Ohio's Kindergarten Readiness Assessment: Does It Forecast Third-Grade Reading Success?

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INTRODUCTION

For many children, kindergarten marks their first entrance into formal schooling. Children's experiences prior to kindergarten are highly diverse, therefore the use of kindergarten-readiness screeners provides an important mechanism to determine a child's academic strengths and needs, so that teachers can provide differentiated instruction during the kindergarten year to get all children on track for longer-term academic success. In 2014, Ohio's schools implemented a new kindergarten-readiness screener – the Kindergarten Readiness Assessment (KRA). The KRA provides a broadened representation of children's readiness relative to the prior assessment, the Kindergarten Readiness Assessment-Literacy (KRA-L), which focused only on language and literacy skills. In this paper, we examined the predictive relations between children's KRA scores at kindergarten entry and their future reading achievement in third grade. Our particular interest was determining whether children who had limited readiness at kindergarten entry were at heightened risk for reading difficulties, as would be suggested in the available research, or whether Ohio's educational system was able to 'respond' to limited readiness and support children's achievement of reading proficiency by third grade. In so doing, the papers offers important considerations for policy-makers, administrators, teachers and others with respect to the use of kindergarten-readiness assessments for enhancing children's future educational outcomes.

What is Kindergarten Readiness and Why is it Important?

The transition into formal education is one of the most important transitions of early childhood. Children entering the kindergarten classroom will find it distinct in many ways from their prior caregiving environments. Today's kindergarten classroom is characterized by daily formal reading and math lessons, often featuring whole-class, teacher-led instruction. Indeed, the majority of kindergarten teachers expect children will learn to read during the school year (Bassok, Latham, & Rorem, 2016). The kindergarten classroom has fundamentally changed over the last decade to include broader content coverage (e.g., math, science, reading), less time in child-selected activities, and a greater use of worksheets (Bassok et al., 2016). For children to excel in the more academically-focused and rigorous kindergarten classroom, it is important that they arrive with some level of language, literacy, math, and social-emotional competence. Indeed, children who arrive to kindergarten with strong skills in these areas have steeper learning trajectories and better academic achievement than children with more limited skills (Duncan et al., 2007; Kurdek & Sinclair, 2001).

Unfortunately, a substantial number of children enter kindergarten with limited readiness skills. In an important, early paper on this topic, Hair and colleagues (2006) examined the school readiness skills of a nationally representative sample of kindergarteners (n = 17,219), finding that only about 30% of children arrive at kindergarten with well-developed language, cognitive, and social-emotional skills. In turn, these children out-performed those with limited kindergarten readiness at the end of first grade, nearly two years into the future, on measures of reading, math, and learning-related behaviors. Duncan and colleagues (2007) conducted a meta-analysis using six longitudinal data sets, reporting a consistent, positive relation between literacy and math at school entry and children's future achievement in a variety of content areas (Duncan et al., 2007). Such work provides strong support for the importance of kindergarten readiness to children's future educational achievement.

An important practical implication of such work is that children who arrive to kindergarten with limited readiness skills need to be identified early so that they can be enrolled in interventions to improve their skills. Extensive research studies show the effectiveness of such efforts for improving the academic outcomes of children who arrive to kindergarten with relatively limited skills. For instance, Vellutino and colleagues (1996) showed that purposeful screening of children's literacy skills at kindergarten entry through the end of first grade, and provision of small-group literacy interventions to those children identified as at-risk, can greatly reduce future reading problems among those with limited readiness skills at kindergarten entry (Vellutino et al., 1996). Specifically, the majority of children with limited kindergarten readiness in the area of literacy were proficient readers at the end of third grade, due to early screening and intervention activities.

