READY TO READ AND SCHOOL SUCCESS

Kindergarten Readiness and the "Third Grade Reading Guarantee"

Jessica Logan, Ph.D., Laura M. Justice, Ph.D., and Jill Pentimonti, Ph.D.

Kindergarten Readiness and Reading-Related Skills

For many children, kindergarten is their official entrance into formal schooling. Although many children participate in preschool programs or child care, often kindergarten is the first setting in which academic skills are explicitly targeted. Kindergarten is important, educationally, because by the time children enter first grade, they are expected to have mastery of a number of foundational academic skills: being able to identify all of the upper- and lower-case alphabet letters, read simple texts, count by tens, and describe objects in terms of measurable attributes, such as length and width (see Common Core Standards Initiative National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

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THE OHIO STATE UNIVERSITY
COLLEGE OF
EDUCATION AND HUMAN ECOLOGY

Many foundational academic skills are targeted within kindergarten programs, although **reading-related skills** have received the greatest attention in recent years. Reading-related skills, which include print knowledge (knowledge of the symbolic system used in written language), phonological awareness (sensitivity to the sound structure of spoken language), and vocabulary (breadth and depth of knowledge of words and concepts), serve as a foundation upon which formal reading skills will develop, including decoding and reading comprehension. Interest in kindergarteners' reading-related skills has been supported by two key findings in the research literature:

- **Kindergarteners who have better reading-related skills** are more likely to be better readers in the future than kindergarteners who have poor reading-related skills; this is because there are strong predictive relations between reading-related skills measured at kindergarten and students' reading achievement as measured in the later grades (e.g., Storch & Whitehurst, 2002); conversely,

- **Kindergarteners who do poorly on reading-related measures** are at heightened risk for future reading difficulties; in particular, kindergarteners who have poor print knowledge, phonological awareness, and spoken language abilities appear to be highly susceptible for future reading disabilities (e.g., Catts, Fey, Zhang, & Tomblin, 2001).

At entrance to kindergarten, children show substantial individual differences with respect to the level of reading-related skills they possess. For instance, some children may be able to read simple books, whereas others may have little understanding of how to handle a book. Some children may be able to identify and write all of the letters of the alphabet, whereas others appear to know no letters at all. In general, children who have relatively limited skills in areas such as these are viewed as being "not ready" for formal schooling.

The term *kindergarten readiness* is used to refer to "the state of child competencies at the time of school entry that are important for later success" (Snow, 2006, p. 9). For our purposes, our interest is in competencies specific to literacy, which we refer to as reading-related skills. Note that a critical part of this definition is the reference to readiness skills as being those that are *important for later success*, which we might interpret as referring to those skills that are significantly related to whether children will or will not be successful in their future academic careers.

Many studies have shown, among the general population of children, that reading-related skills at kindergarten entry are moderately to strongly associated with future reading achievement; however, it is unclear whether these findings can directly inform *on-the-ground* policies and practices concerning kindergarten readiness and reading achievement.

Kindergarten Readiness and the Third-Grade Reading Guarantee

In Columbus, the capital of Ohio, many community constituents – from business leaders to school administrators -- are invested in promoting the readiness of children at kindergarten. In part, such concerns stem from ongoing evidence indicating that overall reading achievement among school-aged children in Columbus is inadequate. For instance, data available from the state for the 2011-12 school year show that only 57% of third-graders in the Columbus City School (CCS) district read proficiently, in comparison to 79% of third-graders statewide. In real terms, this means that nearly one of every two third-graders in CCS cannot read adequately to excel in schooling.

The recent legislation enacted by the Ohio General Assembly referred to as the Third-Grade Reading Guarantee (TGRG) represents an ambitious effort to improve reading achievement not only in Columbus, but also statewide. The TGRG allows third-graders to be promoted to fourth grade only if they demonstrate reading proficiency as based on the state's formal reading assessment. The belief that students' kindergarten readiness is important to their future achievement in reading, and thus will help to guarantee their reading success, has elevated the community's interest in identifying ways to improve kindergarten readiness.

