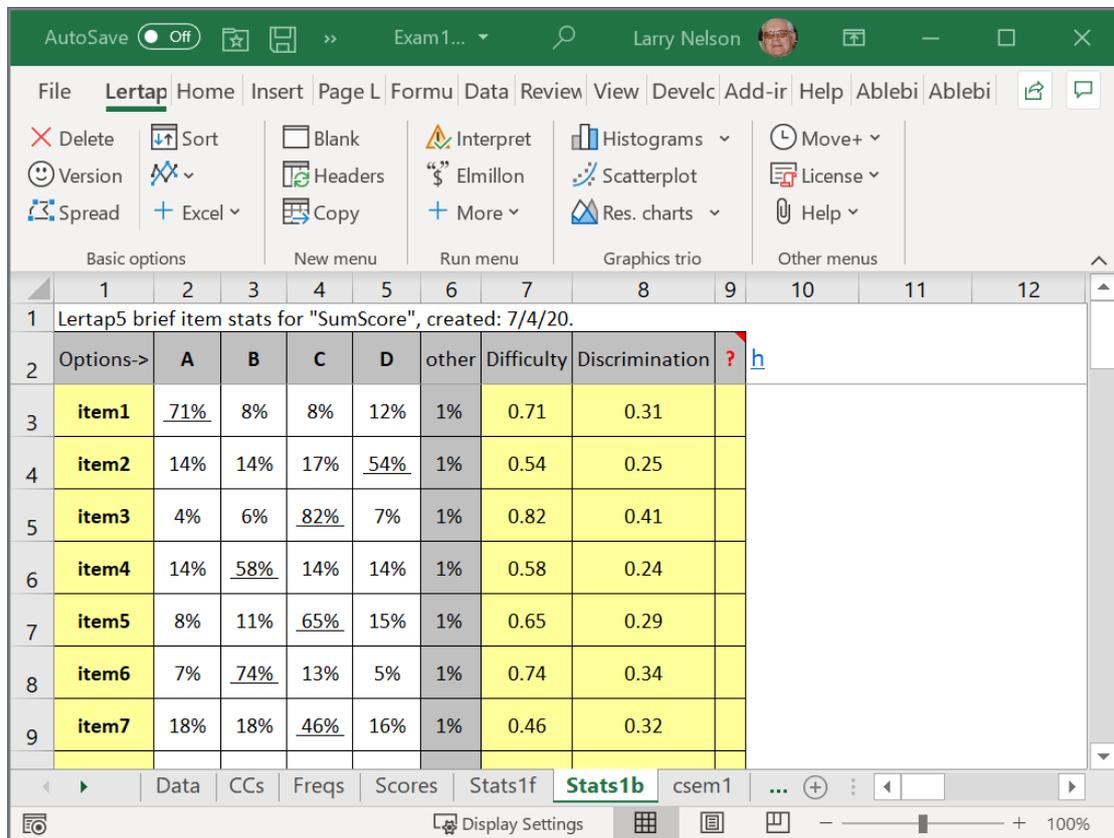
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<sup>2</sup> The difR1 macro was introduced in April 2020. It may not be available unless Lertap5 is [updated](#).

## Using the macro

Alright, I will take this macro for a spin. I'll be using the same dataset, "exam1", seen in "[Using the difR Package with Lertap5](#)"<sup>3</sup>.

I have already taken the **Interpret** and **Elmillon** options, as described in a popular [introduction](#) to Lertap5, and here, at this point, my workbook looks as seen in **Figure 2**:



The screenshot shows an Excel spreadsheet with the following data:

Options->	A	B	C	D	other	Difficulty	Discrimination	
item1	71%	8%	8%	12%	1%	0.71	0.31	
item2	14%	14%	17%	54%	1%	0.54	0.25	
item3	4%	6%	82%	7%	1%	0.82	0.41	
item4	14%	58%	14%	14%	1%	0.58	0.24	
item5	8%	11%	65%	15%	1%	0.65	0.29	
item6	7%	74%	13%	5%	1%	0.74	0.34	
item7	18%	18%	46%	16%	1%	0.46	0.32	

**Figure 2**

I'm ready to apply the macro – the objective is to use it to create a new workbook suitable for input to the difR package.

