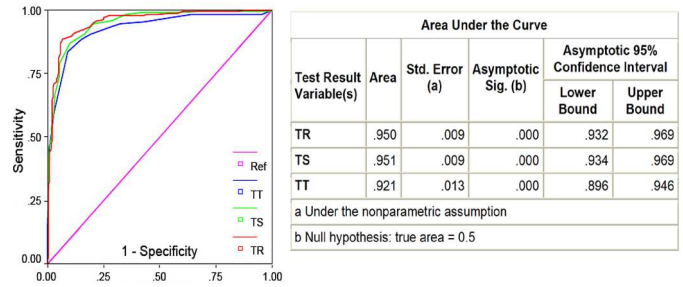


A diagnostic test for a particular condition should classify patients into two groups: those with the condition and those without. A test is assessed by its ability to diagnose the condition correctly, whether this is positive or negative.

The sensitivity of a diagnostic test is the proportion of patients who have ADHD and are correctly identified by the test. The specificity is the proportion of patients who do not have ADHD and are correctly identified by the test.

When the cut-off value for a continuous diagnostic variable is increased (assuming that larger values indicate an increased probability), the proportion of both true and false positives decreases. These proportions are the sensitivity and 1 – specificity, respectively. A graph of sensitivity against 1 – specificity is called a receiver operating characteristic (ROC) curve.



A perfect test would have sensitivity and specificity both equal to 1. Realistically, good tests should be somewhere close to this ideal.

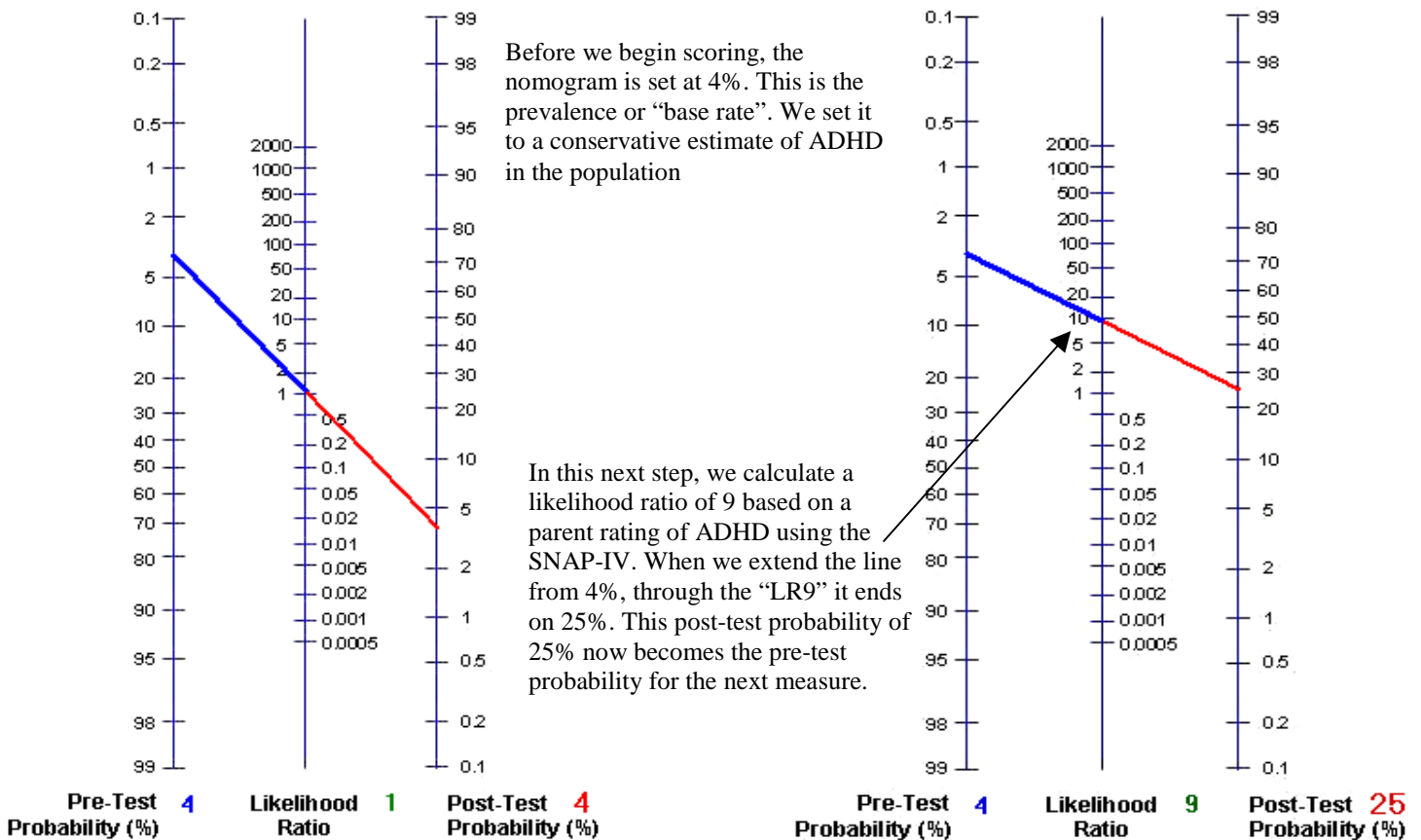
The ROC graph shown here illustrates the actual performance of the PADDs’ 3 Target Tests of Executive Functioning.

