How To ....
A Practical Guide to Psychometrics

Specify the band of error associated with a test score

The formula for the standard error of measurement is:

Standard error of measurement = $\sigma_{meas} = \sigma_x \sqrt{(1 - r_{xx})}$

The traditional method of using the standard error of measurement is as follows. The range within which we can be 95 percent confident that the true score lies will be the score obtained plus or minus 1.96 standard errors of measurement

Example. Someone obtains a score of 115 on a test with a mean of 100 and a standard deviation of 15. The test has a reliability coefficient of .84. What are the limits for range within which we can be 95 percent confident that the true score lies?

The answer will be

$$115 \pm 1.96 \left(15\sqrt{1 - .84}\right) = 103.2 \text{ to } 126.8.$$

The 95 percent limits are the usual ones quoted, but sometimes people quote the range plus or minus one standard error.

The modern alternative: Over recent years there has been increasing use of a different method of specifying the range within which the true score is likely to lie. The range of error has been based on the standard error of estimate of the distribution of true scores around the predicted true score.

The predicted true score will be

$$\hat{t} = r_{xx} x$$
$$or$$
$$\hat{T} = r_{xx}\left(X - M_x\right) + M_t$$

The standard error of estimate will be:

$$SE_{estimate} = \sigma_x \sqrt{r_{xx}\left(1 - r_{xx}\right)}$$

Example Using the same data as in the previous example, (a score of 115 on a test with a mean of 100 and a standard deviation of 15, and a reliability coefficient of .84), the estimated range in which we can be 95 percent confident that the true score lies becomes:

(.84 x 15) + 100 = 112.6 ± 1.96 x (15 x (the square root of (.84 x (1 - .84))))

= 112.6 ± 10.8

= 101.8 to 123.4

For fuller discussion of these matters see Module 4, Section 11.