I get the **MacsMenu** to show (**Figure 1**), and click on **difR1**.

The message in **Figure 3** displays.

I click on **OK**, and then see the message captured in **Figure 4**. Although I had earlier applied Lertap5's Interpret and Elmillon options, that wasn't enough. As the message says, I need to take another Lertap5 option, "Item scores and correlations", in order to get an **IStats** worksheet

<sup>3</sup> See page 15 of [this document](#). The "race" variable was used; it was in column 3 of the Data sheet.

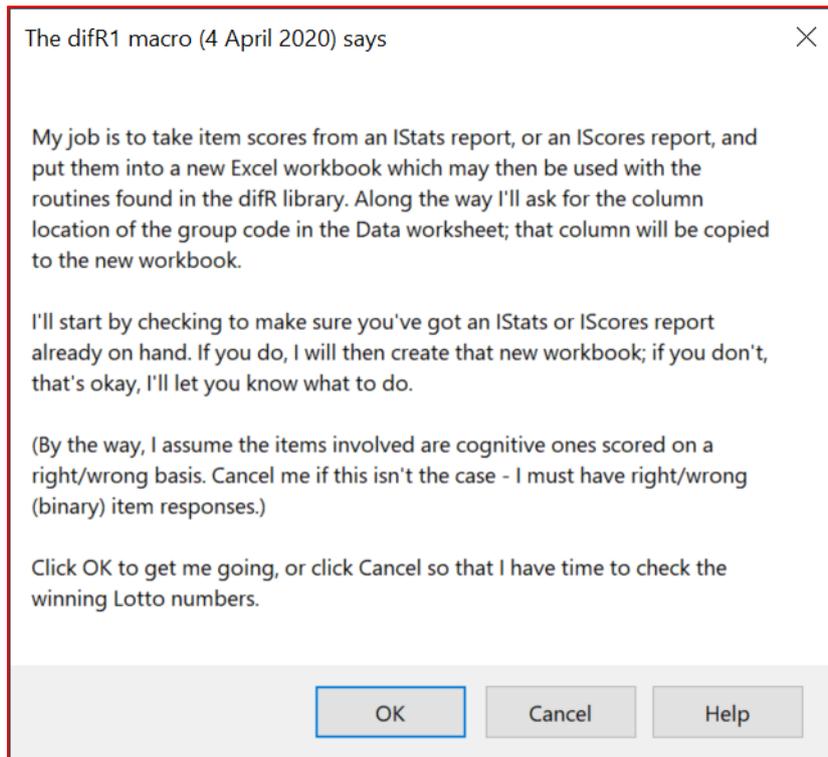


Figure 3

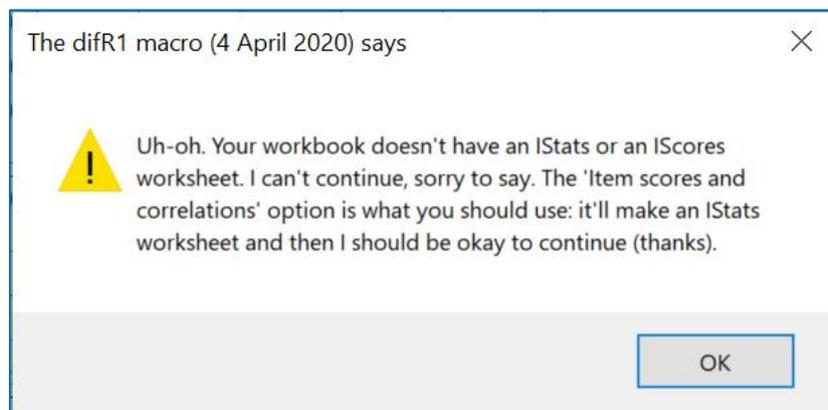


Figure 4

I take the "[Item scores and correlations](#)" option found under the "**More**" menu below "**Elmillion**" (Figure 5).