The state of Ohio has been attentive to such evidence by developing and requiring the use of kindergarten-readiness screeners for some time. The Ohio Department of Education's Kindergarten Readiness Assessment for Literacy (KRA-L; Ohio Department of Education, 2004) was used for more than a decade by teachers to screen entering kindergarteners' initial skills in language and literacy. A validity study showed a strong, positive association between KRA-L scores and children's reading achievement in third grade (Logan, Justice, & Pentimonti, 2014). This study also showed that children who performed poorly on this screener were highly likely to do poorly on the state's third-grade reading assessment: *in fact, more than two-thirds of children identified in the lowest band of kindergarten readiness exhibited inadequate reading proficiency at the end of third grade.* This finding highlights the urgency with which kindergarten screening results need to be attended, so as to disrupt the relations between poor kindergarten readiness and future academic difficulties.

Aims of This Study

In 2014, the Ohio Department of Education (ODE) replaced the existing KRA-L with a more comprehensive screening tool, the Kindergarten Readiness Assessment (KRA; Ohio Department of Education, 2014). Extensive details of the tool as well as ongoing findings regarding its implementation are available on the ODE website, to which we refer readers (see http://education.ohio.gov/Topics/Early-Learning/Kindergarten/Ohios-Kindergarten-Readiness-Assessment). Characteristics of the KRA that distinguish it from its predecessor include (1) a more comprehensive focus on kindergarten-readiness domains, which include not only language and literacy but also mathematics, social foundations, and physical well-being and motor development, and (2) a heightened emphasis on supporting teachers to use screening results to modify their classroom instruction to meet children's readiness needs.

The 2017-2018 academic year represents the first opportunity to evaluate the validity of the KRA in terms of predicting children's third-grade reading achievement based on kindergarten-screening results. The available evidence indicates that nearly one-fourth of the state's kindergarteners exhibit limited readiness skills on the KRA (see Table 1 below), yet the intent of the revised tool is that its results provide information to kindergarten teachers that will help them to improve outcomes for children entering with limited kindergarten readiness (ODE, 2018a). Therefore, it is important to determine the extent to which children identified as having limited readiness at kindergarten entry achieve proficient reading skill by third grade. This is especially crucial in light of Ohio's third-grade reading guarantee (TGRG), passed in 2012. This legislation established requirements that every student in kindergarten through third grade be tested annually, that districts set up reading improvement and monitoring plans (RIMPs), that students in need of reading support be taught by highly qualified teachers, and, ultimately, that non-proficient readers be retained instead of promoted to fourth grade (Logan, Justice, O'Leary, & Purtell, 2019). Thus, the overall aim of this study was to determine the extent to which kindergarten readiness based on the KRA predicts students' success on the third-grade reading assessment and potential for promotion for fourth grade based on the cut-point score used in the fall TGRG implementation.

∨ **Table 1.** Percentage of Children with Limited Kindergarten Readiness Based on the KRA

Academic Year	N	Percentage of Students with Limited Kindergarten Readiness*
2014-2015	114,961	23.6%
2015-2016	112,945	22.8%
2016-2017	117,871	23.1%
2017-2018	118,113	22.4%

*Percentage of students whose scores are characterized as "Emerging Readiness", which describes students who demonstrate minimal skills and behaviors and need significant supports to succeed in kindergarten-level instruction (e.g., ODE, 2016).

Note: Data from ODE annual reports available at http://education.ohio.gov/Topics/Early-Learning/Kindergarten/Ohios-Kindergarten-Readiness-Assessment

Data Source

The dataset used in this study represents a large, urban, public school district in the state of Ohio. In total, 2,221 unique students were included who met four criteria: (1) the student was administered the state-mandated kindergarten-readiness assessment in the 2014-2015 academic year, (2) the student was administered the third-grade reading assessment in the 2017-2018 academic year, (3) the student did not have an Individualized Education Plan (IEP), and (4) the student was not identified as Limited English Proficient (LEP). For the purpose of anonymizing the district represented by this data, we do not provide additional demographic data regarding the participating students.

