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Incremental Validity of Acadience® RAN

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acadience® reading k–6

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Table of Contents

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Abstract: Rapid Automatized Naming (RAN) involves quickly naming familiar items. The present study sought to examine the predictive validity of Acadience RAN measures above and beyond existing Acadience Reading measures. Data were analyzed from a sample of kindergarten and first grade students who had data on RAN and a later Acadience Reading Composite Score. Results indicate that RAN is strongly correlated with concurrent reading ability. Additionally, RAN provides strong incremental prediction of later reading outcomes, even controlling for concurrent Letter Naming Fluency and Reading Composite Score. This prediction remained significant, but declined in magnitude at later times of year. These results suggest that educators can successfully use RAN to help identify students in need of reading interventions.

Background

Rapid Automatized Naming (RAN) is a task that involves quickly and accurately naming repeated sets of familiar items. Although RAN is typically a good predictor of future reading difficulties, difficulties with RAN do not impact reading skills as much as difficulties with phonological awareness (PA) (Georgiou et al., 2011; Pennington et al., 2001). When students have strong PA skills but have difficulties with RAN, the impact on reading skills is typically milder than when students have difficulties with both RAN and PA (see Kilpatrick, 2015).

While there is considerable research support for RAN as a strong predictor of reading skill, variation in the strength of the relation between RAN skill and reading skill is also evident (see Araújo et al., 2015 for discussion). Notably, Kilpatrick (2015) states that at this time, a research-based means to directly improve RAN is not known; however, there is evidence to suggest that meaningful improvement in reading skills is associated with improvements in RAN.

The Acadience RAN measures are brief assessments that are individually administered. They are based on established procedures for creating and interpreting RAN tasks used in decades of research by multiple researchers (see Araújo et al., 2015). Acadience RAN is composed of three brief measures: RAN Objects, RAN Letters, and RAN Numbers. Students begin with RAN Objects and proceed to RAN Letters. RAN Numbers is only administered to students who discontinue on the RAN Letters task. A Spanish version of Acadience RAN is available.

A relative unknown in the research on Acadience RAN is the extent to which it provides information for predicting reading skills above and beyond extant measures of reading ability. Some researchers view RAN as a unique piece of information for understanding a child's reading ability (Norton & Wolf, 2012). On the other hand, there has been some speculation that screening for RAN ability can be adequately accommodated using existing measures of reading skills, specifically Letter Naming Fluency (University of Oregon, 2018–2019). The research presented in this technical report seeks to examine the extent to which Acadience RAN predicts later reading outcomes, even controlling for existing measure of reading ability.

Methods

Sample

Data used for this research consisted of kindergarten and first-grade Acadience RAN and Acadience Reading K–6 scores collected and entered into Acadience Data Management (www.acadiencelearning.net) by school personnel at three benchmark assessment time points (i.e., beginning of year, middle of year, end of year). Because the prediction of later reading outcomes necessarily involves longitudinal data, scores from the 2018–19 school year and beginning of the 2019–20 school year were examined. The sample included 4,995 students across kindergarten and first grade. Data were entered for 581 kindergarten and 48 first-grade students in 2018–19 and 2,397 kindergarten and 2,436 first-grade at the beginning of 2019–20. Of these students, 507 had data entered for both 2018–19 and the beginning of 2019–20. Students were from 50 schools in 17 school districts in eight states representing every census region of the United States. Forty-six schools were public and four were private. Demographic information was available for 49 of the schools from the Institute of Education Sciences National Center for Education Statistics (NCES) website (nces.ed.gov). This information is summarized by locale in Table 1.

Table 1

Demographic Information of Participating Schools by Locale

		Average Percentage							
Locale	Number of Schools	Female	Free/ Red. Lunch Eligible	Native American/ Alaska Native	Asian & Pacific Islander	Black	Hispanic	White	Multiracial
City: Large	1	53%	<1%	<1%	1%	3%	1%	91%	3%
City: Midsize	14	48%	9%	<1%	18%	4%	6%	67%	5%
City: Small	6	48%	69%	1%	1%	<1%	13%	78%	7%
Rural: Distant	3	48%	56%	<1%	<1%	<1%	15%	81%	3%
Rural: Fringe	4	48%	10%	1%	9%	1%	4%	81%	5%
Suburb: Large	16	51%	11%	<1%	12%	3%	6%	75%	4%
Suburb: Midsize	1	47%	23%	<1%	3%	<1%	5%	89%	3%
Town: Distant	1	48%	42%	<1%	<1%	1%	9%	85%	5%
Town: Fringe	2	48%	54%	1%	1%	1%	14%	78%	6%
Town: Remote	1	54%	48%	1%	2%	<1%	19%	75%	3%
All	49	49%	22%	0%	11%	2%	8%	74%	5%

Note. Demographic data aggregated at the school level by the U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (NCES) from the 2017–18 school year. Data were available for 49 of the 50 participating schools. Of those, 46 were public, while three were private. Free/Red. Lunch Eligible represents students who were eligible to participate in the Free Lunch and Reduced-Price lunch programs under the National School Lunch Act of 1946 or who were eligible for the National School Lunch Program (NSLP) through direct certification.