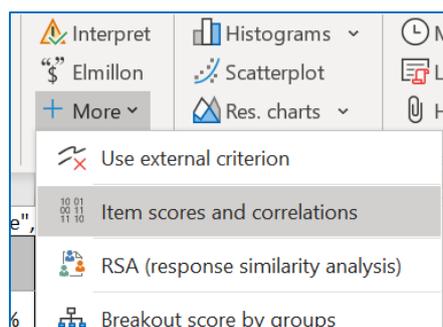
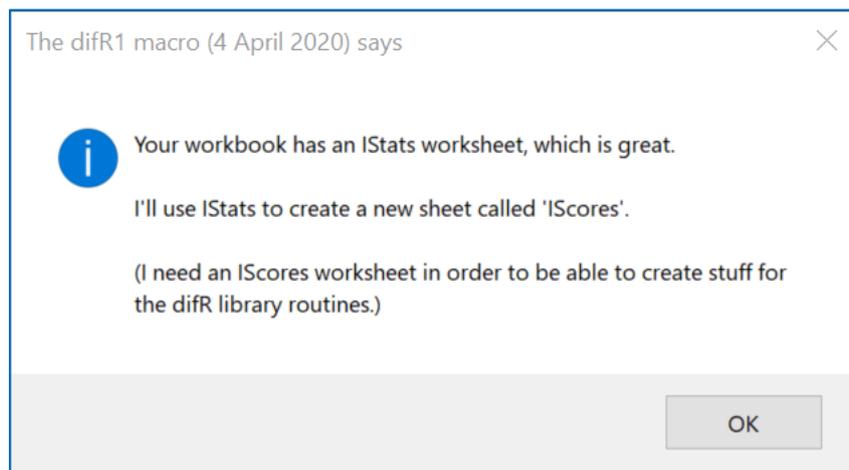


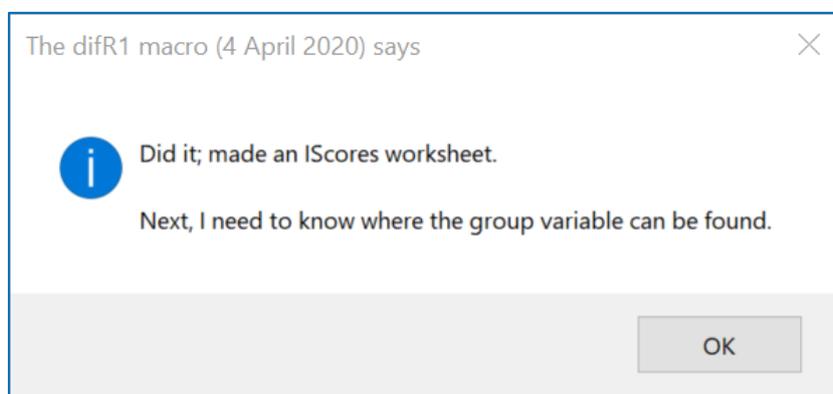
Figure 5

The "Item scores and correlation" option produces a new "report", that is, a new worksheet, called "**IStats**". Once this worksheet is on hand, I can then return to the **Mac Menu** (**Figure 1**) and again click on **difR1**. **Figure 6** displays.



**Figure 6**

Next, I click the OK button, and **Figure 7** flashes up. I now have an **IScores** worksheet. The macro is getting closer to the end.



**Figure 7**

At this stage the difR1 macro has all the information it needs as far as test items go – the **IScores** worksheet will have binary item scores, a matrix of {0,1} scores<sup>4</sup> with each row representing a student's item scores, and each column a test item.

**Figure 8** shows what the **IScores** worksheet will look like. The "id" information in the first column has been picked up from the [ID column](#) in the Data worksheet which was column 1 in this case.

**Figure 9** displays the message made by Lertap5 as it now turns its attention from the item scores to the grouping variable. Differential item functioning programs want to know the group each student belongs to.

The results used in this document are from the "exam1" test presented in [Meyer \(2014\)](#). The test data included two categorical variables, "gender" and "race". The "race" variable was coded in column 3 of the Lertap5 Data sheet; it originally had data for "black", "white", "Asian", and "American Indian" students, but only the black and white students were selected for analysis here.

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<sup>4</sup> They may display as {0.00, 1.00}.