Measures

Kindergarten Readiness Assessment

Students' kindergarten readiness was assessed using the state-mandated KRA, which replaced the KRA-L in August 2014. The measure, which is based on Ohio's Early Learning and Development Standards-Birth to Kindergarten Entry (Ohio ELDS, n.d.) is administered in the early fall of kindergarten by the student's teacher. The KRA is a 50-item, multi-modal assessment including both student responses to questions and teacher-reported observations of the student's classroom behaviors. The tool assesses four areas of development: Language and Literacy, Social Foundations, Mathematics, and Physical Well-Being & Motor Development.

Children receive an overall kindergarten readiness score as well as a score in each of the four areas. Children are categorized as either "emerging", "approaching", or "demonstrating" readiness (see Table 2) based on their overall scores. For a student to be "demonstrating readiness," they must demonstrate readiness on all four domains (see ODE, 2018).

∨ **Table 2.** Kindergarten Readiness Categories for the KRA (ODE, 2016).

Category	Scores	Description
Emerging Readiness	202-257	Exhibits minimal readiness skills and behaviors
Approaching Readiness	258-269	Exhibits some foundational readiness skills and behaviors
Demonstrating Readiness	270-298	Exhibits full spectrum of foundational readiness skills and behaviors

Note: The ODE-specific definitions can be found on the ODE website.

In the present sample, the range of observed scores on the overall KRA assessment was 202 to 298 (*M* = 264.18, *SD* = 12.93). With respect to performance levels, 28% of children were emerging, 41% were approaching, and 31% were demonstrating kindergarten readiness (see Figure 1). The percentage of children in the present sample with emerging readiness (28%) was slightly higher than reported for Ohio's kindergarten cohort for the 2014-2015 academic year (23.6%).

∨ **Figure 1.** Percentage of students within each performance level on the KRA

Overall KRA

28% · 41% · 31%

■ EMERGING   ■ APPROACHING   ■ DEMONSTRATING
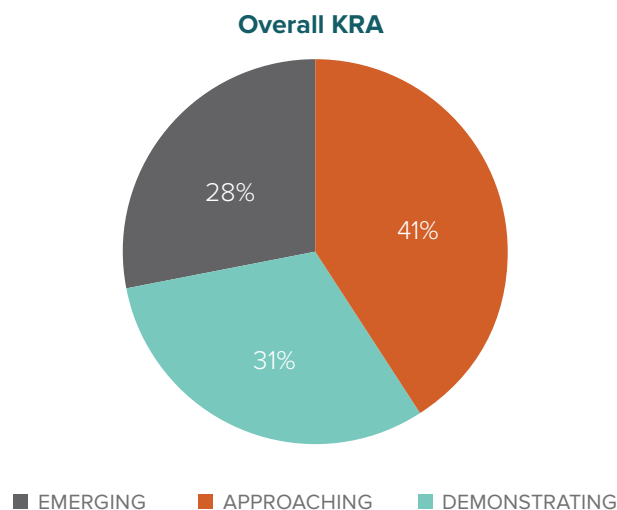
As for the four domains (see Figure 2), the scores again ranged from 202 to 298. Children scored highest on the Social Foundations domain (M = 272.89, SD = 19.79) and lowest on Mathematics (M = 261.51, SD = 14.81). There are no cut-scores for performance in the areas of Social Foundations, Physical Well-Being & Motor Development, or Mathematics; the averages are provided to give teachers a sense of the strengths and areas for improvement for children in their classrooms. The Language and Literacy domain, however, does have a cut-score of 263; those who score at 263 or above are considered, "on track" (n = 1,132, or 51% of the present sample).

