Research Brief

Predicting success on the Minnesota Comprehensive Assessments – III reading using AIMSweb measures of oral reading fluency

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Target Scores on the AIMSweb Measures of Oral Reading Fluency That Predict Success on the Minnesota Comprehensive Assessments – III Reading

Introduction

Many TIES member districts use measures of oral reading fluency (ORF) to screen their students in the fall, winter and spring as part of a comprehensive Response to Intervention system. AIMSweb is the most commonly used vendor of ORF passages for TIES districts. An important part of the screening process is to link student scores to an outcome measure or benchmark in order to compare their performance to a standard. Within Minnesota the Minnesota Comprehensive Assessment – III (MCA-III) is the state assessment for reading, and the standard which most screening measures are compared to. Several studies have examined the relationship between ORF and state tests of reading skill, finding correlations most often in the .60 to .75 range (Shaw & Shaw, 2002; Buck & Torgeson, 2003; Castillo, Torgeson, Powell-Smith & Al Otaiba, 2009; McGlinchey & Hixson, 2004; Hintze & Silberglitt, 2005; Barger, 2003; Crawford, Tindal, & Stieber, 2001; Good, Simmons, & Kame'enui, 2001; Stage & Jacobsen, 2001). This study uses data from several TIES districts to examine the relationship between AIMSweb data and MCA-III results in order to provide target scores from which ORF results can be used to predict subsequent performance on the MCA-III.

Methods

Participants

The full sample for this study consisted of 30,195 students from 8 school districts in Minnesota. These districts were either members of TIES or otherwise using TIES technology tools to store and report assessment data. These districts gave permission for TIES to analyze their students' AIMSweb measures of ORF and their MCA-III reading data in order to better understand the relationship between the two.

The ethnic breakdown of the full sample of students was 80.92% White, not Hispanic; 1.99% Native American; 7.28% Hispanic; 10.11% Black, not Hispanic; 6.66% Asian, and 0.26% Hawaiian or Pacific Islander. Students labeled as English Learners represented 5.78% of the sample, 30.34% qualified to receive free or reduced price lunch, and 8.94% were receiving special education services.

Sample sizes for the ORF measures varied by grade and season due to differences in district assessment protocols. Data was collected for Fall, Winter and Spring, with Fall defined as those completing the assessment between the beginning of September and the middle of November. Winter was defined as those completing the assessment between the middle of November and the end of February, and Spring as those who completed the assessment between the beginning of March and the end of May. MCA-III data was collected according to the Minnesota Department of Education assessment schedule, typically in late April or early May. MCA-III data was collected for the 2012-2013 school year. ORF measures were

compiled across the 2009-10, 2010-11, 2011-12, and 2012-13 school years, allowing for prediction for subsequent years (for example, from grade 2 ORF to grade 4 MCA-II).

Data Analysis Plan

Data from NWEA and statewide assessments were analyzed using Logistic Regression. Previous research comparing statistical analysis methods for developing target scores established Logistic Regression (LR) as an especially advantageous approach (Silberglitt & Hintze, 2005). Logistic regression (LR) is a regression analysis procedure used when the dependent variable is categorical, as are the results of the Minnesota state assessment. With LR, either continuous or categorical independent variables are used to determine probabilities of membership in each of the categories of the dependent variable, using maximum likelihood estimation (Neter, Kutner, Nachtsheim, & Wasserman, 1996). LR calculates the probability (zero to 100%) that a person is a member of a group.

In this study, the dependent variable was the result on the statewide assessment, whose categories were "at or above grade-level proficiency" and "below grade level proficiency", and the independent variable was the score on the AIMSweb measure of oral reading fluency. LR has been frequently used in epidemiology for similar situations, using continuous variables to predict the incidence or absence of disease (Rothman, 2002). Furthermore, LR is considered a superior alternative to other statistical methods, such as Discriminant Analysis, when the assumptions of multivariate normality are not met (Press & Wilson, 1978).

Results

Descriptive Statistics

Descriptive statistic results were compiled for each grade and season of AIMSweb ORF administration. MCA-III reading results for 2013 were also compiled, and the descriptive statistics for both measures are presented in Tables 1 and 2. The first digit of the MCA-III scores indicates the grade level. The highest MCA score was evident in grades 3 and 6. For the ORF measures the scores increased across both grade level and season, although a smaller increase was noted for the higher grades. Skewness and kurtosis were highest in the winter of grade 1, which is the first time that measures of ORF are administered.