For the purposes of examining incremental validity, the sample was restricted to include only students who had (a) data for at least two time points, (b) a RAN score and a Letter Naming Fluency or Reading Composite Score at the initial time point, and (c) a Reading Composite Score at a later time point. Four cohorts based on the initial time point were examined: (a) beginning of kindergarten (n = 2,142), (b) middle of kindergarten (n = 199), (c) end of kindergarten (n = 156), and (d) beginning of first grade (n = 137). Data were collected at the middle and end of the 2018–19 school year in first grade, but the sample sizes were too small to yield meaningful results.

Measures

Acadience RAN

As previously mentioned, Acadience RAN is composed of three measures: RAN Objects, RAN Letters, and RAN Numbers. Students begin with RAN Objects and proceed to RAN Letters. RAN Numbers is only administered to students who discontinue on the RAN Letters task. Information about the design specifications for the measures can be found in the Acadience RAN Assessment Manual (Powell-Smith et al., 2020), available from www.acadiencelearning.org.

Acadience RAN is administered at the beginning, middle, and end of kindergarten and first grade. Administration of each measure begins with a practice activity to ensure the student is familiar with the items. Students are presented with a practice page and asked to name the items. Feedback and correction is provided by the assessor. If the student makes an error on any practice item, a second practice trial is given using the same practice page and directions. If the student makes an error on any practice item during the second trial, the measure is discontinued and the student is administered the next measure. After the practice activity, the student is shown a page containing five items (i.e., objects, letters, or numbers) repeated at random over 10 rows and is asked to name the items as quickly as possible. The assessor follows along and marks any item named incorrectly, skipped over, or not named within 3 seconds as an error. If the student makes four errors in the first two rows, the measure is discontinued and the student is administered the next measure. The final scores that are reported for each measure are (a) the total time, in seconds, the student takes to complete the measure; and (b) the number of errors the student made on the measure. If the student met the discontinue rule, no scores are recorded for that measure.

Time scores of the three separate Acadience RAN measures were each considered separately. Every student had a score for RAN Objects, but since RAN Numbers was only used as an alternative for students who discontinued on RAN Letters, each student was assessed with RAN Numbers or RAN Letters, but not both. Because of this alternative, the number of students with each measure was not equal. In addition to the time scores for each measure, a RAN Total score was created and examined. The RAN Total score was composed of either (a) the sum of Objects and Letters or (b) the sum of Objects and Numbers, given the manner in which the assessment was structured with RAN Numbers being an alternative to RAN Letters.

Acadience Reading K-6

Acadience Reading assesses the essential early literacy and reading skills identified by the National Reading Panel (2000) and National Research Council (1998) that every child must master to become a proficient reader. The measures serve as indicators of these essential skills: phonemic

awareness, alphabetic principle and phonics, accurate and fluent reading of connected text, and reading comprehension. The measures are used for universal screening and progress monitoring in kindergarten through grade six, with a focus on early identification and prevention of later reading difficulties.

The Acadience Reading measures typically collected in kindergarten and first grade are Letter Naming Fluency (LNF), First Sound Fluency (FSF), Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), Oral Reading Fluency (ORF), and the Reading Composite Score (RCS). Due to insufficient sample size at the middle and end of first grade, Acadience Reading scores for these times of year were not included in analysis. Because ORF is administered to students beginning at the middle of first grade and the scores were not included in analysis, the measure is not described below. Table 2 provides a summary of when LNF, FSF, PSF, and NWF were collected in kindergarten and first grade. The RCS was calculated for the beginning, middle, and end of kindergarten and the beginning of first grade.

Table 2

Acadience Reading Data Collection Timeline by Grade and Time of Year

	Kindergarten			First Grade
Measure	Beginning	Middle	End	Beginning
LNF	X	X	X	X
FSF	X	X		
PSF		X	X	X
NWF CLS		X	X	X
NWF WWR		X	X	X

Note. LNF = Letter Naming Fluency; FSF = First Sound Fluency; PSF = Phoneme Segmentation Fluency, NWF CLS = Nonsense Word Fluency Correct Letter Sounds, NWF WWR = Nonsense Word Fluency Whole Words Read.

Letter Naming Fluency (LNF). LNF measures students' accuracy and fluency with letter naming. During administration, the assessor presents a page of uppercase and lowercase letters arranged in random order and asks the student to name the letters. The item pool for LNF includes all letters in the English alphabet, both uppercase and lowercase. As the student reads the letters, the assessor marks letters that are read incorrectly, hesitated on for more than 3 seconds, or skipped. The total score is the number of correct letter names that the student says in 1 minute. If the student cannot name any letters in the first row correctly, the measure is discontinued.

First Sounds Fluency (FSF). FSF is a brief, direct measure of phonemic awareness. It assesses students' fluency in identifying the initial sounds in words. Assessment begins with three practice items. The practice items provide increasing levels of support, including modeling and correction procedures. After the practice activity, the assessor says a series of words one at a time to the student and asks the student to say the first sound in the word. On the scoring page, the assessor circles the corresponding sound or group of sounds the student says. Students receive either 2 points for saying the initial phoneme of a word (e.g., saying the /s/ sound as the first sound in the word street) or 1 point for saying the initial consonant blend (e.g., /st/, /str/ in street), consonant plus vowel (e.g., /si/ in sit), or consonant blend plus vowel (e.g., /strea/ in street). A response is scored as correct as long

as the student provides any of the correct responses listed for the word. Incorrect responses or no response within 3 seconds do not receive points. The total score is the sum of correct 1- and 2-point responses the student says in 1 minute. If the student receives 0 points in the first five words, the measure is discontinued.