⌄ **Figure 2.** Average KRA subscores for each of the four domains
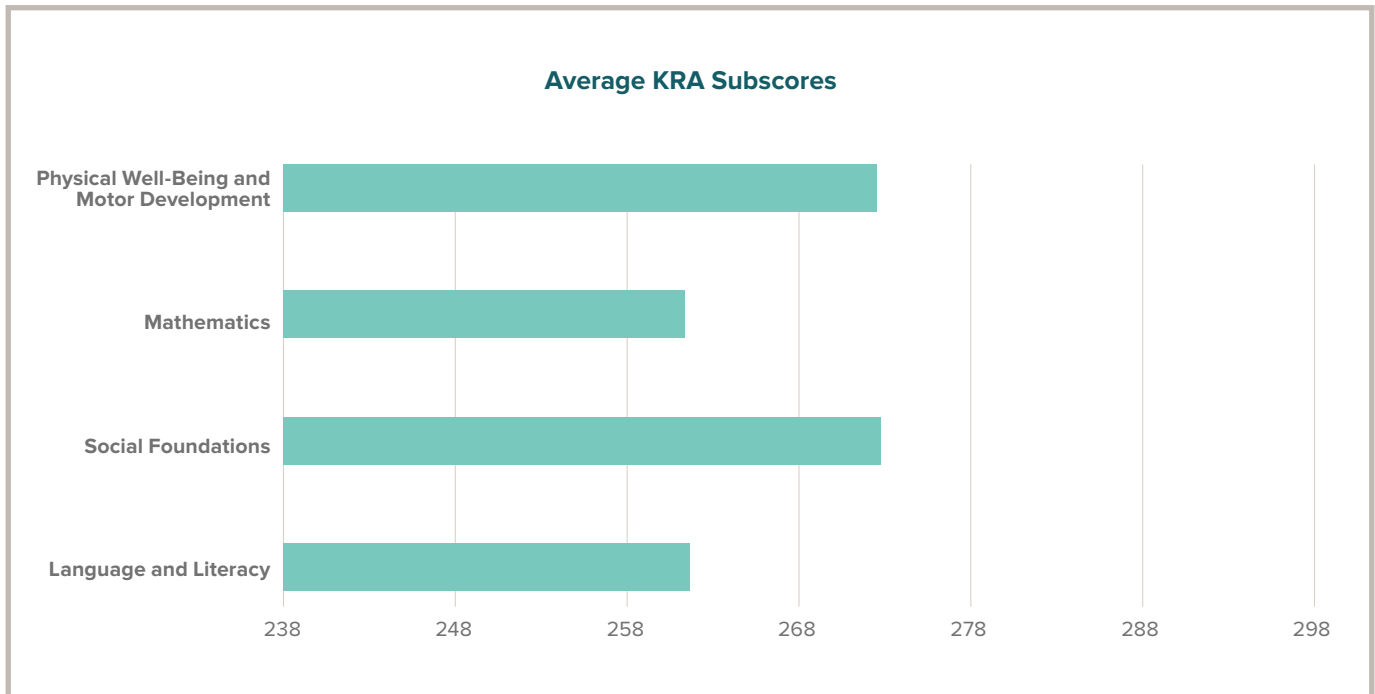
Grade 3 English Language Arts Test

Third-grade reading proficiency was measured by the state-mandated Grade 3 English Language Arts (ELA) test, which is given in the fall and spring of third grade. ODE worked with Ohio educators and the American Institutes for Research to develop this assessment. The three-digit scaled score from the ELA is used for the purpose of deciding whether a student met the Third Grade Reading Guarantee (TGRG) based on the cut-point score used for a given academic year (for more information, see ODE, 2018b).

ELA scaled scores range from 545 to 863, and children are grouped into one of five categories based on their scaled score (see Table 3). Children must score at least 700 to be considered "proficient" in ELA; those who score below 700 are considered, "limited" or "basic", and those who score at 725 or higher are considered "accelerated" or "advanced". For the 2018-2019 school year, the TGRG cut-point score was 677. Importantly, there is also a reading subscale of the ELA test; this is based on the reading items only and is an approved alternative reading assessment for assessing eligibility for promotion to fourth grade. Children who score 45 or higher on the reading subscale (i.e., demonstrate reading competency) will be eligible for promotion to the next grade, *even if the student scores below the promotion score of 677 on the ELA test.*

In the present sample, we examined fall of third grade ELA scaled scores as our outcome of interest. For this sample, ELA scaled scores ranged from 545 to 833 (M = 667.65, SD = 46.27). Exactly 50% of children met the Third Grade Reading Guarantee based on the ELA (i.e., scored 677 or higher) or on the reading subscale (i.e., scored 45 or higher). Children in the dataset we analyzed were already dichotomized into those who did or did not meet criteria for promotion, and we use this indicator in our analyses.

