

Computing Scale Reliability Using [jamovi](#)

20 July 2023

Larry R Nelson, Curtin University¹

With [jamovi](#) already installed on my computer, I began this demo by opening one of my favourite sample datasets, a file called Blirt8.xlsx, downloadable [from here](#). The Blirt8 dataset involves a scale with eight items and is further discussed in [this paper](#), a paper that demonstrates the use of [JASP](#), [SPSS](#), and [Lertap5](#) to get reliability estimates.

I opened Blirt8.xlsx *directly in jamovi*. Figure 1 displays the results.

	blirt1	blirt2r	blirt3r	blirt4	blirt5r	blirt6	blirt7r	blirt8
1	4	2	4	4	4	4	4	4
2	4	4	3	3	3	2	2	2
3	3	4	3	3	2	3	4	2
4	4	3	2	2	2	4	4	4
5	4	2	4	5	2	5	2	4
6	5	2	5	2	5	5	5	1
7	4	3	3	4	4	4	4	2
8	4	3	4	4	3	4	4	3
9	4	4	4	4	4	4	5	2
10	4	3	3	4	3	4	4	4
11	4	4	4	4	4	4	4	4
12	2	3	3	4	2	3	4	2
13	4	5	4	4	5	5	4	2
14	4	2	4	4	2	3	1	4
15	4	4	4	4	3	3	3	4
16	5	5	4	2	2	2	4	2
17	2	2	2	2	1	4	1	2
18	4	4	4	4	4	2	4	3
19	5	4	3	4	2	4	5	5

Figure 1

The “Analyses” tab (top of Figure 1, next to “Data”) leads to a “Factor” option and that, in turn, gives access to the “Reliability Analysis” option seen in Figure 2.

	blirt1	blirt2r	blirt3r	blirt4	blirt5r	blirt6	blirt7r	blirt8
1	4	2	4	4	4	4	4	4
2	4	4	3	3	3	2	2	2
3	3	4	3	3	2	3	4	2
4	4	3	2	2	2	4	4	4
5	4	2	4	5	2	5	2	4
6	5	2	5	2	5	5	5	1
7	4	3	3	4	4	4	4	2
8	4	3	4	4	3	4	4	3
9	4	4	4	4	4	4	5	2
10	4	3	3	4	3	4	4	4
11	4	4	4	4	4	4	4	4
12	2	3	3	4	2	3	4	2

Figure 2

¹ l.nelson@curtin.edu.au

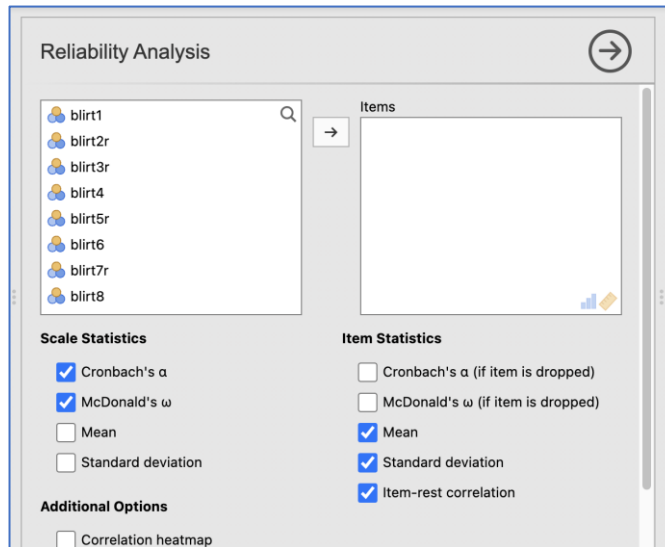


Figure 3

I chose the “Scale and Item Statistics” shown in Figure 3, and then selected all eight Blirt8 items, from “blirt1” to “blirt8”, using the arrow to move them over to the “Items” box. Results appeared immediately – see Figure 4.

Results

Reliability Analysis

Scale Reliability Statistics

	Cronbach's α	McDonald's ω
scale	0.780	0.790

[3]

Item Reliability Statistics

	Mean	SD	Item-rest correlation
blirt1	3.36	1.012	0.560
blirt2r	3.38	1.037	0.565
blirt3r	3.16	0.936	0.542
blirt4	3.13	1.001	0.611
blirt5r	2.98	1.071	0.454
blirt6	3.24	0.981	0.562
blirt7r	3.38	1.142	0.299
blirt8	2.66	1.003	0.312

Figure 4

The “item-rest correlation” is the standard Pearson product-moment coefficient between each item and the scale score formed by summing responses to the rest of the items. Such coefficients are an extremely common index of the cohesiveness of the scale, that is, the extent to which the items are “[internally consistent](#)”.

An option I could have taken (but didn't) would have added “if item deleted” figures to *jamovi's* Reliability Analysis. These are used when a user wants to see how Cronbach's alpha and McDonald's omega would change if an item were removed from the scale.

An interesting *jamovi* option is the “Correlation Heatmap” seen in Figure 5. It uses red and green colours to index item intercorrelations. In the case of Blirt8, all item intercorrelations are green, that is, they’re all positive.

