FCRR Technical Report #4

Predicting FCAT-SSS Scores Using Prior Performance on the FCAT-SSS, FCAT-NRT, and SAT9

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Purpose of the Study

This study was conducted to determine how useful students' prior performance on the Florida Comprehensive Assessment Test (FCAT) is in helping to identify students who are likely to struggle on the subsequent year's FCAT, if intervention is not provided. Specifically, we wanted to determine how students are likely to perform on the FCAT-SSS, a criterion reference test designed to determine if students are meeting the Sunshine State Standards. We used students' prior performance on both the FCAT-SSS and the FCAT-NRT (i.e., the norm referenced portion of the FCAT) to predict FCAT-SSS scores. For students who took the FCAT for the first time as 3rd graders in 2002, we used previous performance on the SAT9 measure of reading comprehension to predict their FCAT-SSS scores.

Method

The original sample of students used in this study included 8941 students from 30 elementary schools in one Florida school district. All 3rd, 4th, and 5th grade students who took the FCAT in 2002 were included in the original sample. This district has approximately 50% white/Caucasian students, and 40% African-American students. The remaining population of students are American-Indian, Asian, Hispanic, and Multi-Racial. Students were excluded from this sample if they did not have FCAT or SAT9 scores for 2000-2002. Therefore, the final sample included 5516 students (1893 3rd graders, 1916 4th graders, and 1707 5th graders).

Results

A standard multiple regression was performed with 2002 reading FCAT-SSS scores as the dependent variable, and 2001 reading FCAT-SSS, 2001 reading FCAT-NRT or SAT9 scores, and 2000 reading FCAT-NRT or SAT9 scores as the independent variables. Since 3rd grade is the first year that students take the FCAT-SSS, the previous years FCAT-SSS scores were not available for the 3rd grade students. Therefore, only 2001 and 2000 scores on the SAT9 reading comprehension test were used as the independent variables for 3rd graders.

These analyses originally included school grade in 2001, students' classification as ESE or standard curriculum, and the percentage of students receiving free/reduced lunch at each school as additional independent variables. However, these additional variables had only a small effect on the model (f^2 = .006-.048). Therefore, these variables were not included in the final model.

A logistic regression was also performed for each grade. These analyses were conducted to determine the probability that a given student will perform adequately on the FCAT-SSS (level 3-5) depending upon how they scored on the FCAT-SSS and FCAT-NRT (or SAT9) in the prior year and on the FCAT-NRT (or SAT9) two years prior. These analyses were conducted separately for each grade.

3rd Grade

The analysis of the 3rd grade students revealed that the overall squared multiple correlation was significantly different from zero, R^2 = .60, $F(2, 1890) = 1434.52$, $p < .001$. Also both 2001 SAT9, $t(1890) = 31.22$, $p < .001$, and 2000 SAT9 scores, $t(1890) = 9.44$, $p < .001$, contributed significantly to the prediction of 2002 reading FCAT-SSS scores. (Table 1 displays the correlations between these variables). Sixty percent of the variability in FCAT-SSS scores was predicted by knowing students' scores on the SAT9 in 1st and 2nd grade.

Table 1

Correlations between FCAT-SSS and SAT9 scores for 3rd grade students

	3rd grade FCAT-SSS scores	2nd grade SAT9 scores	1st grade SAT9 scores
2nd grade SAT9 scores	.76*	-	-
1st grade SAT9 scores	.63*	.70*	-
Mean	315.21	616.53	570.69
SD	63.41	42.96	49.83

Note. * p < .001

Table 2

Simultaneous multiple regression of SAT9 scores onto 3rd grade reading FCAT-SSS scores

	B	B	sr^2
2nd grade SAT9 scores	.932	.631	.453
1st grade SAT9 scores	.243	.191	.137

This regression analysis yielded the following regression formula, which can be used to predict student's FCAT-SSS scores based on their 1st and 2nd grade SAT9 scores: predicted FCAT-SSS score in 3rd grade = -397.85 + (.932 X SAT9 score in 2nd grade) + (.243 X SAT9 score in 1st grade). Figure 1 depicts this relationship. Students scoring at or above the horizontal line (FCAT-SSS score of 284) reached acceptable performance on the FCAT-SSS and students scoring below this line did not perform adequately. Students with scores to the right of the vertical line were predicted on the basis of 1st and 2nd grade performance to have adequate FCAT-SSS scores and students with predicted scores to the left of the vertical line were not predicted to reach adequate FCAT-SSS performance.