According to the law, promoting children's reading-related skills starting in kindergarten is an initial step toward elevating children's likelihood of being a successful reader by the end of third grade. To that end, the law mandates that all students should be screened at entry to kindergarten to determine their areas of relative strength and weakness with respect to reading. The law further asserts that students who arrive to kindergarten with few weaknesses are ready to receive formal reading instruction, and are therefore more likely to be successful readers in third grade.

The present research was conducted to empirically assess the premise that a child who is ready to learn to read in kindergarten is more likely to achieve the third-grade reading guarantee compared to a child who does not exhibit such readiness. Data used to address three specific aims are drawn specifically from children in Columbus City Schools at kindergarten entry who are followed through to the third grade. The goal of this work is to understand the extent to which kindergarten readiness guarantees children's future reading success, a key assumption in the TGRG. In this regard, this work helps to advance understanding of how two state-legislated educational practices – kindergarten readiness screening and third-grade reading assessment – may intersect in a way that improves students' educational achievement.

Aims of this Study

The present study was designed to address three aims regarding potential linkages between kindergarten readiness (specific to reading) and the third-grade reading guarantee.

The *first aim* was to determine the extent to which kindergarten readiness scores, third-grade reading achievement scores, and any observed relations between the two reflects the school a child attends. In addressing this aim, we can determine whether the relations between kindergarten readiness and third-grade reading skills reflects *school effects*, or the likelihood that higher-performing students attend higher-performing schools and the reciprocal (lower-performing students attend lower-performing schools).

The *second aim* was to determine the extent to which kindergarten readiness predicts students' success on the third-grade reading assessment, namely the Ohio Achievement Assessment (OAA, Ohio Department of Education, n.d.). In addressing this aim, we can determine whether children who have well-developed kindergarten readiness are more likely to pass the OAA reading assessment more than three years later, relative to children who have less-developed kindergarten readiness. This aim helps us understand the extent to which there are statistically significant linkages between kindergarten skills at school entry and future reading achievement.

The *third aim* was to determine whether specific aspects of kindergarten readiness appear to be most important to future reading achievement as represented by the specific subtests contained in the kindergarten readiness assessment. Kindergarten reading skills are multidimensional, reflecting general language skills, phonological awareness, and print-related skills, such as alphabet knowledge. It may be that some of these skills are more influential to future reading achievement than others. In addressing this aim, we can learn whether there are certain readiness skills that are most important to children's future reading success.

Methods

Participants

Participants in this study were 11,515 students attending CCS who met three criteria: (1) the student entered kindergarten between the years of 2005 and 2009 and was administered the state-mandated kindergarten-readiness assessment, (2) the student was later administered the third-grade OAA between the years of 2009 and 2013, and (3) the student did not have an Individualized Education Plan (IEP) and was not identified as Limited English Proficient (LEP). Therefore, from all students enrolled in CCS during these years, students were included in the sample only if they had data reflecting both their kindergarten readiness and third-grade reading achievement, did not have an identified disability, and spoke English proficiently. The participants included were generally African American (57%), although other races/ethnicities were represented (i.e., White, 31%; Multiracial, 8%; Hispanic, 2%; and Asian, 1%). Approximately half of the students were male (47%). Seventy-seven percent of participants qualified for free/reduced lunch, indicating the generally low socio-economic status of the sample. For the third-grade assessment point, the students were enrolled in 85 different elementary schools across the city.

Measures

Kindergarten readiness was assessed with the *Kindergarten Readiness Assessment for Literacy* (KRA-L, Ohio Department of Education, 2004), a state-developed and -mandated index of children's early reading skills. The measure is administered prior to or early in the fall of the student's kindergarten year by the student's teacher. The KRA-L consists of 29 items organized into six categories, or subtests; the skills tapped by these subtests are moderately to strongly correlated with future reading skills (see National Early Literacy Panel, 2008). The six subtests include:

  (a) answering when and why questions,

  (b) repeating sentences,

  (c) identifying rhyming words,

  (d) producing rhyming words,

  (e) recognizing letters of the alphabet, and

  (f) recognizing the first sound in words they hear.