Phoneme Segmentation Fluency (PSF). PSF is a brief, direct measure of phonemic awareness. The measure assesses the student's fluency in segmenting a spoken word into its component parts or sound segments. Assessment begins with a practice activity. The practice items provide increasing levels of support, including modeling and correction procedures. After the practice activity, the assessor presents a series of words one at a time and asks the student to say all the sounds in the word. The assessor underlines each correct sound segment of the word that the student says. A correct sound segment is any different, correct part of the word the student says. For example, if the assessor says the word fish and the student says /f/ /i/ /sh/, the student has completely and correctly segmented the word into its component sounds and the score is 3 correct sound segments. If the student says /f/ /ish/, the score is 2 correct sound segments. Partial credit is given for partial segmentation. Incorrect sound segments, omitted sounds, or sounds hesitated on for more than 3 seconds do not receive points. The total score is the number of correct sound segments that the student says in 1 minute. If the student is unable to produce any correct segments in the first five words, the measure is discontinued.

Nonsense Word Fluency (NWF). NWF is a brief, direct measure of the alphabetic principle and basic phonics. It assesses knowledge of basic letter-sound correspondences and the ability to blend letter sounds into consonant-vowel-consonant (CVC) and vowel-consonant (VC) words. The test items used for NWF are phonetically regular make-believe (nonsense or pseudo) words. Following a modeling and practice activity, the student is presented with a sheet of randomly ordered CVC and VC nonsense words (e.g., dif, ik, nop). Standardized directions are used to ask the student to read the make-believe words the best they can, reading either the whole word or saying any sounds they know. For example, if the stimulus word is tof, the student could say /t/ /o/ /f/ or "tof." The assessor underlines each correct letter sound produced either in isolation or blended together. Whole words read without sounding out are underlined in their entirety. Two scores are reported for NWF. Correct Letter Sounds (CLS) is the number of letter sounds produced correctly in 1 minute. For example, if the student reads dif as /d/ /i/ /f/ the score for Correct Letter Sounds is 3. If the student reads dif as /di/ /f/ or "dif," the score is also 3. Whole Words Read (WWR) is the number of make-believe words read correctly as a whole word, one time and only one time, without first being sounded out. For example, if the student reads dif as "dif," the score is 3 points for CLS and 1 point for WWR, but if the student reads dif as "/d/ /i/ /f/ dif," the score is 3 points for CLS but 0 points for WWR. The final scores are the number of CLS and WWR provided by the student in 1 minute. If the student is unable to produce any correct letter sounds in the first row, the measure is discontinued.

Reading Composite Score (RCS). The RCS is a combination of multiple Acadience Reading scores (i.e., the measures given at a specified grade level and time of year) and provides the best overall estimate of students' early literacy skills and/or reading proficiency. The components and formulas for the RCS are available in the Reading Composite Score Worksheets appended to the Acadience Reading Benchmark Goals and Composite Score document, available at www.acadiencelearning.org.

Analyses

Criterion-Related Validity

Criterion-related validity is the degree to which performance on a criterion measure (i.e., Acadience Reading) can be predicted from performance on an assessment (i.e., Acadience RAN). Concurrent validity estimates how well student performance on the assessment is related to performance on the criterion when both measures are given at roughly the same time. Predictive validity estimates how well student performance on the assessment predicts student performance on the criterion given at a later time. Evidence of validity was measured by calculating the correlation between Acadience RAN scores and Acadience Reading scores.

Incremental Validity

The incremental validity of Acadience RAN was tested by examining a series of regression models. The first model predicted later Reading Composite Scores (e.g., end of year) from earlier Reading Composite Scores (e.g., beginning of year). The second regression model added the particular RAN score being tested. This same process was repeated replacing the RCS with students' LNF scores. The change in R-squared values predicting later Reading Composite Scores provided a measure of how much additional variance was explained by adding the RAN measure. Large changes in R-squared imply that Acadience RAN is predicting a significant amount of additional variability above and beyond either the concurrent RCS or the concurrent LNF score, which would justify the use of Acadience RAN as an additional high quality predictor of later reading outcomes.

Several linkages were examined with respect to predicting later outcomes. Beginning-of-year scores were used to predict both middle- and end-of-year scores. Middle-of-year scores were used to predict both the end-of-year scores in kindergarten and beginning-of-year scores in first grade. Finally, the end-of-year scores in kindergarten were used to predict the beginning-of-year first-grade RCS. This process resulted in five total linkages across time, with the three RAN measures and RAN Total assessed at each linkage while controlling for RCS or LNF, yielding a total of 40 models (5 linkages x 4 RAN options x 2 covariates) to assess the incremental validity of Acadience RAN. This process was also used in a logistic regression context to predict later Acadience Reading benchmark status, as opposed to the numerical Acadience Reading Composite score. Because of the planned missing data pattern with RAN Letters and RAN Numbers mentioned previously, regression models were run using Full Information Maximum Likelihood (FIML), as opposed to Ordinary Least Squares, as FIML has been shown to have better statistical properties with the presence of missing data (Enders & Bandalos, 2001).

Results

Criterion-Related Validity

The correlations between performance on the Acadience RAN measures and Acadience Reading measures are reported in Tables 3–6. Overall, the correlations between the measures range from moderate to moderate-strong, with most being significant, $p < .0001$. All significant correlations are negative, meaning less time spent completing the RAN measures (i.e., lower time scores) was associated with higher scores on the Acadience Reading measures. Likewise, greater time spent completing the RAN measures (i.e., higher time scores) was associated with lower scores on Acadience Reading. Due to sample size limitations, concurrent validity for first grade could only be calculated at the beginning of year.