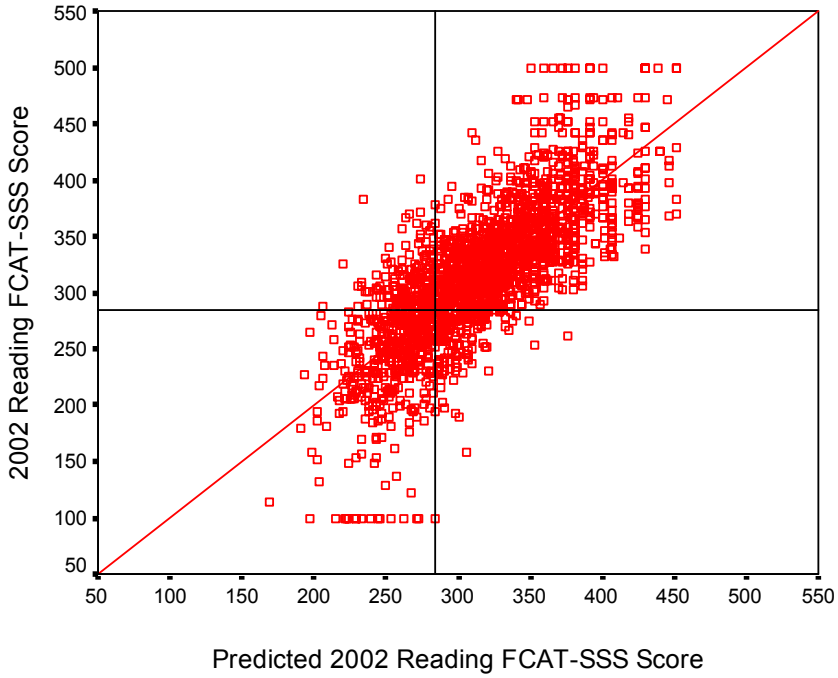

Figure 1. The relationship between actual 2002 reading FCAT-SSS scores and predicted scores for 3rd grade students.

Using the above regression formula, 82% of students are correctly classified as passing or failing the FCAT-SSS. Eighty-six percent of students who were predicted to perform adequately on the FCAT-SSS reached adequate performance and 76% of students who were predicted to perform inadequately on the FCAT-SSS, actually preformed inadequately (see Table 3).

Table 3

Predicting 3rd grade FCAT-SSS scores using 1st and 2nd grade reading SAT9 scores

	Actual FCAT Performance		
Predicted FCAT Performance	Inadequate (Level 1-2)	Adequate (Level 3-5)	Total
Inadequate	544	175	719 38%
Adequate	170	1004	1174 62%
Total	714 38%	1179 62%	1893

Sensitivity = .76 Specificity = .85

Positive Predictive Power = .76 Negative Predictive Power = .86

False Positive Rate = .15 False Negative Rate = .24

Overall Correct Classification = .82

Note. Sensitivity is the proportion of students predicted to be at-risk who were actually at-risk. Specificity is the proportion of students classified as not at-risk who actually were not at-risk. Negative predictive power is an index of how accurately previous tests were able to predict good performance on the FCAT. In contrast, positive predictive power is an index of how accurately performance on previous tests predicted inadequate performance on the FCAT. The false positive rate is the proportion of students predicted to be at-risk who performed adequately on the third grade FCAT. The false negative rate is the proportion of students predicted to not be at-risk who performed inadequately on the third grade FCAT.