Raw scores on the KRA-L are summed across all six of the subtests, with a possible range of 0 to 29 points, with total scores used to differentiate students into three performance "bands."

- **Band 1 (lowest)** are those students who receive 0 to 13 points,
- **Band 2 (middle)** are those students who receive 14 to 23 points, and
- **Band 3 (highest)** are those students who receive 24 to 29 points.

In the present sample, the range of observed scores on the KRA-L readiness assessment was 0 to 29 (M = 17.87, SD = 6.94). With respect to band assignment, 28% of kindergarteners were in Band 1, 47% were in Band 2, and 25% were in Band 3.

Students' third-grade reading achievement was assessed with the OAA, specifically the Reading Assessment component of the measure. The OAA is given to students in grades 3 to 8 in the spring of the academic year. The Reading Assessment given in third grade requires students to read a short text (between one and several paragraphs) and to answer a set of comprehension questions.

On the basis of their performance on the spring OAA Reading Assessment, students can be differentiated into those who do and do not meet state standards regarding proficiency (Ohio Department of Education, 2010):

- **Non-proficient readers** are those who receive a **score lower than 400** on the measure; these students have *basic* reading skills (scores of 385-399), such that they can understand some of what they read and apply basic reading-comprehension strategies, or *limited* reading skills (scores of <385), such that they struggle to read even simple texts.
- **Proficient readers** are those who receive a **score of 400 or better** on the measure; these students have proficient reading skills (400-415), accelerated reading skills (416-432), or advanced reading skills (>432).

The TGRG seeks to minimize if not eliminate the number of students who are deemed to be non-proficient readers by the end of third grade. Although the initial implementation of the TGRG uses slightly lower levels as the threshold for determining proficiency (e.g., 390 in 2012-13), the threshold will increase gradually toward the conventional cut-point for proficiency (i.e., score of 400).

In the present sample, the range of observed scores on the OAA reading test was 302 to 507 (M = 404, SD = 28). Using the threshold for proficiency of 400, 57% were considered proficient readers whereas 43% were considered non-proficient readers in the 2011-2012 school year.

Results

Aim 1

The *first aim* was to determine the extent to which kindergarten readiness scores, third-grade reading achievement scores, and any observed relations between the two reflects the school a child attends. This aim sought to determine the extent to which variance in student KRA-L or OAA scores may be attributable to the school the student attends. Often, the claim is made that good students attend good schools, and poor students attend not-as-good schools. If school-level factors heavily influence student KRA-L and OAA scores, a large proportion of the variance in those scores could be attributable to the school they attend.

To examine the extent to which school-level factors influence student KRA-L and OAA scores, an intra-class correlation (ICC) was calculated. An ICC estimates the extent to which the patterns of similarities and differences in student scores can be accounted for by the school. In this case, the ICC examines whether two students in one school are more similar to one another than two students from two different schools. In the research literature, 10% is typically considered a small proportion of variance in student stores (based on the ICC).

With respect to kindergarten readiness, the results of this analysis indicate that 8% of the variance in student KRA-L scores is attributable to the school they attend (Z = 6.04, p < .001); note that these findings reflect students who enter kindergarten and remain in the CCS school system until at least third grade. In interpreting these results, note that the 8% variance explained does not reflect characteristics of schools, per se, as the students would have been enrolled in school for only a few weeks when testing occurred. Rather, this variance reflects the groupings of students who attend particular schools. Overall, study findings show that the KRA-L scores are not highly dependent upon the schools that students attend.