Table 3

Concurrent Validity of Acadience RAN with Acadience Reading in Kindergarten

Acadience RAN Measure	Acadience Reading Measure by Time of Year					
	FSF	LNF	PSF	NWF CLS	NWF WWR	RCS
			Beginning of Year			
Objects	-.34	-.47	–	–	–	-.47
Letters	-.39	-.62	–	–	–	-.59
Numbers	-.36	-.53	–	–	–	-.53
Total	-.40	-.59	–	–	–	-.58
			Middle of Year			
Objects	-.17***	-.33	-.25*	-.28	-.11†	-.32
Letters	-.30	-.53	-.37	-.40	-.20**	-.51
Numbers	-.29	-.52	-.46	-.47	-.21***	-.55
Total	-.24	-.47	-.32	-.37	-.17***	-.44
			End of Year			
Objects	–	-.58	-.35	-.49	-.39	-.57
Letters	–	-.70	-.33	-.57	-.50	-.65
Numbers	–	-.70	-.46	-.55	-.46	-.68
Total	–	-.71	-.42	-.57	-.47	-.68

Note. Dashes indicate the Acadience Reading measure is not administered at the specified time of year. Correlations calculated using pairwise estimation method. Pairwise sample sizes: beginning of year = 1,726–2,468; middle of year = 138–211; end of year = 152–157. Unless marked, correlations significant, $p < .0001$; *$p < .001$; **$p < .01$; ***$p < .05$; † Not significant. FSF = First Sound Fluency; LNF = Letter Naming Fluency; PSF = Phoneme Segmentation Fluency, NWF CLS = Nonsense Word Fluency Correct Letter Sounds, NWF WWR = Nonsense Word Fluency Whole Words Read; RCS = Reading Composite Score.

Table 4

Concurrent Validity of Acadience RAN with Acadience Reading in Beginning of First Grade

Acadience RAN Measure	Acadience Reading Measure				
	LNF	PSF	NWF CLS	NWF WWR	RCS
Objects	-.53	-.18	-.37	-.31	-.47
Letters	-.70	-.26	-.51	-.42	-.64
Numbers	-.67	-.20	-.48	-.42	-.60
Total	-.67	-.23	-.48	-.40	-.60

Note. Correlations calculated using pairwise estimation method. Pairwise sample sizes = 1,404–1,930. All correlations significant, $p < .0001$. LNF = Letter Naming Fluency; PSF = Phoneme Segmentation Fluency, NWF CLS = Nonsense Word Fluency Correct Letter Sounds, NWF WWR = Nonsense Word Fluency Whole Words Read; RCS = Reading Composite Score.

Table 5

Predictive Validity of Acadience RAN with Acadience Reading in Kindergarten

Acadience RAN Measure	Acadience Reading Measure by Time Span					
	FSF	LNF	PSF	NWF CLS	NWF WWR	RCS
			Beginning to Middle of Year			
Objects	-.22**	-.45	-.22*	-.38	-.20**	-.39
Letters	-.39	-.61	-.29*	-.53	-.16***	-.57
Numbers	-.41	-.48	-.22**	-.49	-.19***	-.50
Total	-.33	-.57	-.26*	-.50	-.19***	-.52
			Beginning to End of Year			
Objects	–	-.49	-.18*	-.37	-.34	-.44
Letters	–	-.55	-.04†	-.42	-.40	-.46
Numbers	–	-.49	-.12†	-.45	-.39	-.49
Total	–	-.58	-.05†	-.45	-.40	-.50
			Middle to End of Year			
Objects	–	-.47	-.27	-.35	-.35	-.44
Letters	–	-.53	-.28	-.41	-.36	-.51
Numbers	–	-.53	-.28**	-.39	-.41	-.49
Total	–	-.54	-.28*	-.41	-.38	-.50

Note. Dashes indicate the Acadience Reading measure is not administered at the specified time of year. Correlations calculated using pairwise estimation method. Pairwise sample sizes: beginning to middle = 139–221, beginning to end = 136–213, middle to end = 131–201. Unless marked, correlations significant, $p < .0001$; *$p < .001$; **$p < .01$; ***$p < .05$; † Not significant. FSF = First Sound Fluency; LNF = Letter Naming Fluency; PSF = Phoneme Segmentation Fluency, NWF CLS = Nonsense Word Fluency Correct Letter Sounds, NWF WWR = Nonsense Word Fluency Whole Words Read; RCS = Reading Composite Score.

Table 6

Predictive Validity of Acadience RAN at End of Kindergarten with Acadience Reading at Beginning of First Grade

Acadience RAN Measure	Acadience Reading Measure				
	LNF	PSF	NWF CLS	NWF WWR	RCS
Objects	-.50	-.23**	-.48	-.42	-.53
Letters	-.69	-.30*	-.58	-.51	-.67
Numbers	-.64	-.17***	-.55	-.47	-.61
Total	-.64	-.29*	-.57	-.50	-.65

Note. Correlations calculated using pairwise estimation method. Pairwise sample sizes = 136–138. Unless marked, correlations significant, $p < .0001$; $^{*}p < .001$; $^{**}p < .01$; $^{***}p < .05$. LNF = Letter Naming Fluency; PSF = Phoneme Segmentation Fluency, NWF CLS = Nonsense Word Fluency Correct Letter Sounds, NWF WWR = Nonsense Word Fluency Whole Words Read; RCS = Reading Composite Score.