To determine how a 3rd grade student is likely to perform on the FCAT-SSS, enter his/her scores on the SAT9 in 1st and 2nd grade into the boxes below:

1st grade SAT9 = [ ]

2nd grade SAT9 = [ ]

Calculate

Predicted FCAT-SSS score in 3rd grade = [ ]

The logistic regression was also significant, model $\chi^2(2) = 1034.71$, $p < .001$, indicating that the predictors (2001 and 2002 SAT9 scores), as a set, reliably distinguished between students who performed adequately on the FCAT-SSS (levels 3-5) and those who did not perform adequately (levels 1-2). This model correctly classified 82% of students as reaching adequate or inadequate performance. Both 1st grade SAT9 scores, $\chi^2(1) = 295.89$, $p < .001$, and 2nd grade SAT9 scores, $\chi^2(1) = 21.90$, $p < .001$, reliably predicted 3rd grade FCAT-SSS performance.

The logistic regression analysis allowed us to produce a formula that can be used to predict an individual student's likelihood of performing adequately on the FCAT-SSS based on their scores on the SAT9 for the previous two years. To get the probability that a 3rd grade student will perform adequately on the FCAT-SSS, enter his/her 2nd grade SAT9 score and 1st grade SAT9 score into the below boxes:

1st grade SAT9 score = [ ]

2nd grade SAT9 score = [ ]

Calculate

Probability of reaching adequate performance on the 3rd grade FCAT-SSS = [ ] %

For example, if a student scored a 579 in 2nd grade on the SAT9 and a 511 on the 1st grade SAT9, then without further intervention, this student's probability of passing the 3rd grade FCAT-SSS is only 20%. We want to stress at this point that the accuracy of these predictions depends to some extent on the quality of reading instruction and interventions provided in the 3rd grade. The accuracy of these predictions will depend on how closely the third grade instruction of the child for whom the prediction is being made resembles the "typical" instruction that was provided during the 2002 school year to the students in this sample. If more powerful interventions are available, then it is probable that many students will outperform the predictions made by these equations.

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4th Grade

Similar to the findings for the 3rd grade students, the multiple regression including 4th grade students was significant, $R^2 = .69$, $F(3, 1912) = 1431.81$, $p < .001$. However this formula accounted for more variance (69%) in FCAT-SSS scores, possibly due to the addition of the previous year's FCAT-SSS scores. Third grade FCAT-SSS scores, $t(1912) = 16.38$, $p < .001$, 3rd grade FCAT-NRT scores, $t(1912) = 11.94$, $p < .001$, and 2nd grade SAT9 scores, $t(1912) = 12.28$, $p < .001$, significantly contributed to the prediction of 4th grade FCAT-SSS scores. (Table 4 displays the correlations between these variables.)

Table 4

Correlations between FCAT-SSS, FCAT-NRT, and SAT9 scores for 4th grade students

	4th grade FCAT-SSS scores	3rd grade FCAT-SSS scores	3rd grade FCAT-NRT scores	2nd grade SAT9 scores
3rd grade FCAT-SSS scores	.78*	-	-	
3rd grade FCAT-NRT scores	.77*	.80*	-	-
2nd grade SAT9 scores	.74*	.73*	.77*	-
Mean	323.15	318.73	644.32	613.09
SD	55.17	60.47	44.07	41.33

Note. * $p < .001$

Table 5

Simultaneous multiple regression of reading FCAT-SSS, FCAT-NRT, and SAT9 scores onto 4th grade reading FCAT-SSS scores

	B	B	sr^2
3rd grade FCAT-SSS scores	.332	.365	.208
3rd grade FCAT-NRT scores	.358	.286	.152
2nd grade SAT9 scores	.339	.254	.156

The following regression formula can be used to predict student's FCAT-SSS scores based on the previous test scores: predicted 4th grade FCAT-SSS score = -220.77 + (.332 X 3rd grade FCAT-SSS score) + (.358 X 3rd grade FCAT-NRT score) + (.339 X 2nd grade SAT9 score). Using this formula, 83% of students were correctly classified as passing or failing the FCAT-SSS, and 87% of students who were predicted to perform adequately reached adequate performance on the FCAT-SSS (see Table 6). Seventy-four percent of students who were expected to perform inadequately on the FCAT-SSS, actually preformed inadequately. Figure 2 depicts the relationship between predicted scores for FCAT-SSS based on 3rd and 2nd grade FCAT and SAT9 performance and actual FCAT-SSS scores. Similar to Figure 1, students scoring at or above the horizontal line preformed at or above the acceptable level on the 4th grade FCAT-SSS (a score greater than 297) and students scoring below this line performed inadequately. Students with scores to the right of the vertical line were predicted to perform adequately on the FCAT-SSS and students with scores to the left of the vertical line were predicted to show inadequate FCAT-SSS performance.

