

The Componential Model of Reading: Predicting First Grade Reading Performance of Culturally Diverse Students From Ecological, Psychological, and Cognitive Factors Assessed at Kindergarten Entry

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Abstract

This study, framed by the component model of reading (CMR), examined the relative importance of kindergarten-entry predictors of first grade reading performance. Specifically, elements within the ecological domain included dialect, maternal education, amount of preschool, and home literacy; elements within the psychological domain included teacher-reported academic competence, social skills, and behavior; and elements within the cognitive domain included initial vocabulary, phonological, and morpho-syntactic skills, and alphabetic and word recognition skills. Data were obtained for 224 culturally diverse kindergarteners (58% Black, 34% White, and 8% Hispanic or other; 58% received free or reduced-price lunch) from a larger study conducted in seven predominantly high poverty schools ($n = 20$ classrooms) in a mid-sized city school district in northern Florida. Results from a hierarchical multiple regression (with variables in the ecological domain entered first, followed by the psychological and cognitive domains) revealed a model that explained roughly 56% of the variance in first grade reading achievement, using fall-of-kindergarten predictors. Letter-word reading and morpho-syntactic skill were the strongest significant predictors. The findings largely support the CMR model as a means to understand individual differences in reading acquisition and, in turn, to support data-based instructional decisions for a wider range of children.

Keywords

beginning reading, kindergarten, home literacy environment, oral language, dialect

There is widespread concern that too many students who live in poverty significantly underperform in reading compared to their more affluent peers (National Assessment of Educational Progress [NAEP], 2007). It is also problematic that more than a third of all American fourth graders perform below basic level on the reading comprehension portion of the NAEP and that reading performance is even lower for minority students (e.g., of fourth graders, 53% of Blacks and 50% Hispanics performed below basic level). Reading difficulties limit school performance, are a frequent cause for referral to special education, and, in turn, limit employment opportunities (e.g., Adams, 1990; Mastropieri, Leinart, & Scruggs, 1999). Specifically, researchers report that the ease with which children acquire foundational skills in two domains of early literacy—code-focused skills (letter

knowledge and phonemic awareness) and meaning-focused skills (oral language and comprehension)—shapes their future reading development (National Institute of Child Health and Human Development, Early Child Care Research Network [NICHD-ECCRN], 2005; Storch & Whitehurst, 2002; Whitehurst & Lonigan, 1998). Thus, understanding ways to optimize reading instruction for beginning readers, particularly among children from minority backgrounds, many of whom

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enter school with weaker reading readiness, which has been associated with poverty, is vital given robust and converging findings that the trajectory of reading growth is established early in children's school careers and that it becomes increasingly difficult to close the gap between strong and weak readers (Coyne, Kame'enui, Simmons, & Harn, 2004; Good, Simmons, & Kame'enui, 2001; Juel, 1988; Torgesen & Burgess, 1998). Given that oral language skills are important predictors of subsequent reading performance (National Early Literacy Panel [NELP], 2008; National Reading Panel [NRP], 2000; Snow, Burns, & Griffin, 1998), some researchers have hypothesized that students who begin school speaking a dialect other than mainstream American English (MAE) may be at a disadvantage with regard to reading achievement (Campbell, Dollaghan, Needleman, & Janosky, 1997).

Using a Componential Model of Reading to Understand Differences in Reading Performance

Aaron, Joshi, Gooden, and Bentum (2008) proposed the component model of reading (CMR), which we use as a framework for understanding individual differences in reading acquisition within a majority minority sample that includes many speakers of Non-Mainstream American English (NMAE). Essentially, the CMR is composed of three domains that are relevant to the current study. The first domain they described, the *cognitive domain*, is composed of children's code-related skills and their language- or meaning-related skills. For the purposes of the present study, we assessed early code-related skills that the NELP (2008) identified as important predictors, including letter naming, phonological awareness, and letter-word reading. We also assessed important linguistic skills, including expressive vocabulary, or semantics, which refers to knowledge about the meaning of words, and morpho-syntax, or the understanding of sentence structure and grammatical rules. We hypothesized, based on the NELP findings, that the strongest predictors of first grade reading would be factors within this cognitive domain.