With respect to third-grade reading achievement, the proportion of variance attributable to schools is slightly larger; specifically, 16% of the variance in students' third-grade reading scores on the OAA are attributable to the school they attend (Z = 5.95, p < .001). It is not surprising that this value is slightly larger compared to the KRA-L scores, as students have been in school for nearly four years at the point of OAA testing. However, 20% is typically attributed to be the threshold for demarcating moderate value with respect to variance explained, indicating that only a small to moderate proportion of the variance in students' third grade reading test scores are attributable to the school they attend. Note that though the percentage of variance is small, it is still potentially impactful to understanding the relations between KRA-L and OAA Reading scores; thus, the school a student attends is controlled for in all subsequent analyses.

Aim 2

The *second aim* was to determine the extent to which kindergarten readiness predicts students' success on the third-grade reading assessment (i.e., OAA Reading Assessment). As can be seen in Table 1, there are significant relations among students' KRA-L scores and their third-grade OAA Reading Assessment Scores. In fact, the correlation between KRA-L total scores and third-grade reading scores is .47 ($p < .001$). However, although these relations are significant, indicating a positive association between kindergarten readiness and future reading, they do not explicitly inform us as to whether a child who has limited kindergarten readiness is more likely to be a non-proficient reader in third grade than is a child with a high level of kindergarten readiness.

Therefore, we examined the extent to which a student's KRA-L band score was predictive of whether that student would be deemed proficient or not on the third-grade reading test. Noted previously, students in this sample were distributed across the kindergarten-readiness bands as follows: 28% were in Band 1, 47% were in Band 2, and 25% were in Band 3. This analysis allows us to ask whether students in Band 1 at kindergarten, for example, were more likely to be non-proficient readers in third grade compared to students in Band 2 or Band 3. This analysis also allows us to consider the predictive, longitudinal correlation between students' achievement at kindergarten entry and their future achievement as readers. Figure 1 provides a graphic representation of the overlap among students' band assignment at kindergarten entry, based on the KRA-L, and their performance on the third-grade OAA in terms of passing (score of 400 or higher) or failing (score <400).

Table 1

Relations between KRA-L (kindergarten entry) and OAA reading scores (spring of third grade)

Variable	M	SD	1	2	3	4	5	6	7	8
1. KRA-L (Total)	17.87	6.94	-	0.49	0.52	0.77	0.78	0.76	0.66	0.47
2. KRA-L Answering Questions	2.45	0.86	0.49	-	0.39	0.31	0.28	0.23	0.25	0.21
3. KRA-L Sentence Repetition	3.42	1.00	0.52	0.39	-	0.32	0.29	0.26	0.26	0.21
4. KRA-L Rhyming Identification	4.72	2.02	0.77	0.31	0.32	-	0.59	0.39	0.40	0.29
5. KRA-L Rhyming Production	2.08	2.05	0.78	0.28	0.29	0.59	-	0.44	0.40	0.36
6. KRA-L Letter Identification	3.23	2.53	0.76	0.23	0.26	0.39	0.44	-	0.44	0.43
7. KRA-L Initial Sounds	1.95	1.36	0.66	0.25	0.26	0.40	0.40	0.44	-	0.32
8. OAA Reading Assessment	403.38	29.01	0.47	0.21	0.21	0.29	0.36	0.43	0.32	-

Note: All correlations were significantly different from zero (p<.001).