Table 1. Descriptive statistics on the MCA-III 2013 reading assessments by grade level

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
MCA3 G03 R	15913	301	399	352.93	19.770	-.301	.046
MCA3 G04 R	15870	411	490	451.11	15.003	-.219	.195
MCA3 G05 R	15216	517	591	555.56	14.338	-.016	.070
MCA3 G06 R	15527	606	699	654.63	16.841	-.045	.221
MCA3 G07 R	15718	703	798	752.44	17.052	-.046	.206
MCA3 G08 R	15928	802	898	851.67	16.942	-.254	.162
MCA3 G10 R	16250	1013	1094	1054.34	13.971	-.127	.388

Table 2. Descriptive statistics on the AIMSweb measure of oral reading fluency

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
ORF G01 Winter	8605	1	224	46.40	35.200	1.243	1.380
ORF G01 Spring	8471	1	250	73.80	37.936	.610	.304
ORF G02 Fall	15039	1	222	65.17	35.717	.555	.098
ORF G02 Winter	14884	1	262	93.43	37.187	.099	-.096
ORFG 02 Spring	15502	1	270	109.12	37.711	.008	.075
ORF G03 Fall	20263	1	269	89.73	38.270	.267	-.073
ORF G03 Winter	19720	1	281	112.31	38.652	-.006	.005
ORF G03 Spring	20410	1	292	125.02	41.719	-.235	.249
ORF G04 Fall	17993	1	285	109.77	37.403	.269	.169
ORF G04 Winter	16158	6	303	129.79	37.812	.185	.231
ORF G04 Spring	16628	3	329	142.71	39.827	.182	.195
ORF G05 Fall	14882	1	341	126.98	38.227	.191	-.039
ORF G05 Winter	13191	1	349	144.55	38.442	.079	.013
ORF G05 Spring	13373	15	349	158.02	39.024	.076	.189
ORF G06 Fall	10280	13	320	146.16	36.642	.125	.302
ORF G06 Winter	8774	9	352	159.19	38.802	.169	.407
ORF G06 Spring	8827	9	346	171.97	40.369	.207	.549
ORFG07 Fall	4334	13	314	154.39	38.107	.130	.164
ORF G07 Winter	4012	2	359	167.68	38.458	.194	.608
ORF G07 Spring	4302	18	380	179.28	39.319	.123	.469
ORF G08 Fall	2689	37	281	154.62	34.847	-.008	.269
ORF G08 Winter	2538	29	307	165.20	33.322	.005	.575
ORF G08 Spring	2400	63	300	171.97	34.152	.064	.418

Correlations

Correlations for the same grade and season were in the .56 to .71 range. These correlations appear in bold text in table 3. Correlations for the same grade, fall ORF and spring MCA-III were in the .58 to .70 range. When looking at the 2 scores that were farthest apart in time (ex. ORF scores from the Fall of grade 2 to MCA-III scores from the spring of grade 4) the correlations were in the .57 to .64 range.

All of the correlations indicated a strong positive relationship between ORF and MCA-III reading, with remarkably little decrease as the interval of time between the two measures increased. These correlations indicate a significant concurrent and predictive relationship between these two variables.

Table 3. Correlations between AIMSweb ORF and MCA-III reading assessments

		ORF 01W	ORF 01S	ORF 2F	ORF2 W	ORF 2S	ORF 3F	ORF 3W	ORF 3S	ORF 4F	ORF4 W	ORF4 S	ORF 5F	ORF 5W	ORF 5S	ORF 6F	ORF 6W	ORF 6S	ORF 7F	ORF 7W	ORF 7S	ORF 8F	ORF 8W	ORF 8S
MCA3 3R	r	.568**	.639**	.657**	.706**	.709**	.702**	.712**	**.712****															
	N	4832	4638	6149	6041	6701	7112	6726	7077															
MCA3 4R	r	.518**	.596**	.619**	.648**	.653**	.651**	.664**	.497**	.671**	.672**	**.671****												
	N	3738	3798	4701	4830	4816	5038	4833	5314	6754	5707	5955												
MCA3 5R	r			.536**	.571**	.562**	.594**	.612**	.606**	.607**	.618**	.620**	.631**	.626**	**.610****									
	N			4132	3958	3929	4381	4587	4391	4494	4204	4359	5376	4567	4820									
MCA3 6R	r						.550**	.570**	.551**	.587**	.587**	.590**	.589**	.598**	.591**	.593**	.561**	**.563****						
	N						3647	3493	3555	3754	3383	3465	3884	3440	3655	4411	3744	3857						
MCA3 7R	r									.588**	.606**	.595**	.628**	.614**	.594**	.568**	.546**	.541**	.595**	.605**	**.588****			
	N									2933	2816	2807	3124	2779	2539	2832	2554	2653	1777	1547	1778			
MCA3 8R	r												.612**	.601**	.597**	.575**	.585**	.563**	.604**	.587**	.587**	.583**	.579**	**.596****
	N												2445	2348	2307	2998	2437	2281	1407	1316	1384	1579	1412	1307
MCA3 10R	r																		.598**	.584**	.585**	.592**	.570**	.556**
	N																		1133	1132	1123	1094	1111	1083

**. Correlation is significant at the 0.01 level (2-tailed).

b. Cannot be computed because at least one of the variables is constant.