As conceptualized by Aaron and colleagues, the second domain is the *psychological domain* and includes elements such as teacher expectations and students' motivation, interest, and behavior. These skills consistently contribute to students' performance in the classroom, whether observed directly (Pianta, Belsky, Houts, Morrison, & NICHD-ECCRN, 2007) or indirectly using teacher report (Connor et al., 2010). In the present study, we used a reliable and valid teacher checklist to assess three elements within this domain: students' academic skills, social skills, and behavior. We hypothesized that kindergarten teachers' perceptions of their students' school-entry skills in this psychological domain would be related to students' cognitive skills and therefore

would predict first grade reading performance, albeit less strongly than direct measures of cognitive skills such as letter-word reading.

Finally, Aaron and colleagues conceptualized the third domain as *ecological*, and it includes the components of home or classroom environment and dialect of the school community and of individual students. In the present study, we did not directly measure the classroom environment, but instead we focused on the ecological domain prior to school entry and on dialect use. This focus relates to concerns that a large proportion of students who have reading difficulties come from low socioeconomic households, including many children who are speakers of NMAE. We surveyed parents about their own education, their child's preschool attendance, and the home literacy environment. Home literacy factors have been shown to have an effect on reading achievement in young children (Swalander & Taube, 2007); research suggests that when parents spend an extensive amount of time reading, and when there are many books in the home, children are less likely to encounter problems with reading in school (Snow et al., 1998).

Our interest in dialect is informed by research findings related to the importance of dialect variations not only among Black students, who may speak a version of NMAE known as African American Vernacular English (Campbell et al., 1997; Craig, Zhang, Hensel, & Quinn, 2009), but also among other students who speak Southern White Vernacular English, which is another form of NMAE (Oetting & McDonald, 2001). Researchers working in the field of language impairment have shown that dialect use is distinguishable from language impairment in samples of Black students (Craig & Washington, 2000) and Black and White samples (Oetting & McDonald, 2001; Qi, Kaiser, Milan, & Hancock, 2006). Moreover, Craig and Washington (2000) found a stronger relation between nonverbal cognitive skills and language than between dialect and language, and Qi and colleagues (2006) reported that maternal education was significantly related to language scores. Specifically, children's language scores were 5 points lower when their mothers had only a high school degree compared to some college education or a bachelor's degree.

Four additional studies have predicted reading performance of speakers of NMAE from factors that would be considered within the CMR cognitive and ecological domains, with equivocal findings related to the contribution of dialect. Craig, Connor, and Washington (2003) predicted the reading comprehension of 50 Black preschool and kindergarten students on the *Metropolitan Achievement Test* (Barlow, Farr, & Hogan, 1993) using (a) a researcher-made dialect variation measure to assess NMAE usage, (b) a standardized test of nonverbal cognition, and (c) language samples to measure C-unit length, complexity of syntax, wh-questions, and number of different words. Only the complexity of syntax and the nonverbal cognition test were found to be significant

predictors; dialect did not play a significant role in predicting their early reading.

Connor and Craig (2006) also studied the role of NMAE in predicting language and emergent literacy skills in a set of 63 Black children 4 and 5 years old. Several assessments were given in the fall and spring to measure NMAE use and reading achievement. NMAE use decreased from fall to spring but vocabulary increased, and both were significant predictors of literacy. In addition, students' performance on the dialect variation measure had a significant relationship to spring rhyming skills, sentence imitation, and letter-word identification. Thus, the study found that not only dialect variation but also the decline in dialect usage played an important role in predicting success in literacy for young students. Therefore, findings indicate that factors in both the cognitive and ecological domains combine to predict reading success.

Craig et al. (2009) also evaluated contributions of variables within the ecological domain to reading performance in their examination of the effect of dialect shifting on reading achievement scores. They reported that dialect variation and reading achievement were negatively correlated in their sample of 165 elementary-grade students who were speakers of NMAE. The denser the dialect variation from MAE, the lower the reading score. In addition, a significant correlation was found between oral language and comprehension.

