

Reliability Calculator Directions

Overview

The Reliability Calculator calculates five traditional reliability coefficients for assessments made up of closed-ended items (e.g. multiple choice). In addition, assessment level and item level statistics are provided for further research. Users input data for students by item into the file and reliability estimates are calculated. Data for students must be in the format of correct (one) and incorrect (zero) responses.

Directions

To use the spreadsheet, data must be provided that has unique student information by row and data for correctness for each item in columns. The table below provides a brief example.

	Question 1	Question 2	Question 3
Student 1	1	1	0
Student 2	0	1	1
Student 3	0	0	0

Data must be entered into the spreadsheet with a one indicating a correct response to a question and a zero indicating an incorrect response. In the table above, student 1 answered Question 1 and 2 correct, student 2 answered Question 2 and 3 correct, while student 3 answered no items correctly.

Data can be entered from a raw data file of collected information and should be inserted by using Edit → Paste Special → Values. This is to insure that no formulas are moved into the spreadsheet.

Output

Once the data is entered, the calculator will exhibit how many questions there were in the instrument and how many students took the assessment. The output will appear in a table within the spreadsheet like the following:

Questions	Students
10	55

This table shows that the assessment has ten questions with 55 students participating.

Statistical information (covered in the presentation) about the assessment will appear in the following table of the spreadsheet:

Cronbach's Alpha
Split-Half Correlation
Spearman-Brown Prophecy
KR-21
KR-20
Mean for Test
Standard Deviation for Test

Item level statistics can be found on the second tab found at the bottom of the spreadsheet titled "Item Statistics." The provided item level statistics include:

Number of subjects
Number correct for each questions
Proportion Correct (Item Difficulty)
Proportion Wrong
Standard Deviation
Variance
Item-Total Correlation
Item Reliability

Data other than Correct/Incorrect

In many situations, assessments are created that have more than just closed-ended items such as multiple-choice or true/false. One might also want to examine the reliability of an assessment that includes essays, numerical problems, completion or other items types. This Reliability Calculator was constructed for examining item types that provide correct/incorrect information. If a user wants to examine data from an assessment that uses other item types, the only reliability coefficient that can be examined is Cronbach's Alpha. The other reliability coefficients are not usable and would be inaccurate.

REFERENCES

Allen, M. J. & Yen, W. M. (1979). Introduction to Measurement Theory. Monterey, CA: Brooks/Cole Publishing Company.

Crocker, L. M. & Algina, J. (1986). Introduction to Classical and Modern Test Theory. Belmont, CA: Wadsworth Group.

Exercise 1

1. Locate the data file titled Student Data – Set B.
2. In this data set you will find 70 students with ten items. The students responses to these items have been coded correct (1) or incorrect (0).
3. Open the Reliability Calculator spreadsheet which is an Excel file.
4. We want to copy the student data into the Reliability Calculator. Within the Student Data – Set B file select the data from B2 to K71. Edit → Copy.
5. Switch to the Reliability Calculator. Click in B10. Edit → Paste Special → Values. This will paste only the data into the cells. You should see and match exactly:

	A	B	C	D	E	F	G	H
1	Cronbach's Alpha	0.4371		Reliability Calculator				
2	Split-Half Correlation	0.3168						
3	Spearman-Brown Prophecy	0.4811		<i>To Add Data: Edit → Paste Special → Values</i>				
4	KR-21	0.3415						
5	KR-20	0.4371						
6	Mean for Test	6.5143		Questions	Students			
7	Standard Deviation for Test	1.8106		10	70			
8								
9			Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
10	Student 1	1	1	1	0	0	0	0
11	Student 2	1	1	1	1	1	1	1
12	Student 3	1	1	1	1	0	1	0
13	Student 4	1	0	1	0	1	1	0
14	Student 5	1	0	1	1	0	1	1
15	Student 6	1	1	1	0	0	1	0
16	Student 7	1	1	1	1	1	1	0
17	Student 8	1	0	1	0	1	1	0
18	Student 9	1	1	1	0	1	1	1
19	Student 10	0	1	0	0	0	1	1

6. When finished with the Reliability Calculator and you are exiting out of it, DO NOT chose to save changes unless you change the filename. This will keep the old data in there and you may forget to clean out rows and columns the next time you use it. You can save it with a different file name and then keep the original file as your main use file. I would suggest saving files with the name of the assessment and date you completed the analysis.

Exercise 2

1. Locate the data file titled Student Data – Set C.
2. In this data set you will find 40 students with 20 items. The students responses to these items have been coded correct (1) or incorrect (0).
3. Open the Reliability Calculator spreadsheet which is an Excel file.
4. We want to copy the student data into the Reliability Calculator. Within the Student Data – Set C file select the data from B2 to U41. Edit → Copy.
5. Switch to the Reliability Calculator. Click in B10. Edit → Paste Special → Values. This will paste only the data into the cells. You should see and match exactly:

	A	B	C	D	E	F	G	H		
1	Cronbach's Alpha	0.6573		Reliability Calculator						
2	Split-Half Correlation	0.6263		<i>To Add Data: Edit→Paste Special→Values</i>						
3	Spearman-Brown Prophecy	0.7702								
4	KR-21	0.6367								
5	KR-20	0.6573								
6	Mean for Test	17.0750		Questions	Students					
7	Standard Deviation for Test	2.5138		20	40					
8										
9										
10			Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Qu
11	Student 1		0	1	1	1	0	0	0	
12	Student 2		1	1	1	1	1	1	1	
13	Student 3		1	1	1	1	0	1	1	
14	Student 4		1	1	1	1	1	1	1	
15	Student 5		1	1	1	1	1	1	1	
16	Student 6		1	0	0	1	0	1	1	
17	Student 7		1	1	1	1	1	0	1	
18	Student 8		1	1	0	1	1	1	0	
19	Student 9		1	1	0	1	1	1	0	
20	Student 10		1	1	1	1	0	1	1	