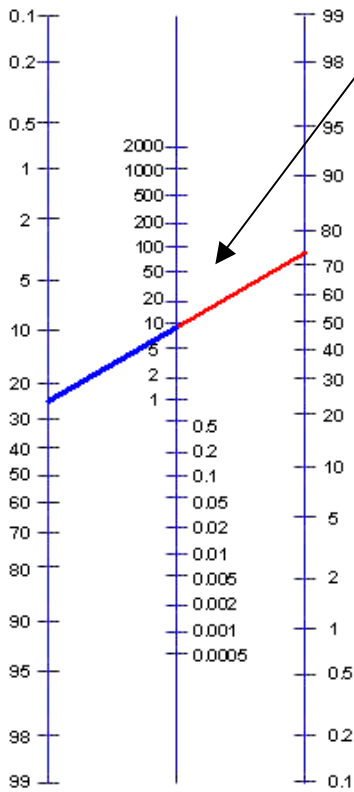
Sensitivity and specificity are most useful when combined in likelihood ratios. The likelihood ratio of a positive test result (LR+) is the ratio of the probability of a positive test result if the outcome is positive (true positive) to the probability of a positive test result if the outcome is negative (false positive). It can be expressed as follows: **LR+ = Sensitivity/(1-Specificity)**

Collecting diagnostic information from multiple sources is a hallmark of modern evidence based assessment practices. However, combining the results for the purpose of interpreting, illustrating, and describing the overall perspective can be difficult. In addition to using likelihood ratios as a more useful way to express the sensitivity and specificity of each test result, we can also efficiently combine the results from multiple measures, using the likelihood ratios and incrementally graphing each effect on a nomogram, into an overall cumulative probability.

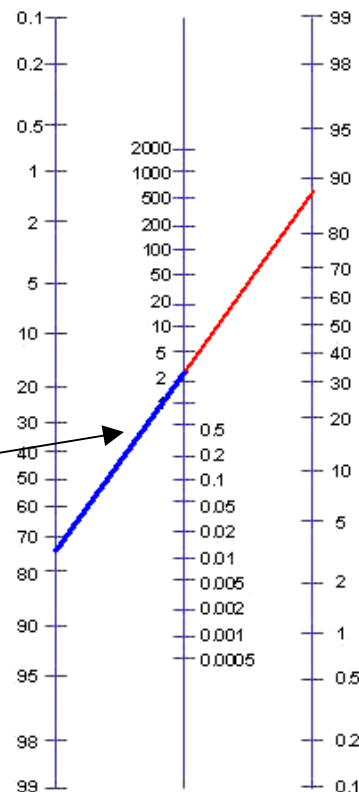
In the examples below we see two Fagan’s nomograms. The leftmost scale for each nomogram is labeled “Pre-Test Probability” and runs from 0.1% at the top to 99% at the bottom. The rightmost scale is labeled “Post-Test Probability” and runs from 99% at the top to 0.1% at the bottom. In the center scale, we apply the likelihood ratio to adjust the Pre-Test Probability into the Post-Test probability. We will step through a typical PADDs Testing sequence to illustrate how the individual scores are incrementally combined.