When examining how well a screening measure, such as the KRA-L, is able to predict an outcome, researchers often examine positive and negative predictive power. Positive
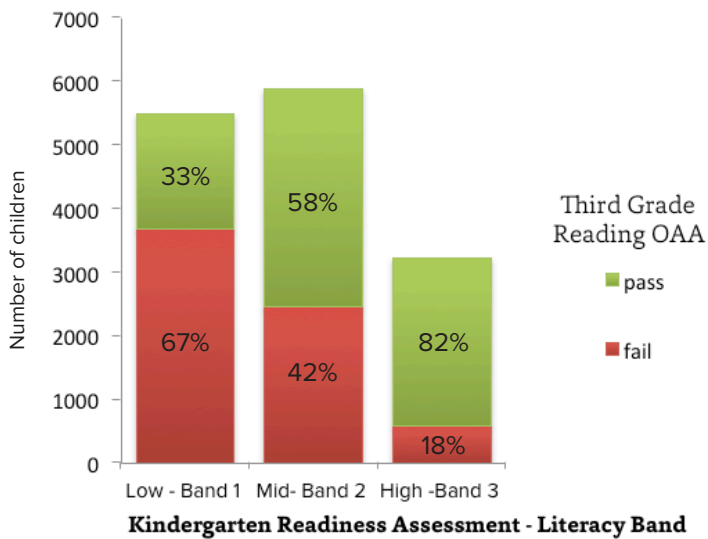
predictive power represents how likely it is that persons who score positively on the screener, such that they are identified as likely to have a problem, go on to actually have that problem. With respect to the KRA-L and the OAA reading achievement, we are interested in the positive predictive power of the KRA-L in terms of its identification of children with poor readiness skills at kindergarten entry (Band 1) and the likelihood that they will be poor readers in grade three (non-proficient readers on the OAA). Negative predictive power represents the opposite, namely the frequency with which persons who score negatively on the screener (indicating no presence of a problem) go on not to have that problem.

In the case of the KRA-L to OAA relation, overall positive predictive power was 67%, indicating that 67% of the students who tested positively for a potential problem on the KRA-L (scores within Band 1) went on to be non-proficient readers based on the third-grade OAA Reading Assessment. Negative predictive power was even stronger: 82% of students who scored in Band 3 on the KRA-L went on to later pass the third-grade OAA.

To conceptualize this another way, a student who scores in Band 3 on the KRA-L is eight times more likely to pass the third-grade OAA than a student who scored in Band 1, and is three times more likely to pass than a student who scores in Band 2. Overall, the predictive power of the KRA-L is quite high in terms of prediction of whether or not a student will eventually meet the third-grade reading guarantee.

Aim 3

The third aim was to determine whether specific aspects of kindergarten readiness appear to be most important to future reading achievement, as represented by the specific subtests contained in the kindergarten readiness assessment. Though the previous analysis showed that the positive and negative predictive power of the KRA-L are both strong, the prediction of third-grade reading success was far from perfect. For example, one-third (33%) of the students anticipated to be non-proficient readers in third grade (based on their scoring in Band 1 on the KRA-L) went on to pass the third grade reading test. Similarly, about one in five (18%) students

anticipated to be proficient readers (indicated by their scoring within the range of Band 3 on the KRA-L) went on to fail the third-grade OAA. One reason for these faulty predictions may be the reliance on the general KRA-L bands as a way to assess predictive power of kindergarten readiness rather than the more specific and accurate subtests.