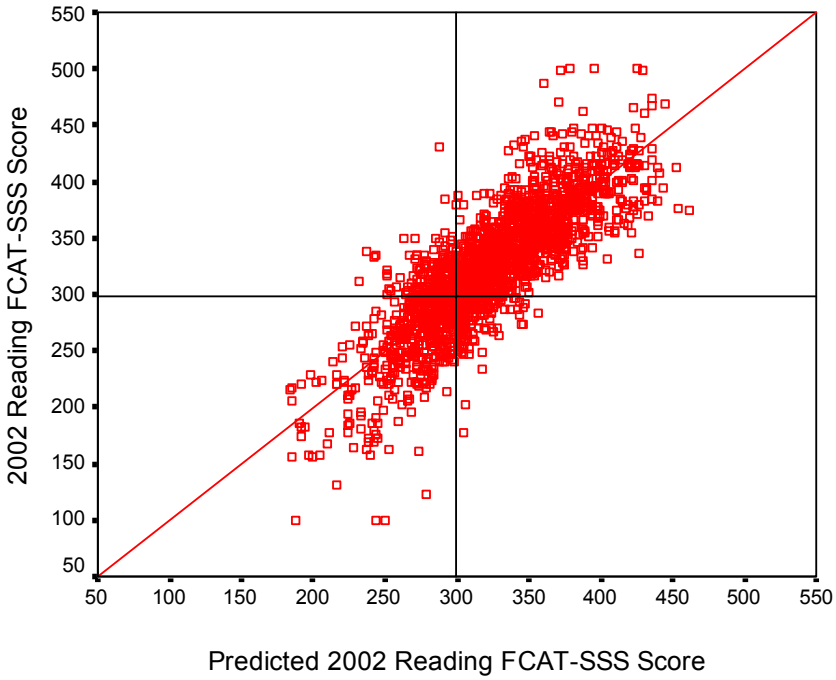

Figure 2. The relationship between actual 2002 reading FCAT-SSS scores and predicted scores for 4th grade students.

To determine how a 4th grade student is likely to perform on the FCAT-SSS, enter his/her scores on the 2nd Grade SAT9 and 3rd grade scores on the FCAT-SSS and FCAT-NRT into the boxes below:

2nd grade SAT9 = ☐

3rd grade FCAT-NRT = ☐

3rd grade FCAT-SSS = ☐

Calculate

Predicted FCAT-SSS score in 4th grade = ☐

Table 6

Predicting 4th graders' 2002 reading FCAT-SSS scores using prior FCAT and SAT9 scores

	Actual FCAT Performance		
Predicted FCAT Performance	Inadequate (Level 1-2)	Adequate (Level 3-5)	Total
Inadequate	419	151	570 30%
Adequate	170	1176	1346 70%
Total	589 31%	1327 69%	1916

Sensitivity = .71

Specificity = .89

Positive Predictive Power = .74

Negative Predictive Power = .87

False Positive Rate = .11

False Negative Rate = .29

Overall Correct Classification = .83

The logistic regression also yielded significant results, model $\chi^2(3) = 1055.26$, $p < .001$. This analysis indicated that 2nd grade SAT9 and 3rd grade FCAT scores together reliably predicted adequate performance on the 4th grade FCAT-SSS. This model correctly classified 83% of students as reaching adequate or inadequate performance. Scores on the 2nd grade FCAT-NRT, $\chi^2(1) = 43.37$, $p < .001$, 3rd grade FCAT-NRT, $\chi^2(1) = 25.80$, $p < .001$,and 3rd grade FCAT-SSS, $\chi^2(1) = 71.94$, $p < .001$, contributed significantly to the prediction of 4th grade FCAT-SSS performance.