Incremental Validity

The results of the models described above are displayed in Figures 1 and 2. Figure 1 shows the incremental R-squared values for each linkage while controlling for the concurrent RCS for each student. Figure 2 shows the incremental R-squared values for each linkage while controlling for concurrent LNF scores. Both figures show largely the same pattern regarding the incremental validity of RAN. In every case, RAN explained additional variation in the RCS outcome, regardless of controlling for the RCS or LNF. At the beginning of year, the incremental variance explained was substantial, with approximately 10% of additional variance in middle-of-year RCS explained by the RAN total score, even controlling for beginning-of-year RCS. This incremental validity was also present when controlling for LNF. The additional variance explained by RAN declined somewhat at later times of year, but always remained substantial and statistically significant. These results suggest that RAN is adding predictive power above and beyond already existing reading measures.

At the beginning of kindergarten, RAN makes a substantial contribution to predicting later Reading Composite Scores, but as time progresses this effect tends to diminish. For example, while always significant, the incremental validity (holding concurrent RCS constant) of RAN Total drops from approximately 10% additional variance explained when predicting middle and end of year kindergarten scores from beginning of year, to less than 3% when explaining beginning of year first grade RCS from end of year kindergarten RAN Total. It should be noted that because of the aforementioned differences in sample size for the RAN measures, these measures of incremental validity are built on different sample sizes, so there are differing degrees of confidence in each incremental validity estimate. Despite this sample size difference, it appears that RAN is measuring truly powerful and unique information at the beginning of kindergarten, but this information becomes largely shared with the other existing reading measures by the end of kindergarten.

While predicting numerical scores can be helpful and informative, Acadience Reading measures are built to assess a student's benchmark status on reading. In that vein, incremental validity was also examined as the extent to which RAN contributes to the prediction of later benchmark status. The outcome was predicting which students would be At or Above Benchmark at a later time point, and a logistic regression was used with either the RCS or LNF as the initial predictor, then the RAN

Total score was added. The extent of incremental validity was the extent to which adding RAN to the logistic regression improved the classification accuracy. Classification accuracy was assessed using the area under the receiver operating characteristic curve (AUC) (see Good et al., 2019). Models with no predictors have an AUC of .50, and the extent to which the AUC is above .50 indicates that the model does a better than chance job of classifying later student outcomes.

Table 7 compares separate models in their ability to classify which students would be At or Above Benchmark at later times. The first column provides a baseline value of .50 with no predictors. The next two columns compare a model with just the RCS and another with RCS and RAN. The last two columns compare a model with just LNF and another with LNF and RAN. In both comparisons, the results closely resemble the results observed for predicting continuous RCS outcomes. RAN adds a substantial amount of classification accuracy at the beginning of kindergarten, indicating that RAN could be important for identifying those students who are less likely to achieve later reading goals. RAN continues to improve classification accuracy at later times of year in kindergarten, though again this added benefit does tend to diminish later in the year. Overall, whether controlling for RCS or LNF, RAN provides unique and meaningful information for predicting later reading outcomes.

Table 7

AUCs with RAN and Acadience Measures Predicting Later Benchmark Status

Linkage	None	RCS Only	RCS + RAN	LNF Only	LNF +RAN
K BOY to K MOY	.50	.69	.76	.63	.74
K BOY to K EOY	.50	.66	.75	.65	.75
K MOY to K EOY	.50	.83	.85	.83	.85
K MOY to G1 BOY	.50	.80	.84	.80	.83
K EOY to G1 BOY	.50	.88	.90	.86	.87

Note. RCS = Reading Composite Score; BOY = beginning of year; MOY = middle of year; EOY = end of year; AUC = Area Under the Receiver Operating Characteristic Curve.