We noted previously that the KRA-L represents a composite of six different subtests, which together serve to measure multiple skills important to early reading. Any one of these subtests may be more or less predictive of future reading performance than the others.
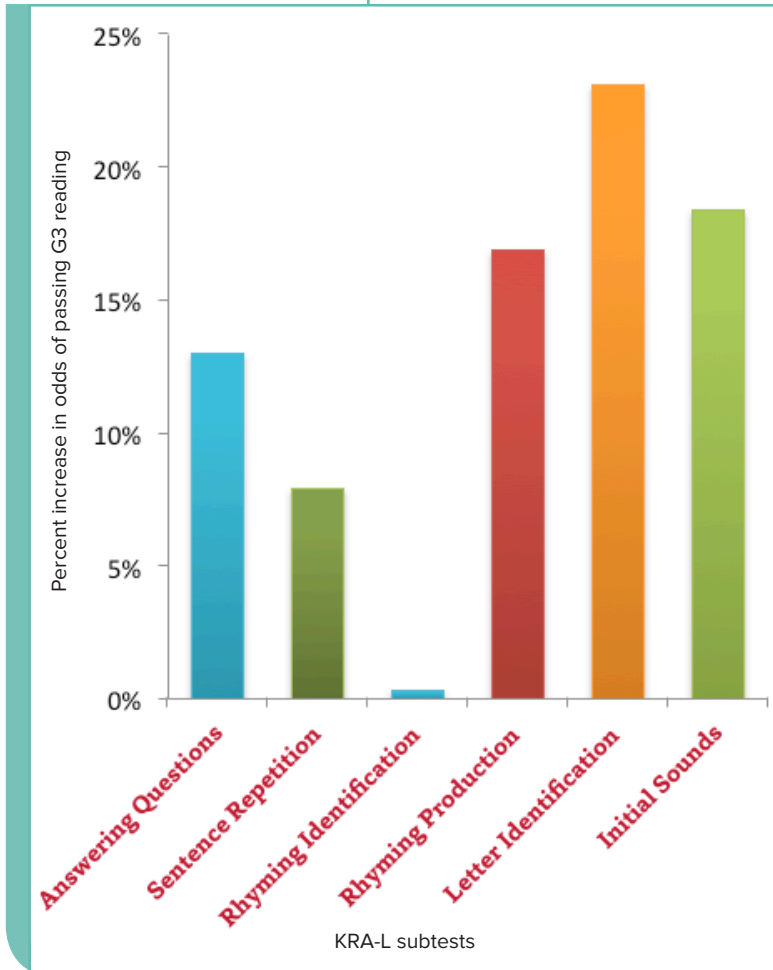
To assess this possibility, each student's score on each of the six KRA-L subtests was used to predict the probability that he/she would pass the third-grade reading test. The analytic approach involved hierarchical logistic regression, which estimates the strength of the relationship of each KRA-L subtest with the third-grade reading outcome, after controlling for the contributions of the other subtests and controlling for students' school assignment. As depicted in Figure 2, this analysis allows us to determine the increase in odds that a student will pass the third-grade reading test for every additional point scored on each of the six KRA-L subtests.

As may be seen in Figure 2, the strength of the relations between the individual subtests and third-grade reading outcomes vary. For instance, in examining the results for answering questions, we see that one additional point scored on this subtest corresponds to a 12% increase in the odds of passing the third-grade reading test (t = 4.89, p < .001). In total, five of the six KRA-L subtests were significantly related to third-grade reading scores (all t-values > 4, all p-values <.001), the exception being rhyming identification. For this subtest, a non-significant association (t = .67, p = .50) indicated that student scores on this subtest were unrelated to third-grade reading skills. For the other six subtests, the strongest predictor was the letter identification subtest, such that one additional point scored on this subtest corresponded to a 24% increase in the odds of a student passing the third-grade reading OAA. In other words, if two students score one-point differently on the letter identification subtest at kindergarten entry, the student scoring one point higher has increased odds of passing the third-grade reading test by 24%. Of additional import is noting that these two students, whose scores differ by only one point on this particular subtest, would likely score in the same band on the KRA-L.

Conclusions

The present study sought to test an assumption key to the TGRG legislation, namely the premise that kindergarteners' reading-related skills represent the first step on the path toward third-grade reading comprehension. Although a number of studies have shown moderate to strong relations between kindergarteners' reading-related skills and future reading achievement (see National Early Literacy Panel, 2008), the extent to which such relations are apparent in measures specific to the Ohio educational system and governing policies is unclear.

The results of this study, which involved a sample of more than 11,000 students in the CCS system, showed positive relations between kindergarten readiness, based on the state-developed KRA-L, and third-grade reading achievement, based on the OAA. The correlation between KRA-L and OAA Reading Assessment scores was .47, indicating a modest longitudinal association that is similar to those reported in other samples. More importantly, findings showed general stability in children's reading status over time: two-thirds of students identified as having poor kindergarten readiness were non-proficient readers in third grade, whereas four-fifths of students identified as having good kindergarten readiness were proficient readers in third grade. *To a large extent, study findings show that kindergarten readiness helps to guarantee a student's future reading success.*

An important caveat to this work concerns the kindergarten readiness assessment as applied in Ohio and, more specifically, CCS. Assessed at or just prior to kindergarten entry, children's kindergarten readiness reflects what children learned and experienced prior to arriving at formal schooling. At this time, children are the summation of all experiences they have had from the time they were born until they arrived to kindergarten. Indeed, it is these formative years, from birth to age five, that equip children with the reading-related skills that were found to be predictive of future reading success. The strong relations observed between children's readiness skills and third-grade reading success, as presented in this study, point specifically to the importance of what children experience prior to entering school, and its potential for predicting reading achievement nearly four years post-kindergarten.