Logistic Regression

Diagnostic accuracy statistics. Diagnostic accuracy statistics were calculated for Tier I, Tier II and Tier III targets on the MCA-III reading, as presented in Table 4. Within each grade level, under the Percent in Tier who pass MCA columns are data showing the percentage of students at or above the Tier targets who were also at or above the grade-level standards on the MCA-III. As can be seen on the Tier I rows, typically, around 90 percent of students reaching the Tier I target on the measures of ORF met the grade level standard on the MCA-III. The second row for each grade level represents the percentage of students at or above the Tier II target but below the Tier I target who were at or above the grade-level standard on the corresponding MCA-III. Typically, this was around 50 percent. The third row represents the percentage of students below the Tier II target who were at or above the grade level standards on the corresponding MCA-III. This number varied between 0 and 21%.

Final Suggested Target Scores

It was assumed that errors where students are expected to be successful on the MCA-III but subsequently are not should be considered more serious than errors where students are not expected to succeed and do perform proficiently. Based on this assumption, target scores were set to whichever grade-level MCA-III yielded the highest target scores (either the same grade or 1 to 2 grades higher). In all cases, a consistent P(success) of between .75 and .87 was used for the Tier I target. A second, Tier II target was also set, using a consistent P(success) of between .27 and .36. A third target for Tier III was set using a P(success) of between .00 and .05. The final suggested target scores are given in Table 4. Tier I represents that benchmark target, above which students are reasonably expected to succeed on the MCA-III. Tier II represents a lower-level target, useful for identifying students in need of Strategic and Intensive support in a Response to Intervention framework. The grade level MCA-III used to set the target score is noted at the bottom of the table.

Table 4: Target scores—ORF to MCA-III Reading

		Fall Target Score	P(success)	Winter Target Score	P(success)	Spring Target Score	P(success)
1	Tier 1			51+	85.3%	80+	85.6%
	Tier 2			7 - 50	49.0%	38 - 79	53.7%
	Tier 3			Below 7	13.7%	Below 38	14.7%
2	Tier 1	71+	85.0%	100+	85.4%	118+	85.9%
	Tier 2	31 - 70	53.9%	64 - 99	49.6%	82-117	51.3%
	Tier 3	Below 31	16.7%	Below 64	13.4%	Below 82	13.5%
3	Tier 1	100+	85.8%	123+	85.4%	138+	85.4%
	Tier 2	59 - 99	53.9%	88 - 122	50.8%	100 - 137	51.6%
	Tier 3	Below 59	13.9%	Below 88	14.6%	Below 100	11.7%
4	Tier 1	123+	83.9%	148+	82.8%	160+	82.6%
	Tier 2	81 - 122	50.6%	106 - 147	52.8%	118 - 159	51.9%
	Tier 3	Below 81	14.2%	Below 106	15.2%	Below 118	14.0%
5	Tier 1	126+	88.0%	149+	86.4%	161+	85.9%
	Tier 2	85 - 125	52.7%	106 - 148	53.4%	117 - 160	54.3%
	Tier 3	Below 85	16.7%	Below 106	15.6%	Below 117	14.6%
6	Tier 1	148+	84.9%	168+	85.2%	178+	84.1%
	Tier 2	106 - 147	49.9%	123 - 167	51.3%	131 - 177	50.8%
	Tier 3	Below 106	17.6%	Below 123	19.6%	Below 131	17.4%
7	Tier 1	177+	83.1%	188+	82.0%	198+	81.7%
	Tier 2	122 - 176	50.3%	136 - 187	51.0%	144 - 197	51.5%
	Tier 3	Below 122	21.4%	Below 136	18.1%	Below 144	18.2%
8	Tier 1	176+	81.2%	184+	82.1%	192+	81.7%
	Tier 2	132 - 175	54.3%	142 - 183	49.9%	150 - 191	51.7%
	Tier 3	Below 132	17.2%	Below 142	15.2%	Below 150	15.2%

Grade 1 ORF linked to MCA in Grade 3
Grades 2, 3, and 4 ORF linked to MCA in Grade 4
Grade 5 ORF linked to MCA in Grade 5
Grades 6 and 7 ORF linked to MCA in Grade 7
Grade 8 ORF linked to MCA in Grade 8

Conclusions

There is extensive research demonstrating the positive predictive relationship between measures of oral reading fluency and nationally normed and state developed measures of reading (Baker et al., 2008; Crawford, Tindal & Stieber, 2001; Hintze and Silberglitt, 2005; Klein & Jimerson, 2005; Shapiro et. al., 2006). This study affirms this relationship when examining the relationship between AIMSweb measures of ORF and subsequent outcomes on the MCA-III reading assessment.

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