Figure 1

Incremental Validity of RAN Total and Acadience Reading Composite Score

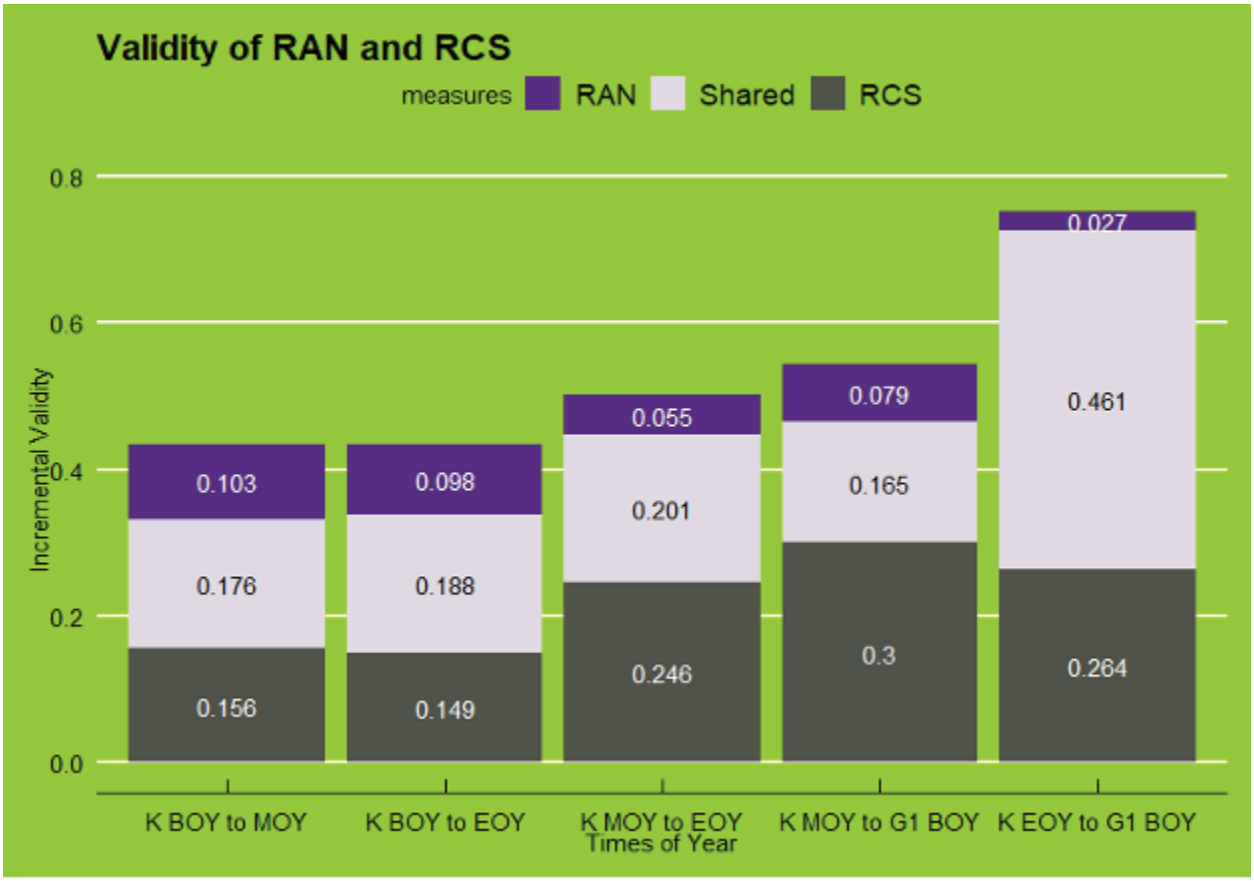
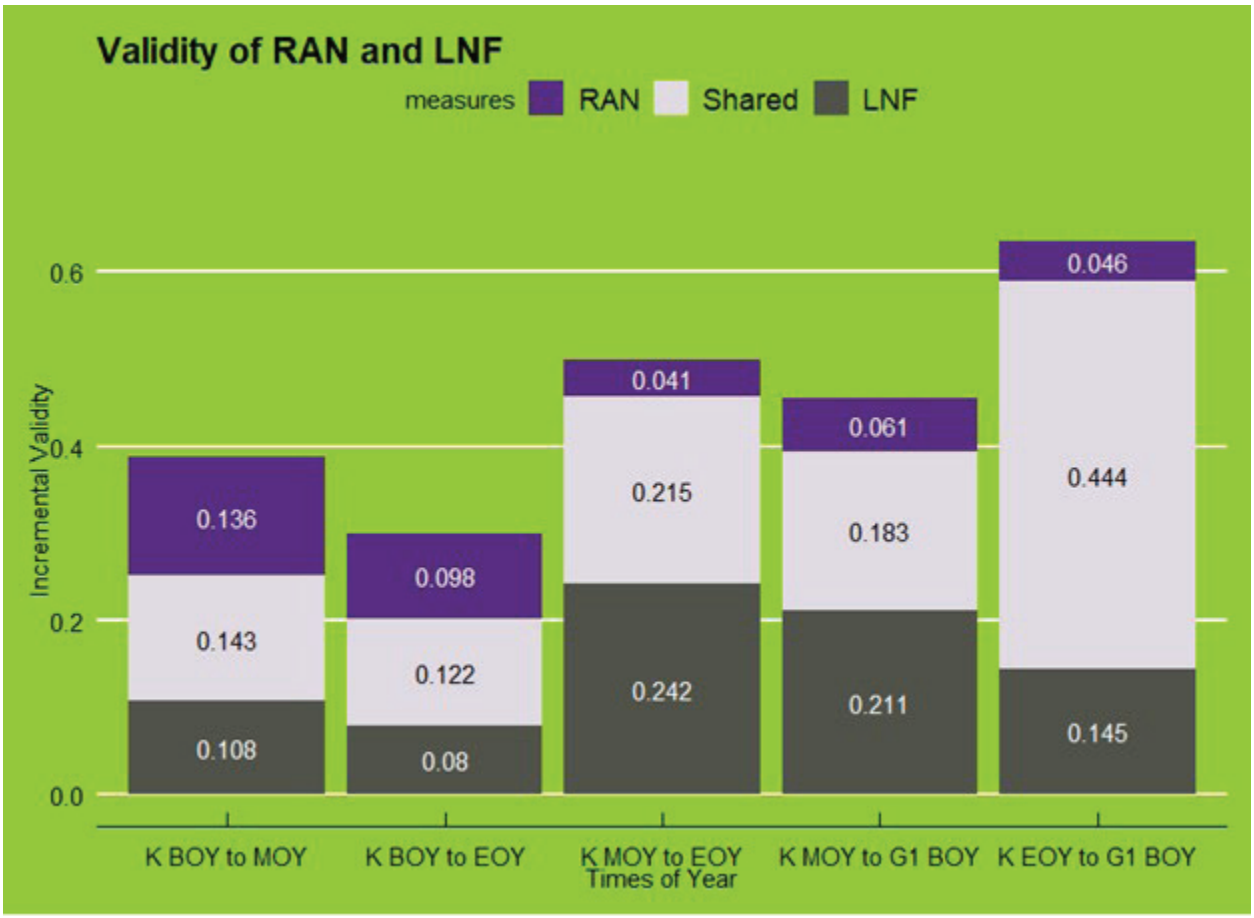