Finally, Terry, Connor, Thomas-Tate, and Love (2010) examined the relationship among dialect use, school environment, and literacy for 780 students in the first grade. Researchers found that socioeconomic status, but not race, predicted reading. In addition, they reported a nonlinear relationship between dialect use and reading. Students exhibiting very high and very low amounts of dialect variation were found to have higher scores in reading than those who only had moderate dialect use. Therefore, within the ecological domain, socioeconomic status played a stronger role than race, and dialect use was not linear in its relation to reading achievement.

Because findings across studies about the strength of relations among cognitive, psychological, and ecological domains with reading have been equivocal in samples with speakers of NMAE, there is a need for additional research that includes all three domains simultaneously. Thus, as part of our ecological domain, we assessed students' dialect when they entered kindergarten and hypothesized that more NMAE use would be associated concurrently with generally weaker language scores and would predict lower end-of-first-grade reading scores. In addition, we hypothesized that the home literacy environment and parent education might initially appear to predict reading but would likely not continue to add unique prediction once early literacy skills enter the prediction model.

Study Purpose

The purpose of the present study is to examine the relative influence on first grade reading performance of the three CMR domains: ecological (dialect, maternal education, and home literacy), psychological (teacher-reported academic competence, social skills, and behavior), and the cognitive (vocabulary, morpho-syntactic, and phonological skills and alphabetic and word recognition skills). Our first research aim was to describe the concurrent relations among the domains at school entry. Our second, and primary, research aim was to evaluate the relationship between independent predictor variables in each domain assessed in kindergarten at school entry and the dependent variable of first grade reading performance. We tested this model with a diverse sample of students who had participated in a larger correlational observation study of reading instruction and student response (see Al Otaiba et al., in press). Specifically, a majority of students in this sample, regardless of ethnicity, spoke NMAE.

Method

Participants

The present study involved a secondary analysis of data collected within 20 classrooms in seven predominantly high poverty schools in a midsized city school district in northern Florida. Four of these seven schools received Title I funding, two schools received Reading First support, and all schools had a reading coach. Across all schools, explicit and systematic reading instruction occurred for a minimum of 90 min per day within a full-day academically oriented kindergarten program. The core reading program used by six schools was *Open Court*, published by SRA (Bereiter et al., 2002), and the remaining school used *Reading Mastery Plus*, published by SRA. Our analysis of these core programs confirmed that they provided both code-focused (phonological awareness, letter naming and letter sound, decoding, and word recognition) and meaning-focused (vocabulary and listening comprehension and beginning reading comprehension) instruction (Al Otaiba, Kosanovich-Grek, Torgesen, Hassler, & Wahl, 2005).

Of the 21 participating teachers, 2 cotaught; thus, the sample represented 20 classrooms (ranging from 1 to 4 teachers per school). All teachers were credentialed; the majority held bachelor's degrees (81%), and four held graduate degrees (19%). All were female; the majority (15) were White, 5 were Black, and 1 was Hispanic. On average, teachers had taught for 5.71 years ($SD = 5.06$), and only one was a first-year teacher. Generally, in our earlier investigation (Al Otaiba et al., in press) we observed classroom instruction and determined that it was effective and that it included relatively more code-focused than

meaning-focused instruction. Specifically, in this earlier study we analyzed videotapes of classroom reading and language arts instruction in fall, winter, and spring. On average, students received 27.28 min ($SD = 10.44$ min) of code- and 21.51 min ($SD = 11.00$) of meaning-focused instruction each day. Furthermore, teachers' overall mean instructional effectiveness rating (scores included 0 = *not observed*, 1 = *not effective*, 2 = *effective*, 3 = *highly effective*) on the *Classroom Observation Instrument* (Gersten et al., 2005; Haager, Gersten, Baker, & Graves, 2003) was 2.22 ($SD = 0.35$), suggesting that across the year, instruction was generally rated as *effective* to *highly effective*. With regard to reading instruction more specifically, teachers were similarly effective ($M = 2.26$, $SD = 0.38$).

Within these 20 classrooms, a total number of 224 kindergarten culturally diverse students completed the study; 58% of the students were Black, 34% were White, and 8% were Hispanic or Other, and 57.6% received free or reduced-price lunch. As is typical within this district in northern Florida, less than 2% of students had limited English proficiency. Slightly more than half of the participating kindergartners were female (56.25%), and their mean age at school entry was 5.4.