The screenshot shows an Excel spreadsheet titled "Exam1Copy2.xlsx". The spreadsheet contains a table with the following data:

	1	2	3	4	5	6	7	8	9	10	11
1	Lertap5 IScores matrix, created: 8/4/20										
2	id	item1	item2	item3	item4	item5	item6	item7	item8	item9	item10
3	1	1.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00
4	2	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
5	3	1.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
6	4	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00
7	5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
8	6	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00
9	7	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
10	8	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
11	9	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00
12	10	0.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00

Figure 8

The dialog box has the title "Where are the group codes" and a close button. The text inside says "Please enter the Data sheet column number you want to work with." Below the text is an empty input field. At the bottom are "OK" and "Cancel" buttons.

Figure 9

As mentioned, the group variable used in the study was "race", found in column 3 of the Data worksheet (having codes of "B" and "W"). So, I entered 3 in Figure 9's box.

The macro will now copy the contents of that column from the Data sheet and paste them into a new column in the new worksheet, immediately to the right of the {0,1} scores for the last test item.

Then it will get into the final steps needed to prepare a new workbook so that the difR package will be happy. **Figure 10** indicates what happens.

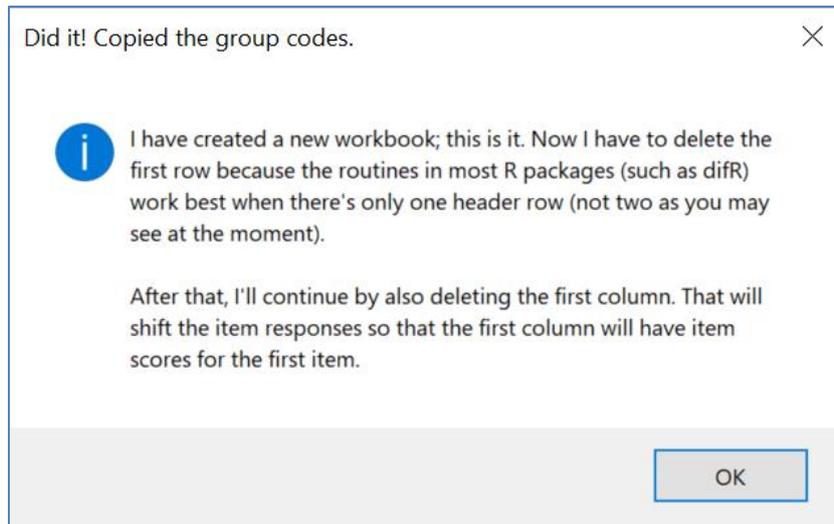


Figure 10

The macro will save the workbook in the "csv" format (comma separated values<sup>5</sup>), giving it the name of "difR-IScores.csv" as seen in Figure 11.

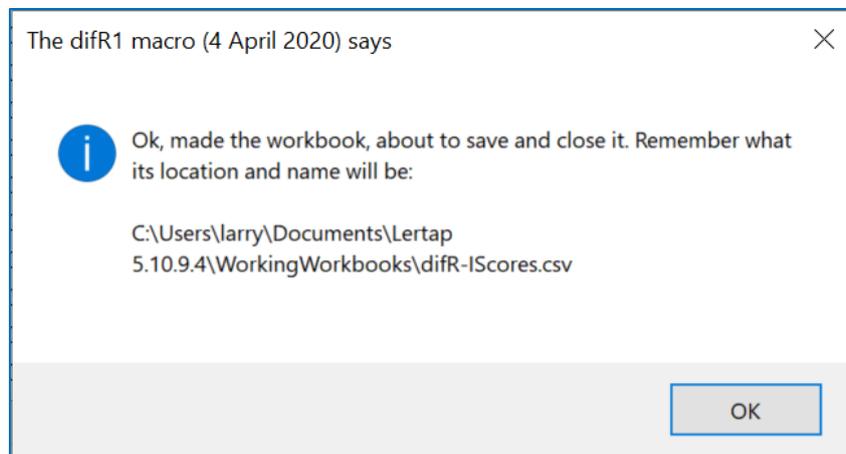


Figure 11

### Checking it out

Now what I will do is open that new workbook to see if it looks as wanted. It should have just one worksheet, and it'll be called "difR-IScores", just like the workbook itself.