It is important to note that this percentage of students who did not meet the promotion score for the TGRG is not the same percentage of students who will be retained, as students have additional opportunities to retake the ELA and alternative assessments through the spring and summer of 2018. However, the promotion score is relevant for consideration in these analyses, as it provides a policy-relevant indicator of third-grade reading achievement. We use the TGRG cut-point as applied in the fall; this indicates the children who, in the fall of third grade, are not adequately reading and need prompt remediation.

∨ **Table 3.** Reading Categories based on Performance on the Grade 3 ELA Test (ODE, 2018b).

Category	Scores	Description
Advanced	752-863	Student can ask and answer advanced questions about a story and write a well-organized opinion based on the facts presented.
Accelerated	725-751	Student can cite details of a story to explain the main idea, use context to figure out unfamiliar words, and write an organized opinion.
Proficient	700-724	Student can describe the main idea by citing details in the story, understand most common words and phrases, and draw from the text to write an opinion.
Basic	672-699	Student can identify the main idea and some important details, understand some common words and phrases, and formulate a written opinion based on a cursory organization of facts.
Limited	545-671	Student cannot point out important details of a story, understand common words and phrases, or construct a written opinion supported by the story.

Note: More information about these categories is available at: https://oh.portal.airast.org/core/fileparse.php/3094/urlt/OST_Fall18_G3_ELA_Guide.pdf

Results

The primary aim of this study was to determine the extent to which kindergarten readiness based on the KRA predicts students' performance on the Grade 3 English Language Arts test in fall of the school year. The data used in these analyses are longitudinal, with a span of approximately 3.5 years between the kindergarten and third-grade assessments.

As an initial examination of these longitudinal data, we examined correlations among the KRA scores and third-grade ELA scores. As can be seen in Table 4, there are significant relations among students' KRA scores (overall and sub-domains) and their scores on the Grade 3 ELA test. The correlation between KRA overall scores at kindergarten entry and the Grade 3 ELA test is .49 (p < .01). A child's Language and Literacy score on the KRA is also positively and significantly associated with third-grade ELA performance at .46 (p < .01). This is considered a large effect size in terms of correlational analyses (Bosco, Aguinis, Singh, Field, & Pierce, 2015), indicating that the relations between kindergarten readiness and third-grade reading achievement in this sample is of appreciable magnitude.

A few other findings regarding these correlational analyses warrant note. First, children's Math scores at kindergarten were positively and significantly associated with third-grade reading (r = .48), slightly more strongly than Language and Literacy scores (r = .46). Second, children's Social Foundation and Physical Well-Being & Motor Development scores are significantly but relatively weakly related to third-grade reading (r = .31 and .28, respectively).

⌄ **Table 4.** Relations between Overall KRA, KRA subdomains, and Grade 3 English Language Arts Score

Variable	1	2	3	4	5	6
1. Overall KRA	—	0.79**	0.90**	0.85**	0.70**	0.49**
2. SF		—	0.57**	0.49**	0.76**	0.31**
3. LL			—	0.76**	0.50**	0.46**
4. MATH				—	0.42**	0.48**
5. PMD					—	0.28**
6. 3G ELA						—
Mean	264.18	272.89	261.59	261.51	272.55	667.65
SD	12.93	19.79	14.67	14.81	16.63	46.27

Note: ** p < .01. SF = Social Foundations, LL = Language and Literacy, MATH = Mathematics, PMD = Physical Well-Being & Motor Development

Our next analyses examined the extent to which children's categorical KRA performance levels were predictive of whether students would meet the Third Grade Reading Guarantee based on a passing score on the ELA or the reading subscale. As noted previously, 28% of students were emerging, 41% were approaching, and 31% were demonstrating readiness at kindergarten entry based on the KRA. This analysis allows us to ask whether students who scored the lowest on kindergarten readiness (i.e., emerging readiness) were less likely to meet the TGRG compared to those who were approaching or demonstrating readiness.