To obtain the probability that a 4th grade student will perform adequately on the FCAT-SSS, enter his/her appropriate reading scores into the boxes below:

2nd grade FCAT-NRT = [ ]

3rd grade FCAT-NRT = [ ]

3rd grade FCAT-SSS = [ ]

Calculate

Probability of reaching adequate performance on the 4th grade FCAT-SSS = [ ] %

5th Grade

Based on the multiple regression analysis which included 5th grade students, the three independent variables significantly predicted 2002 FCAT-SSS scores, $R^2 = .72$, F(3, 1706) = 1435.79, $p < .001$. Fourth grade FCAT-SSS scores, $t(1703) = 16.31$, $p < .001$, 4th grade FCAT-NRT $t(1703) = 12.61$, $p < .001$, and 3rd grade FCAT-NRT scores, $t(1703) = 12.78$, $p < .001$, significantly contributed to the prediction of 5th grade reading FCAT-SSS scores. This study developed prediction formulas based on predicting FCAT-SSS scores from 2002. However, 3rd grade FCAT-SSS scores were not available for these 5th grade students because only a field test of the FCAT-SSS was given to 3rd graders in 2000. Therefore, 3rd grade FCAT-SSS scores were not included in these analyses. Table 7 displays the correlations between these variables. Seventy-two percent of the variability in 5th grade FCAT-SSS scores was predicted by knowing students' scores on the three independent variables.

This analysis yielded the following regression formula, which can be used to predict student's FCAT-SSS scores based on the previous two years FCAT-NRT scores and the 4th grade FCAT-SSS score: predicted 5th grade FCAT-SSS score = -284.18 + (.325 X 4th grade FCAT-SSS score) + (.392 X 4th grade FCAT-NRT score) + (.360 X 3rd grade FCAT-NRT score). Figure 3 depicts this relationship. Students scoring at or above the horizontal line (FCAT-SSS score of 286) reached acceptable performance on the FCAT-SSS and students scoring below this line did not perform adequately. Students with predicted scores to the right of the vertical line were expected to have adequate performance on the FCAT-SSS and students with scores to the left of the vertical line were predicted to show inadequate FCAT-SSS performance. Using this regression formula, 86% of students are correctly classified as passing or failing the FCAT-SSS and 90% of students who were predicted to perform adequately reached adequate performance on the FCAT-SSS (see Table 9). However, only 76% of students who were predicted to perform inadequately on the FCAT-SSS actually preformed inadequately.

Table 7

Correlations between FCAT-SSS scores and FCAT-NRT scores for 5th grade students

	5th grade FCAT-SSS scores	4th grade FCAT-SSS scores	4th grade FCAT-NRT scores	3rd grade FCAT-NRT scores
4th grade FCAT-SSS scores	.78*	-	-	
4th grade FCAT-NRT scores	.78*	.76*	-	-
3rd grade FCAT-NRT scores	.77*	.75*	.78*	-
Mean	309.84	324.03	662.24	636.13
SD	54.64	58.50	40.15	43.58

Note. * $\underline{p} < .001$

Table 8

Simultaneous multiple regression of reading FCAT-SSS and FCAT-NRT scores onto 5th grade reading FCAT-SSS scores

	B	B	sr^2
4th grade FCAT-SSS scores	.325	.348	.210
4th grade FCAT-NRT scores	.392	.288	.163
3rd grade FCAT-NRT scores	.360	.287	.165