Figure 2

Incremental Validity of RAN Total and Acadience Reading Letter Naming Fluency



While RAN is adding significant variance explained, this effect is not uniform. Figure 3 shows a breakdown of individual RAN measures in the linkage from beginning to middle of year in kindergarten. Figure 4 shows the breakdown of individual RAN measures in the linkage from beginning to end of year in kindergarten. As evidence by both figures, the incremental validity of RAN Objects is substantially lower than RAN Letters, RAN Numbers, or the RAN Total score. RAN Letters in particular provides and enormous boost to variance explained, with approximately 20% of the variation in middle of year RCS being accounted for by RAN Letters when controlling for RCS. This suggests that not every subtest of RAN is an equally powerful predictor of later reading outcomes, however the RAN Total score is still a powerful predictor. Not only is the incremental validity not uniform across RAN measure, but validity seems to differ by time of year as well.

Figure 3

Incremental Validity of Individual RAN Measures from Beginning to Middle of Year

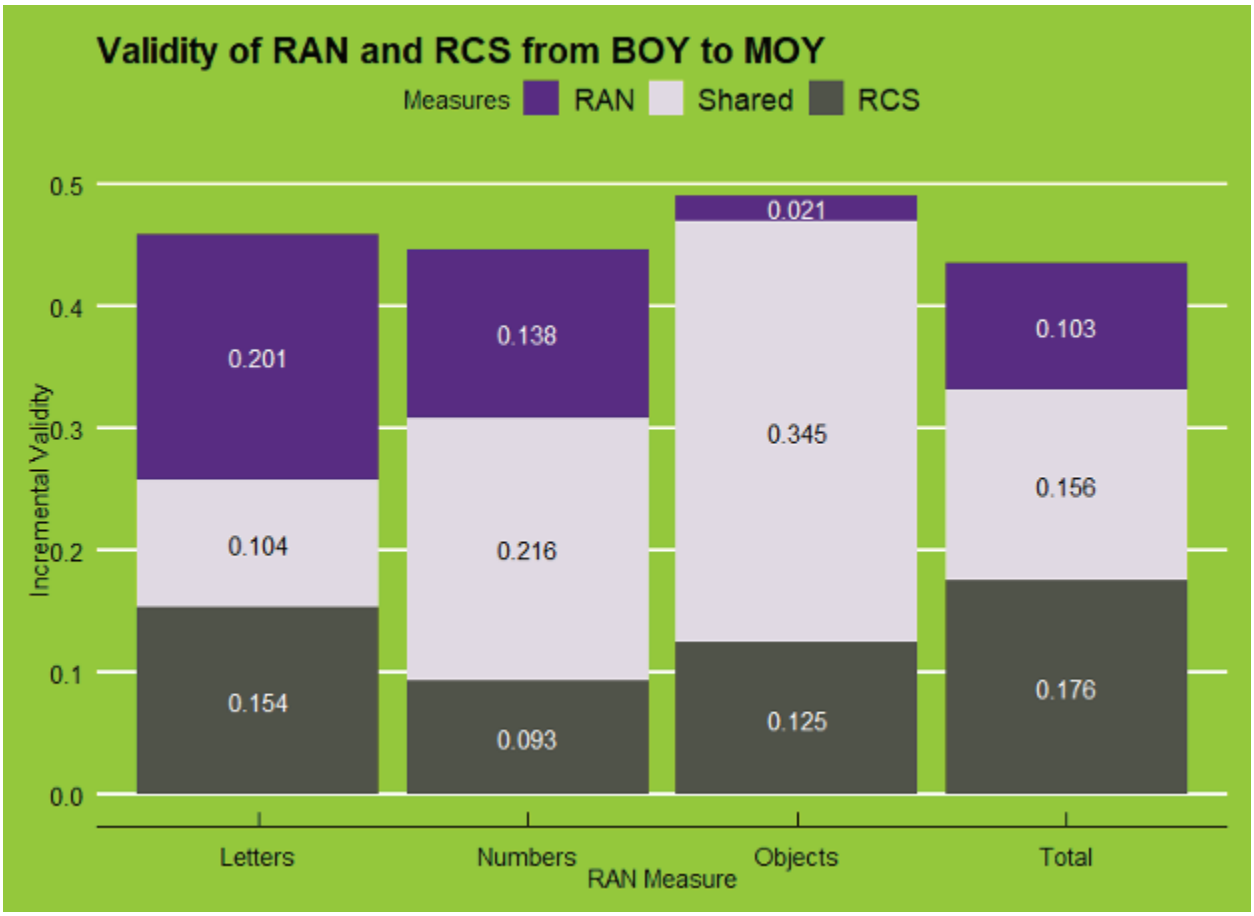
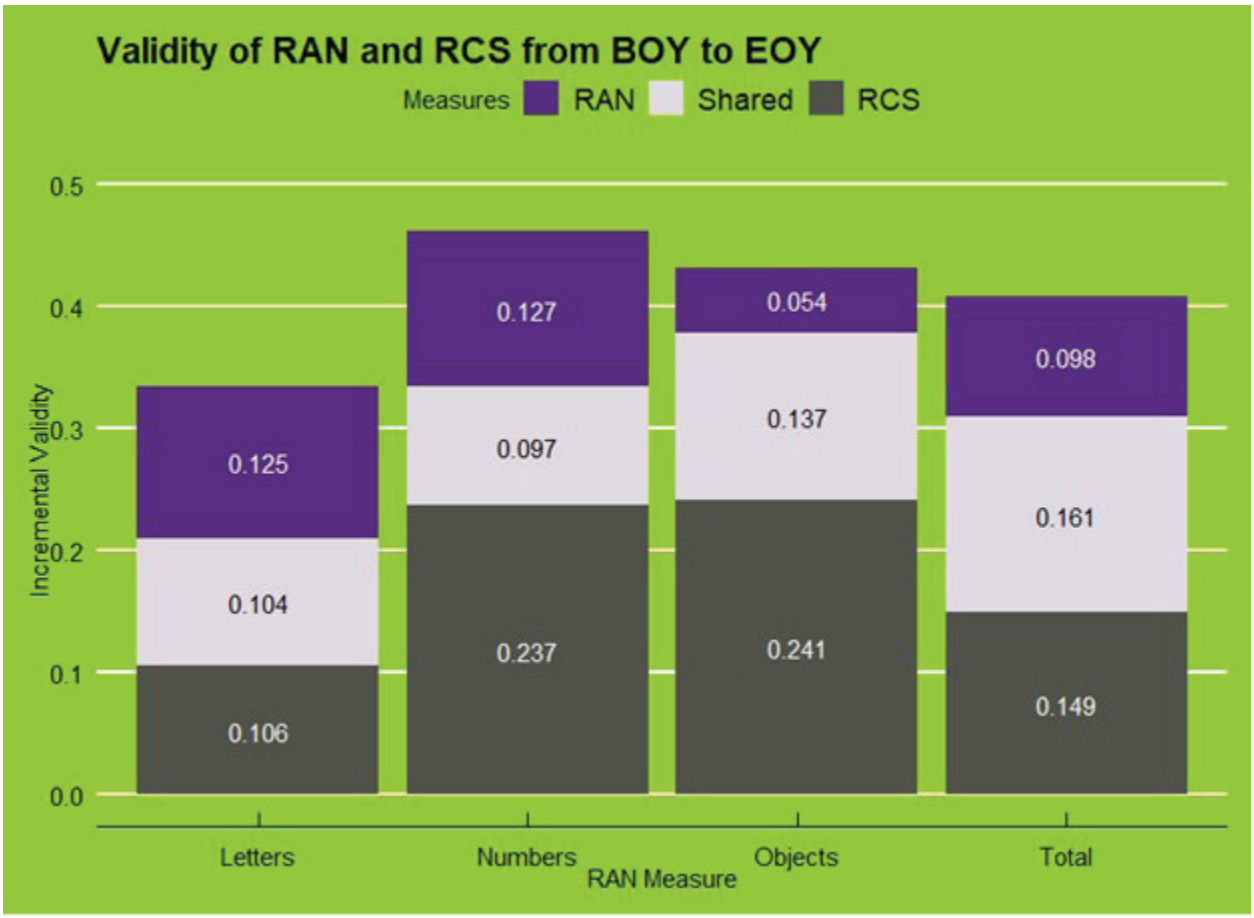