When examining how well a screening measure, such as the KRA, is able to predict an outcome, researchers often examine positive and negative predictive power. In this case, we were interested in the positive predictive power of the KRA in terms of its identification of children with limited readiness skills (i.e., those in the emerging readiness category) at kindergarten and the likelihood that they will be non-proficient readers in third grade (i.e., those not meeting the TGRG cut-point). Negative predictive power indicates the opposite, that is, it indicates the frequency with which children who were demonstrating readiness in kindergarten (indicating no presence of a problem, characteristic of being in the approaching or demonstrating readiness categories) go on to meet the TGRG cut-point in the fall of third grade.

In the case of the predictive power of the KRA to reading achievement in third grade, overall positive predictive power was 74%, indicating that 74% of children who tested positively for a potential problem on the KRA went on to score below the passing promotion score on the fall assessment of ELA or reading subscale. Negative predictive power was even stronger; 77% of students who scored as demonstrating readiness on the KRA were already meeting the Third Grade Reading Guarantee by the fall of third grade (see Figure 3). Of additional note are those children who were approaching readiness at kindergarten entry: these children had roughly a 50% chance of meeting or not meeting the TGRG. Moreover, students who score as demonstrating readiness on the KRA are roughly three times as likely to meet the TGRG at the start of third grade compared to students who score as emerging readiness on the KRA.

Figure 3. Perforance Levels: KRA
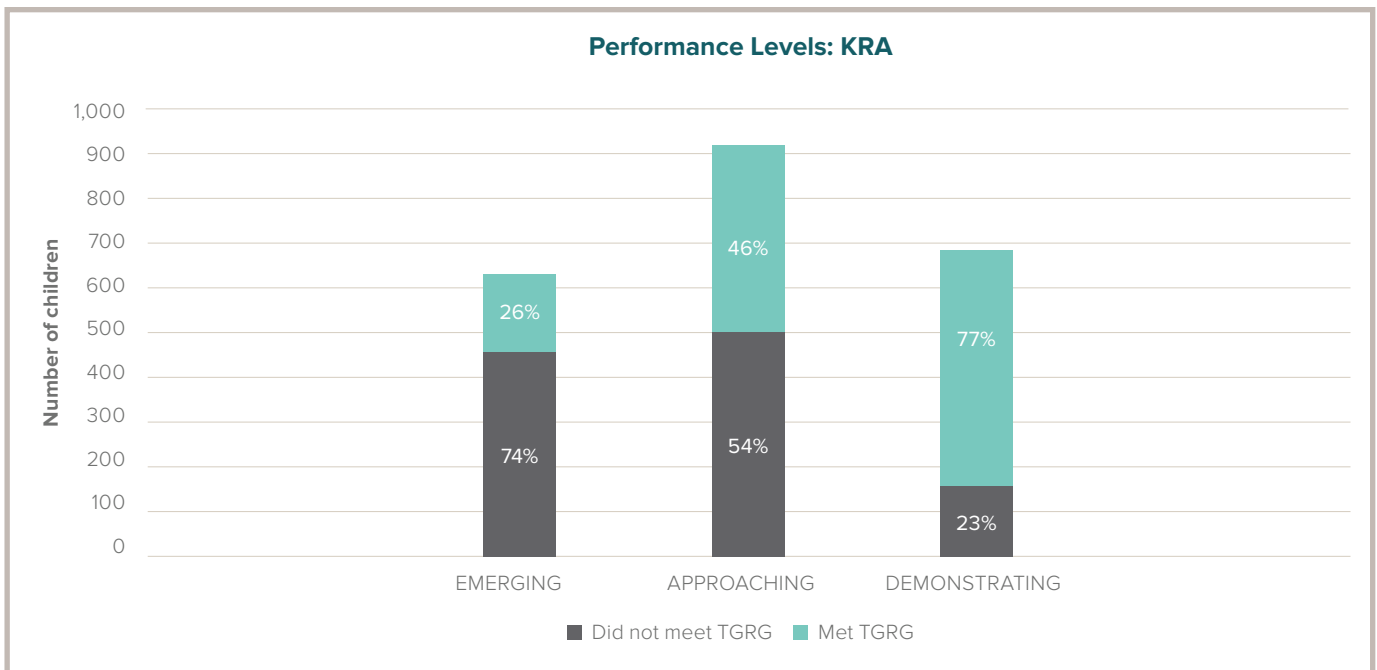
It is also useful to consider whether the Language and Literacy area of the KRA is particularly important when predicting students' future third-grade reading proficiency. As noted previously, the Language and Literacy area of the KRA has a cut off score of 263; children who score at 263 or higher are on track for reading proficiency by third grade, whereas children who are lower are considered to be not on track. As shown in Figure 4, the overall positive predictive power for the Language and Literacy area was 67%. This indicates that two-thirds of children who were not on-track with regards to their Language and Literacy skills in kindergarten subsequently did not meet the TGRG. Negative predictive power was nearly identical; 66% of students who were on-track with regards to their Language and Literacy skills on the KRA went on to meet the TGRG cut-point. Children who are on-track in Language and Literacy in kindergarten are twice as likely to meet the TGRG compared to children who are not on track.