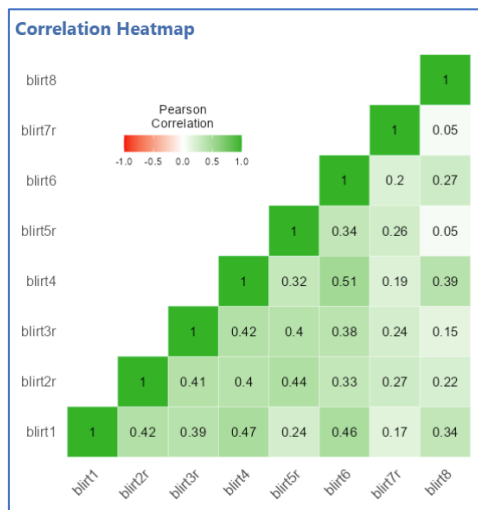


Figure 5

Just to see what might happen, I asked *jamovi* to reverse the scoring of item blirt4. Figure 6 displays the result.

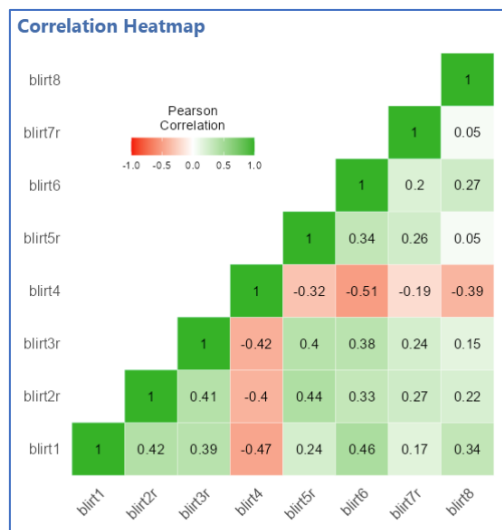


Figure 6

Processing a test

How does a test differ from a survey? Well, the items on a test will have a correct answer. Survey items will not.

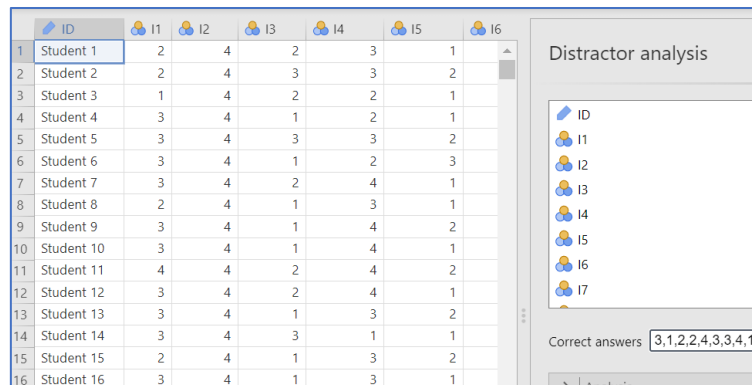
Have a look at Figure 7 below. It displays student responses to the items on a test and, in this case, the numbers showing are digits indicating which of four options a student chose for each of the questions on the test. To be more correct, the entries data entries in Table 7 are “characters” – yes, they certainly look like digits, but they have no numeric value at all.

Only one of these options will be correct. If a student selects the correct option to an item, usually one point will be added to the student’s test score, otherwise, in the case of an

incorrect answer, no points will be awarded. This is referred to as {0,1} and {wrong, right} scoring although, in actuality, more commonly this type of scoring is referred to as “right, wrong”.

The reliability options in both *jamovi* and JASP expect data table entries to correspond to the number of points earned by a person’s answer to each survey item.

Can *jamovi* and JASP be used to estimate the reliability of a test? Yes, but only after the test items have first been scored.



The screenshot shows a software interface with a data table on the left and a 'Distractor analysis' panel on the right. The data table has columns for 'ID' and items I1 through I6. The 'Distractor analysis' panel lists the same items and shows a 'Correct answers' field with the value '3,1,2,2,4,3,3,4,1'.

ID	I1	I2	I3	I4	I5	I6
1 Student 1	2	4	2	3	1	
2 Student 2	2	4	3	3	2	
3 Student 3	1	4	2	2	1	
4 Student 4	3	4	1	2	1	
5 Student 5	3	4	3	3	2	
6 Student 6	3	4	1	2	3	
7 Student 7	3	4	2	4	1	
8 Student 8	2	4	1	3	1	
9 Student 9	3	4	1	4	2	
10 Student 10	3	4	1	4	1	
11 Student 11	4	4	2	4	2	
12 Student 12	3	4	2	4	1	
13 Student 13	3	4	1	3	2	
14 Student 14	3	4	3	1	1	
15 Student 15	2	4	1	3	2	
16 Student 16	3	4	1	3	1	

Figure 7

Lertap5’s “[Omega macro](#)” may be used to prepare the {0,1} item scores for tests when needed by the reliability routines in *jamovi* and JASP. I used it extensively in [this paper](#).