Figure 4

Incremental Validity of Individual RAN Measures from Beginning to End of Year



Discussion

This technical report presents results concerning the criterion-related validity of Acadience RAN and the extent to which Acadience RAN provides incremental validity for predicting later reading outcomes, independent of RCS or LNF performance. There has been some conjecture regarding whether the information contained in RAN measures is unique with respect to predicting later reading outcomes. The results presented here suggest that RAN is not only strongly related to later reading outcomes, but also adds significant variability explained, independent of the RCS or LNF. These results suggest that Acadience RAN provides another useful tool for identifying those students who are at risk for future reading difficulties, including dyslexia.

The use of RAN at the beginning of kindergarten is an especially powerful predictor of later outcomes. Year-to-year correlations are typically lower from kindergarten to first grade than for any other cross-year correlation because of the myriad additional influences on kindergarten scores that have not yet been "leveled off" by the beginning of formal instruction (see Wagner et al., 1997). Individual differences in RAN are likely reflections of pre-K processes that differ across students, rather than a measure that can be impacted directly by instruction (Lervåg & Hulme, 2009). RAN is another tool that instructors can use to make informed decisions for their students, and a tool that is especially informative at the time when student reading abilities are especially dynamic.

While RAN showed incremental validity for all times of year that were examined, the additional variance explained diminished substantially by the middle and end of kindergarten. Interestingly, the overall variance explained for RAN with LNF or the RCS did not decrease across this same timeframe. One potential explanation for this phenomenon is that the information gained by administering RAN begins to overlap more with the RCS and LNF at the later time points of kindergarten. Future research should aim at disentangling the development of RAN with other features of early reading ability to further determine when and RAN predicts important reading outcomes.

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