∨ **Figure 4.** Percentage of students on- or off-track on KRA-Language and Literacy at kindergarten entry and whether they met- or did not meet TGRG in the fall of third grade.

On/Not on Track Language and Literacy (LL) KRA
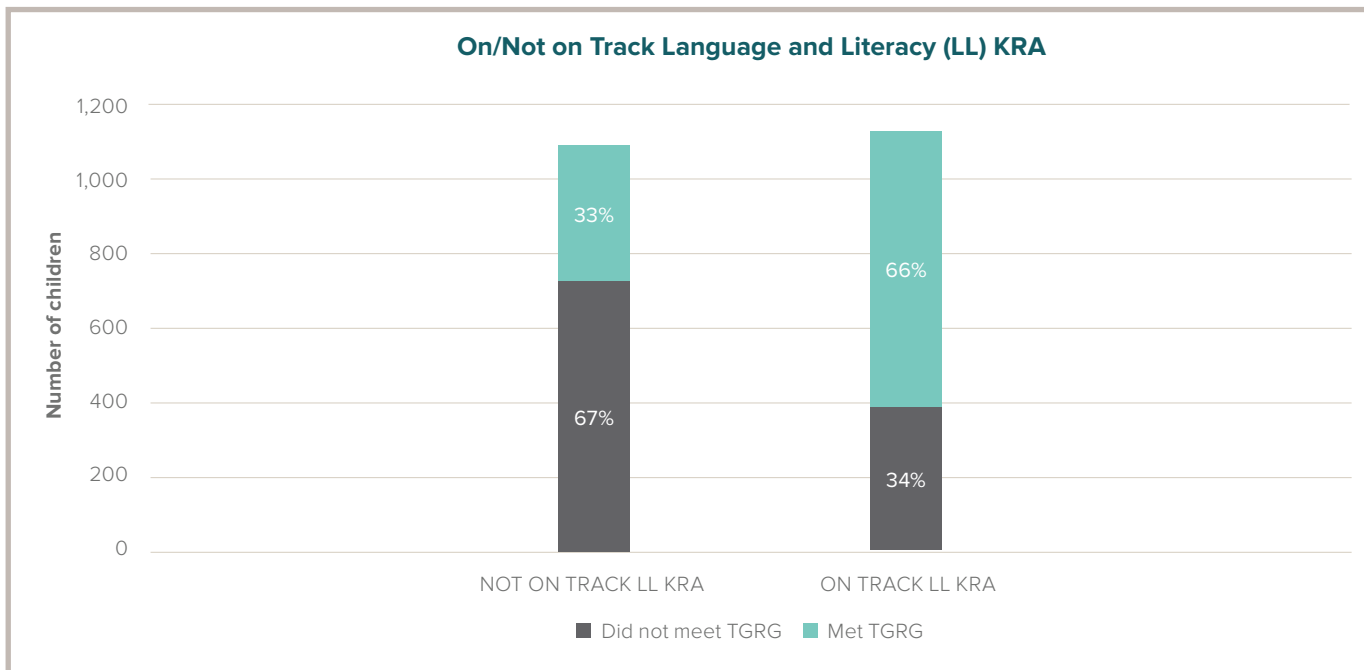
Discussion and Recommendations

