PSYC 4301: Psychological Tests and Measurements

Tarleton State University | Exam 2 | Spring 2021

Instructions: please complete each problem below and submit your completed exam in Canvas using one of two file formats: either (1) wirite your solutions on paper and scan to a PDF, or (2) embed photos of your solutions in a Word/OpenOffice document. On either method, please show (or describe) as much work as possible. Report your final answers rounded to 2 decimal places.

1. Suppose we have a test X with reliability coefficient $\rho_{XX'} = 0.72$ and we calculate an observed score variance of 55.
   (a) Calculate the true-score variance and the error variance.
   (b) Calculate expected measurement error for our test X.
   (c) Suppose someone scores 80 on this test. Calculate a 95% confidence interval for their true score.
2. Suppose you split a test into two parallel halves and observe a correlation of 0.46 between the two halves. What is the estimated reliability of your test?
3. A test is split in half. The scores on the first half of the test have a variance of 34, and the scores on the second half have a variance of 20. The correlation between the scores on the two halves is 0.85. Calculate the estimated reliability of the test.
4. A test consisting of four items was adminstered to five participants:

subject	Q1	Q2	Q3	Q4
A	8	9	7	8
B	4	4	6	8
C	7	9	5	5
D	6	7	7	7
E	5	6	5	7

   Calculate Cronbach's α, and interpret this value in terms of *at least two* equivalent meanings of reliability.
5. Suppose you have a 15-item test with an estimated reliability of 0.68. If you expanded it to a 45-item test by adding parallel items, what reliability would you expect to have?
6. Suppose you have an 40-item test with an estimated reliability of 0.85. Estimate the reliability of a 20-item version of this test.
7. Suppose you have constructed a 20-item test with an estimated reliability of 0.65. How long would the test need to be in order to expect a reliability of at least 0.80?
8. A predictor and a criterion have a correlation of 0.44. If the reliabilities of the predictor and criterion are 0.87 and 0.65, respectively, what is the estimated correlation between the predictor observed score and the criterion true score?
9. Test score X has a reliability of 0.82. Criterion Y has a reliability of 0.73. The observed correlation between X and Y is 0.35. If you could increase the reliability of your measurements, how big could this correlation be?
10. For the data in the following table, compute the base rate and find the cut score which yields the best hit rate.

Score	Successful	Unsuccessful
5	25	1
4	18	6
3	14	8
2	5	10
1	2	34