Measures

First grade reading outcome measure. Comprehension and general reading ability were assessed with the *Stanford Achievement Test—Tenth Edition* (SAT-10; Harcourt Educational Measurement, 2003). At the end of first grade, the school district required students to complete the SAT-10, which was administered in whole group. The first grade SAT-10 includes the following subtests: Word Study Skills (skills include structural and phonetic analysis), Word Reading (skill includes multiple printed word to picture), and Sentence Reading and Reading Comprehension (skills include predictable text, onset-rime, two simple sentences, two sentence stories, cloze, short passages with questions, literary, informational, functional, initial understanding, interpretation, and critical analysis and strategies).

Predictors from the cognitive domain: Early literacy and language measures. To assess word reading performance, the Letter-Word Identification subtest of the *Woodcock-Johnson-III* (WJ-III) was used (Woodcock, McGrew, & Mather, 2001). This subtest consists of 76 increasingly difficult items starting with identifying letters and then reading words. Testing is discontinued after six consecutive incorrect items. Reliability for this measure is .91. At kindergarten, concurrent intercorrelations with the Word Attack and Passage Comprehension subtests of the WJ-III are between .80 and .79, respectively.

To assess letter knowledge, scores were obtained from the school district on the Letter Naming Fluency (LNF) test of the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Kaminski & Good, 1996, 1998). The LNF task is

a measure of alphabetic awareness that assesses a child's ability to name letters. The examiner presents an array of upper- and lowercase letters presented in random order and asks students to name as many letters as they can in 1 min. Test authors report alternate-form reliability of .99.

To assess fall phonological awareness, the blending and elision tasks from the *Test of Preschool Early Literacy* were used (Lonigan, Wagner, Torgesen, & Rashotte, 2007). These tests have a reliability alpha of .87.

The Picture Vocabulary subtest of the WJ-III (Woodcock et al., 2001) was used to assess students' expressive vocabulary. Testers point to pictures on each page and ask students, "What is this?" Students are scored based on the accuracy of their response. Testing is discontinued after six consecutive incorrect items. Reliability of this subtest is .77.

To assess morpho-syntactic skills, we administered a subtest of the *Diagnostic Evaluation of Language Variation Test* (DELV; Seymour, Roepert, & de Villiers, 2003). The main purpose of the DELV is to distinguish language variations resulting from dialect difference from language impairment. Therefore, within the cognitive domain, we used items related to morpho-syntactic skill (Items 1–11 of 17). These items assess language impairment risk and have undergone a recent item response theory analysis with vertical scaling (Petscher, Connor, & Al Otaiba, in press). The items include possessive pronouns. For example, the examiner points to a picture of a girl and states, "She has a ball." After the examiner points to a ball, the child is asked to finish the sentence "The ball is ____." Therefore, the correct answer is *hers*. Additional items target singular subjects with copula prompted by wh-questions. D-scores, which are similar to Rasch scores, were used for the analysis.

Predictors from the psychological domain: Academic competence, social skill, and problem behavior. Teachers completed the *Social Skill Rating System* checklist (Gresham & Elliott, 1990). This measure is a nationally standardized rating scale with 57 items that yields scores in academic competence, social skills, and problem behavior. Internal reliabilities of the scales were .90 or higher.

Predictors from the ecological domain: Parent education, home literacy, preschool predictor, and dialect measures. Home literacy was assessed using a questionnaire, completed by parents, about factors related to children's home literacy environment (i.e., number of books in the home, amount of time children were read to), their preschool history, and their parents' education. Previous work using this survey instrument has demonstrated significant correlations between these factors and children's phonological, language, and reading skills (e.g., Al Otaiba, Connor, Folsom, Greulich, Meadows, & Li (2011). The response rates on this questionnaire varied by item from 87% to 84%. Table 1 summarizes data regarding years of preschool, parental education, amount of time children are read to, and number of books in the home.