To use a Fagan nomogram to calculate probabilities, you would draw a line connecting the pre-test probability to the likelihood ratio. When you extend this line to the right, it intersects at the new post-test probability.





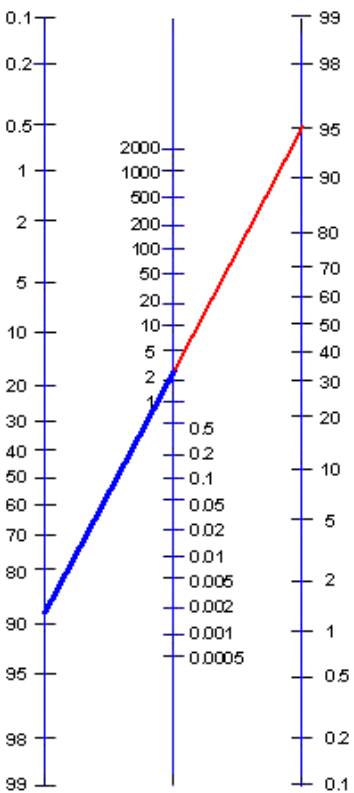
In this next step, we calculate a likelihood ratio of 9 based on a teacher rating of ADHD using the SNAP-IV. When we extend the line from 25%, through the “LR 9” it ends on 74%. This post-test probability of 74% now becomes the pre-test probability for the next



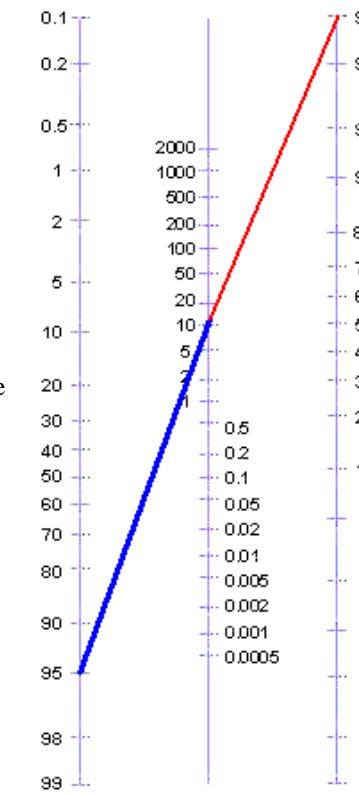
Adding in the first target test score results in a likelihood ratio of 3. Again we extend the line from 74%, through the “LR 3” and it ends on 88%. This post-test probability of 88% now becomes the pre-test probability for the next measure.

Pre-Test Probability (%) **25** Likelihood Ratio **9** Post-Test Probability (%) **74**

Pre-Test Probability (%) **74** Likelihood Ratio **3** Post-Test Probability (%) **88**



Adding in the next target test score results in another likelihood ratio of 3. Again we extend the line from 88%, through the “LR 3” and it ends on 95%. This post-test probability of 95% now becomes the pre-test probability for the next measure.



And the final target test score results in a likelihood ratio of 12. Again we extend the line from 95%, through the “LR 12” and it ends on 99%. This post-test probability of 99% is now the overall probability of ADHD for this patient.

This is the strength of incremental validity. We have successfully combined the results of multiple measures into a single predictive index. In this instance, it clearly indicates ADHD. It is worth noting that these measures may also detract from the overall index, indicating a non-ADHD condition may exist.

Pre-Test Probability (%) **88** Likelihood Ratio **3** Post-Test Probability (%) **95**

Pre-Test Probability (%) **95** Likelihood Ratio **12** Post-Test Probability (%) **99**