There will be a row of item scores for each student; at the end of each row will be the "race" code for the student. I should and will check to make sure that all of the item scores are binary ({0.00, 1.00}), and that the group variable {race} has the values expected in this example, B and W.

I recommend [this topic](#) for "snooping" the difR-IScores worksheet. The following screen snapshots exemplify some typical data snooping results.

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<sup>5</sup> Excel is happy to open csv files (they can also be opened with Notepad in Windows, and with TextEdit on the Mac).

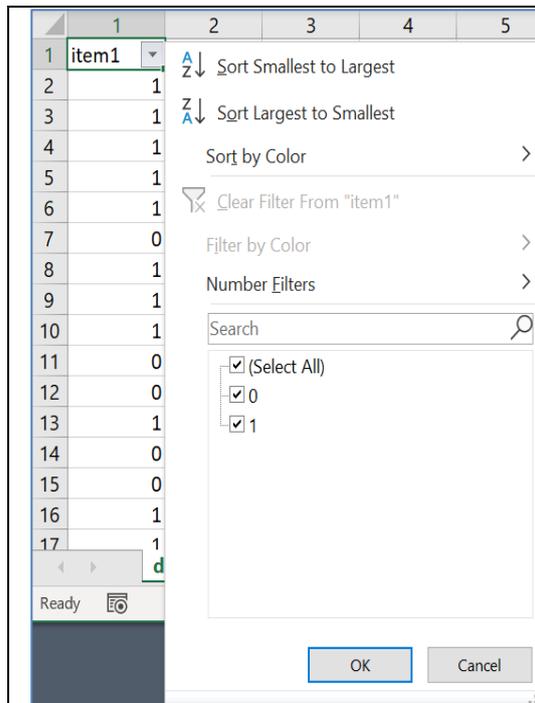


Figure 12

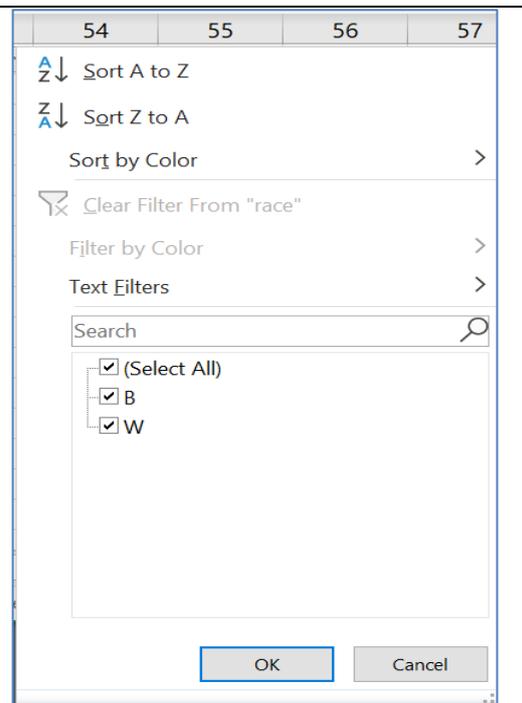


Figure 13

**Figure 12** shows a “snoop” on the first column. This column was to contain binary item scores for Item 1. And it does.

**Figure 13** displays a snoop of the last column, 57 in this case. This column was to house the ‘race’ codes of B and W. And it does.

**Note:** should there be errors in the worksheet, even something as simple as one row missing a value, such as column 57 not having a B or a W, when it comes to running difR the program may very well indicate something was wrong with the data, and it is likely to produce an error message too – but chances are the message will not be readily interpretable unless one has experience with R.

If this happens my suggestion is to go back and have a super snoop of the difR-IScores worksheet. Snoop all of its columns. Those with item scores to have only {0,1} values. The column with the group codes to have no missing data.

### Continued reading

Please refer to the “[Using the difR Package with Lertap5](#)” document, perhaps to the final pages, under “**M-H results with difR**”. When doing so, remember that the csv file resulting from the process above will always be “difR-IScores.csv”.

**Help:** write to [lertap5@gmail.com](mailto:lertap5@gmail.com)