Table 1. Parental Education, Preschool, and Home Literacy Survey Data

	<i>n</i>	%
Child's preschool attendance		
Attended	162	72.3
Did not attend	24	10.7
Not reported	38	17.0
Years of pre-K (<i>M</i> , <i>SD</i>)	1.8	1.2
Parental education		
Some high school	19	8.5
High school	25	11.2
Some college	60	26.8
4-year college degree	59	26.3
Graduate degree	36	16.1
Not reported	25	11.2
Parent-to-child reading time per week		
None	3	1.3
About 10 min	49	21.9
15–30 min	104	46.4
More than 30 min	42	18.8
Not reported	26	11.6
Number of children's books in the home		
None	1	0.4
1–50	76	33.9
51–100	61	27.2
101–200	39	17.4
> 200	22	9.8
Not reported	25	11.2

Note: Information ascertained through parent survey.

Finally, to assess dialect variation, we used the dialect variation screener of the DELV (Seymour et al., 2003). This section includes items that target phonological differences between NMAE and MAE (e.g., pronunciation of “teef” for *teeth* and “smoov” for *smooth* or deletion of final consonant clusters such as “gif” for *gift*) and items that target morpho-syntactic differences (e.g., omission of tense marker such as “the girl always sleep” in which /s/ is missing or use of don’t instead of doesn’t as in “this boy don’t like to . . .”). Specifically, we followed Terry and colleagues (2010) and computed the percentage dialect variation score (DVAR) by dividing the number of screener items that varied from MAE (Column A) by the total number of scoreable items (Columns A + B), multiplied by 100. Therefore, DVAR represents a metric for the density of dialect use.

Procedures

Trained research assistants assessed students in three 30-min sessions for all measures except DIBELS LNF and SAT-10. Interrater reliability was established as data were collected through the Project II: School Based Classification and Prevention Study during the 2006 and 2007 school years.

DIBELS LNF was administered by district-trained assessors, and the SAT-10 was group administered by teachers; as per the research agreement, the district provided results for these measures. For each DIBELS measure, raw scores were used.

Data Analysis

Our outcome measure for first grade reading skills was the first grade SAT-10 (standard score). Hierarchical multiple regression with a three-step model was used; missing data were handled by replacing with the mean of the sample. In the first step we included variables related to ecological factors (dialect variation, years of pre-K, parent education, time spent reading at home, and number of children’s books in the home), which we hypothesize to be most distally related to the outcome. In the second step, we added variables related to psychological factors, specifically the teacher’s evaluation of the student’s academic competence, social skills, and problem behaviors. Last, we added variables related to cognitive factors (morpho-syntactic skill, letter naming fluency, letter-word identification, picture vocabulary, and phonological awareness), which we hypothesized to be most proximally related to the outcome.

Results

Table 2 displays the means and standard deviations for all continuous variables included in the analyses. Overall, at kindergarten entry, students had letter-word reading scores that were generally higher than their vocabulary scores ($M = 100.6$, $SD = 9.2$). At the end of first grade, on average, reading performance on the SAT-10 exceeded the 60th percentile. However, there was a relatively large standard deviation (26.9), and percentile ranking ranged from the 3rd to the 97th percentile.

Correlations among ecological, psychological, and cognitive variables with end-of-first-grade reading. Table 3 summarizes the correlations among variables related to ecological, psychological, and cognitive factors in the fall of kindergarten and with end-of-first-grade reading. As displayed by Table 4, correlations among ecological variables with end-of-first-grade reading achievement ranged from $-.421$ (dialect density or DVAR) to $.335$ (parent education). Correlations among psychological variables with end-of-first-grade reading achievement ranged from $-.013$ (problem behavior) to $.543$ (academic competence). Correlations among cognitive variables with end-of-first-grade reading achievement ranged from $.467$ (expressive vocabulary) to $.671$ (letter-word identification).

Predicting first grade reading from kindergarten entry skills in the ecological, psychological, and cognitive domains. We used a three-step hierarchical multiple regression model (see Table 4). Step 1 of the regression, which included ecological factors, accounted for 20% of the variance of the end-of-first-grade

Table 2. Descriptive Statistics of Continuous Kindergarten Predictors and First Grade Outcomes

