PSYC 4301: Psychological Tests and Measurements

Tarleton State University — Homework 4

1. Given the assumptions of classical test theory, answer the following:
   (a) If the observed score X is 52 and the error score E is 4, what is the true score T?
   (b) If the true score T is 28 and the error score E is -3, what is the observed score X?
   (c) If the true score T is 73 and the observed score X is 78, what is the error score E?
   (d) If the true score variance σ_T^2 is 5 and the observed score variance σ_X^2 is 10, what is the error score variance σ_E^2?
   (e) If the observed score variance σ_X^2 is 25 and the error score variance σ_E^2 is 7, what is the true score variance σ_T^2?
   (f) If the error score variance σ_E^2 is 3.2 and the observed score variance σ_X^2 is 14, what is the true score variance σ_T^2?
   (g) If the observed score variance σ_X^2 is 20 and the true score variance σ_T^2 is 15, calculate the correlation between observed scores X and true scores T.
   (h) If the error score variance σ_E^2 is 3 and the observed score variance σ_X^2 is 9, calculate the reliability coefficient $\rho_{XX'}$.
   (i) If the error score variance σ_E^2 is 1 and the true score variance σ_T^2 is 4, calculate the reliability coefficient $\rho_{XX'}$.
2. Suppose we have a test X with reliability coefficient $\rho_{XX'} = 0.8$ and we calculate an observed score variance of 20.
   (a) Calculate and interpret the values of σ_T^2/σ_X^2, σ_E^2/σ_X^2, ρ_{XT}, and ρ_{XE}
   (b) Calculate the true-score variance and the error variance.
   (c) Calculate the expected measurement error of our test X.
3. Suppose we have a test X with reliability coefficient $\rho_{XX'} = 0.6$ and we calculate an observed score variance of 78.
   (a) Calculate the true-score variance and the error variance.
   (b) Calculate expected measurement error for our test X.
   (c) Suppose someone scores 120 on this test. Calculate a 95% confidence interval for their true score.
4. Suppose we have a test X with observed score variance equal to 100.
   (a) What is the expected measurement error for X if the test has reliability $\rho_{XX'} = 0.5$?
   (b) What is the expected measurement error for X if the test has reliability $\rho_{XX'} = 0.9$?
   (c) In general, how does reliability of a test affect the expected measurement error of the test?