However, the study findings may also speak to the importance of responding to a low level of kindergarten readiness when it is observed. The readiness skills assessed in the KRA-L, such as alphabet knowledge and phonological awareness, are malleable skills that can be improved through targeted instruction and interventions. It stands to reason that those students who had poor kindergarten readiness (i.e., were in Band 1 on the KRA-L) but who became proficient readers by third grade (identified as proficient on the OAA) were those whose kindergarten teachers vigorously responded to their limited readiness and thus changed, for the better, their reading trajectory. Future research can help us determine whether change

in reading-related skills during the kindergarten year is an important predictor of reading success at third grade.

Recommendations

Three recommendations relevant to both educational policy and practice may be derived from this work.

First, we recommend that students' performance on the KRA-L be carefully studied with respect to each of the six subtests. This recommendation is consistent with the TGRG legislation, which explicitly states that the goal of kindergarten readiness screening is to identify areas in which a student may need additional help. In other words, screening results should result in increased differentiation of kindergarten reading-related instruction. While the present study supports the validity of the KRA-L as a kindergarten screening tool, as mandated by the TGRG, we believe this is true only if the tool is used as it was designed to provide information about children's skills in six different reading-related areas. The reliance on the KRA-L's band system as a way to identify risk undermines the targeted nature of the assessment, and undermines the goal of the assessment per the TGRG.

Second, we recommend that students who do poorly on any one of three specific KRA-L subtests be prioritized as candidates for intensive interventions. With respect to guaranteeing a student's future success as a reader, the present study suggests that the six KRA-L subtests do not have equivocal predictive power. The results presented here show that some subtests are more influential to whether a student will or will not be guaranteed future reading success, particularly subtests examining letter identification, initial sounds, and rhyming production. This has important implications for identifying those skills most important for intensive efforts. For instance, if a teacher is designing instruction for a child in Band 1 who has limited skills in both rhyming identification and rhyming production, the teacher could prioritize development of rhyming production skills as these are more strongly related to reading success. Additionally, we also recommend that any student who arrives to kindergarten with limited skills in letter identification (i.e, alphabet knowledge) receive targeted interventions to develop these skills, irrespective of their KRA-L band assignment; this recommendation is based on the prominent role that alphabet knowledge plays in guaranteeing a student's reading success, as based on the OAA Reading Assessment.

Third, we recommend that the KRA-L be retained as an essential screening tool in the Ohio education system. The present study represents the only rigorous assessment of the validity of the KRA-L, which has been used with countless students statewide for nearly one

decade. The results presented here show that students' performance on this measure is associated with reading achievement *four years after its administration*, which affirms the validity of the tool as an index of early reading-related skills. Currently, the state of Ohio is developing a new kindergarten entry assessment, which is intended to encompass far more skills than only the six reading-related skills represented on the KRA-L. This is important, as it reflects the broad nature of school readiness. However, it is anticipated that the KRA-L will be removed from use when the new assessment is instituted. Given that the validity of the new assessment for predicting third-grade reading achievement cannot be assessed until at least four years into the future (the time it will take the incoming kindergarten class to finish third grade), we recommend that the KRA-L be retained as a supplemental kindergarten entry screener. Given the valuable information provided by the tool, and recognizing that it is already developed, widely used, and easy to implement and score, there is no compelling reason for it to be abandoned in educational policy and practice.

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Author Note