The present study sought to examine the longitudinal, predictive relations between children's kindergarten readiness as measured by the state-mandated KRA and their future third-grade reading performance based on fall implementation of the ELA test. We were particularly interested in how children who were identified as having limited readiness in fall of kindergarten would fare with respect to proficiency on the ELA in light of the state's third-grade reading legislation and the application of a cut-point to identify children with insufficient reading proficiency to matriculate to fourth grade. To our knowledge, this is the first study to examine the longitudinal relations between KRA scores and third-grade reading achievement, as the 2017-2018 academic year was the first cohort of third graders for whom KRA scores were available.

The results of this study have substantial implications to the policy and practice landscape of primary education in Ohio. First, study findings demonstrate the predictive validity of KRA scores to future third-grade reading achievement for this cohort of students. Approximately 25% of the variance in third-grade ELA performance was explained by children's KRA scores. The tool functions almost identically to its predecessor (the KRA-L) in terms of its predictive relations to third-grade reading achievement (Logan et al., 2014). To this end, the KRA appears to be a useful tool for assessing children's readiness at school entry, given the tool's prognostic performance.

The results of this study suggest that the KRA has strong predictive validity four years after entry to kindergarten. This suggests that the KRA be retained for its use as a state-wide measure of kindergarten readiness. Further, the results of this study suggests that the Language and Literacy and Mathematics sub-domains have the strongest predictive relations to future reading achievement. Future research is encouraged to determine whether the Social Foundations and Physical Well-Being & Motor Development sub-domains of the KRA predict other outcomes of interest (e.g., social-emotional skills) at third grade.

Second, study findings also show the serious, concerning pattern by which limited kindergarten readiness is a particularly strong indicator of future risk for reading difficulties among Ohio's youngest students. In this sample of 2,221 children, *three out of four children* (74%) who performed in the lowest category of the KRA at kindergarten entry did not meet the fall of third-grade cut-point for reading proficiency as designed by the state's TGRG legislation. *This positive predictive power is unexpectedly high, and is even higher than the same relation for the KRA-L* (66%; Logan et al., 2014). We might expect that in the subsequent three years of schooling, from first to third grade, these odds could be reduced through ongoing screening and intervention. However, it is also possible that such interventions are happening, and without those interventions, this number would be even higher. These results suggest that schools need to provide additional supports to students with limited school readiness. These results may also reflect a need for clear and efficient reporting of the KRA results back to kindergarten teachers, with immediate suggestions for how to intervene with children of different skill sets. We recommend that this finding be replicated across other districts using state-wide data to determine if this finding can be generalized more broadly. If so, there is a significant and serious need to rapidly improve educators' responsiveness to KRA data as well as subsequent literacy test results to mitigate children's risks for poor reading achievement.

In sum, this white paper demonstrates the predictive validity of the KRA, but raises significant questions regarding why children deemed at-risk on the KRA at school entry are performing so poorly in reading achievement by third grade. The intent of the tool, as coupled with the state's third-grade reading legislation passed in 2012, is for it to be used to proactively to identify and respond to presence of reading risks from kindergarten forward. Given that three of four children in this sample who were identified with limited readiness at kindergarten did not meet the third grade ELA test's cut-point for proficiency at the start of third grade, the evidence suggests that use of kindergarten-readiness screenings is not currently meeting its intended goal.

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An advance copy of this white paper was shared with the Ohio Department of Education.

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