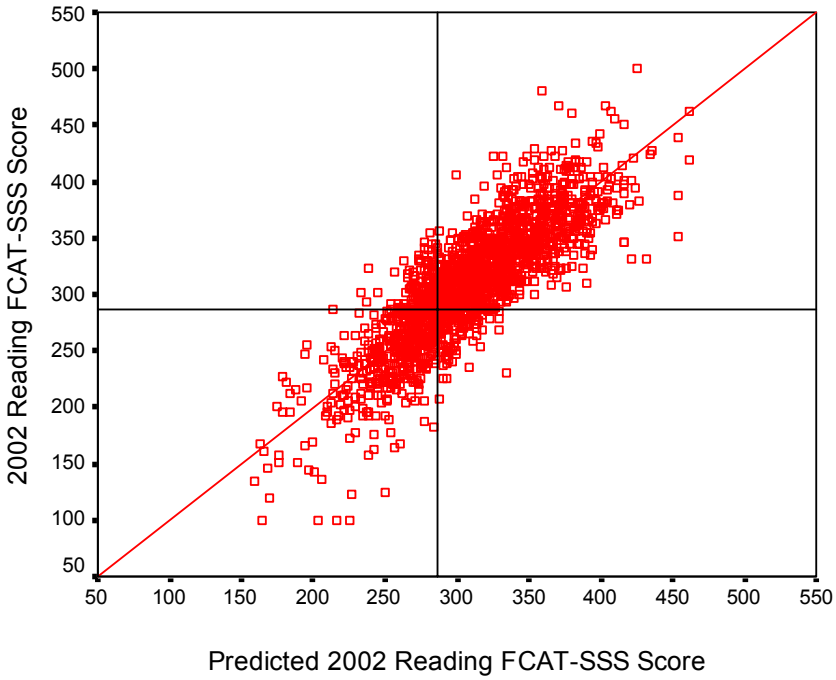

Figure 3. The relationship between actual 2002 reading FCAT-SSS scores and predicted scores for 5th grade students.

To determine how a particular 5th grade student is predicted to perform on the FCAT-SSS, enter his/her FCAT scores into the boxes below:

3rd grade FCAT-NRT = ☐

4th grade FCAT-SSS = ☐

4th grade FCAT-NRT = ☐

Calculate

Predicted FCAT-SSS score in 5th grade = ☐

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Table 9

Predicting 5th graders' 2002 reading FCAT-SSS scores using prior FCAT scores

	Actual FCAT Performance		
Predicted FCAT Performance	Inadequate (Level 1-2)	Adequate (Level 3-5)	Total
Inadequate	390	122	512 30%
Adequate	125	1070	1195 70%
Total	515 30%	1192 70%	1707

Sensitivity = .76 Specificity = .90

Positive Predictive Power = .76 Negative Predictive Power = .90

False Positive Rate = .10 False Negative Rate = .24

Overall Correct Classification = .86

The logistic regression also found that these independent variables significantly predicted FCAT-SSS performance, model $\chi^2(3) = 1072.45$, $p < .001$. This model correctly classified 86% of students as reaching adequate or inadequate performance. Scores on the 3rd grade FCAT-NRT, $\chi^2(1) = 49.52$, $p < .001$, 4th grade FCAT-NRT, $\chi^2(1) = 39.86$, $p < .001$, and 4th grade FCAT-SSS, $\chi^2(1) = 78.78$, $p < .001$, contributed significantly to the prediction of 5th grade FCAT-SSS performance.

To obtain the probability that a 5th grade student will perform adequately on the FCAT-SSS, enter his/her FCAT scores into the below boxes:

3rd grade FCAT-NRT = [ ]

4th grade FCAT-SSS = [ ]

4th grade FCAT-NRT = [ ]

Calculate

Probability of reaching adequate performance on the 5th grade FCAT-SSS = [ ] %

Conclusions

Based on this study, it is clear that prior NRT or SSS scores from the FCAT, as well as previous scores on the SAT9 test predict subsequent FCAT-SSS scores for grades three through five. These findings were quite consistent from third through fifth grade, with between 82 and 86% of students being correctly predicted to attain either adequate (level 3 and above) or inadequate scores (levels 1 and 2) FCAT-SSS scores in the subsequent year. These predictive relationships are not surprising, given the similarity of content and test structure across these measures of reading ability. These findings suggest a high degree of stability in performance on these assessments of reading comprehension skill from first through fifth grade. This latter finding is consistent with a large amount of previous research indicating that individual differences in reading ability are quite stable from first grade through the remainder of elementary school. They also indicate that previous year's performance on either the FCAT or another reliable measure of reading comprehension is an excellent way to identify students who are likely to need special support if they are to break the pattern of inadequate performance on these tests.