	<i>n</i>	Min	Max	<i>M</i>	<i>SD</i>
Kindergarten predictors					
Ecological factors					
DVAR ^{DIBELS}	224	0	100	54.7	33.8
Psychological factors					
Academic competence ^S	224	62	125	96.5	12.0
Social skills ^S	223	74	130	105.7	15.5
Problem behavior ^S	224	40	141	95.8	13.2
Cognitive factors					
Syntax ^{DIBELS}	224	58	130	99.8	15.4
Letter Naming Fluency ^{DIBELS}	215	0	73	27.3	16.2
Letter-Word Identification raw ^W	224	3	42	17.6	5.7
Letter-Word Identification SS ^W	224	71	153	108.5	13.3
Picture Vocabulary raw ^W	224	9	26	16.5	2.7
Picture Vocabulary SS ^W	224	75	134	100.6	9.2
Phonological Awareness ^T	224	5	27	20.7	4.9
First grade reading achievement					
Grade 1 SAT-10 NPR	203	3	97	63.2	26.9
Grade 1 SAT-10 SS	203	381	667	569.7	59.4

Note: Where available, standard scores and raw scores are provided descriptively; however, raw scores were used in the analysis. Categorical independent variables are reported in a separate table. DVAR = dialect variation; D = *Diagnostic Evaluation of Language Variation Test* (Seymour, Roeper, & de Villiers, 2003); S = *Social Skills Rating System* (Gresham & Elliott, 1990); DIBELS = *Dynamic Indicators of Basic Early Literacy Skills* (Kaminski & Good, 1998); W = *Woodcock-Johnson-III Test of Achievement* (Woodcock, McGrew, & Mather, 2001); SS = standard score; T = *Test of Preschool Early Literacy* (Lonigan, Wagner, Torgesen, & Rashotte, 2007); NPR = National Percentile Ranking; SAT-10 = *Stanford Achievement Test-Tenth Edition*. (Harcourt Brace Educational Measurement, 2003).

SAT-10 scores. As displayed in Model 1 of Table 4, the regression results indicated that two ecological factors were significant contributors to students' reading achievement. Specifically, parental education and density of dialect variation were significant predictors. As hypothesized, density of dialect variation was negatively related to achievement and parental education was positively related.

In the second step of the regression, we added in psychological factors. This model explained an additional 18% of variance in first grade reading achievement, which was significantly more than the previous model, $F_{\Delta}(3, 215) = 21.03, p < .001$. The regression results indicated that dialect variation remained significant, but parent education became only marginally significant. Of the three psychological factors, only teacher judgment of students' academic competence was significant.

Finally, in Step 3, we added the cognitive factors; these explained an additional 16% of variance in the model, for a total of 54% of variance in the first grade SAT-10 scores. This model explained significantly more variance than the previous model, $F_{\Delta}(5, 210) = 14.23, p < .001$. In this final model, teacher-reported academic competence became marginally significant, and dialect density was no longer significant. Of the cognitive factors, syntax, letter-word identification, and phonological awareness were all significant predictors.

As seen in Table 4, of the three models tested, the final model explained the most variance in first grade SAT-10 and had a significant F change over the previous model, which included only ecological and psychological factors. This suggests that combining ecological, psychological, and cognitive factors, as measured in the beginning of kindergarten, provided the best fitting model to predict first grade reading achievement.

Discussion

The purpose of the present study was to examine whether first grade reading performance was predicted by the proposed three CMR domains: ecological (dialect variation, maternal education, and home literacy), psychological (teacher's evaluations of academic competence, social skills, and problem behavior), and cognitive domains (initial phonological and morpho-syntactic skills, alphabetic and word recognition skills). This examination took place in seven schools and 20 classrooms. Because we directly observed the reading instructional context, we were able to document that kindergarten teachers effectively implemented a strong core reading program. A majority of the sample were from minority backgrounds and began kindergarten with average letter-word reading scores ($M = 100.6, SD = 9.2$).

Table 3. Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ecological factors														
1. DVAR ^{DIBELS}	—	-.209***	-.356***	-.07	-.424***	-.181***	.013	-.032	-.500***	-.223***	-.336***	-.459***	-.430***	-.421***
2. Years of pre-K		—	.263***	.038	.284***	.267***	.091	-.128	.168**	.303***	.359***	.348***	.181**	.217***
3. Parent education			—	.200***	.364***	.230***	.184***	-.165**	.146**	.223***	.329***	.171**	.257***	.335***
4. Time spent reading				—	.188***	.075	-.014	.02	-.029	.159**	.159**	-.085	.045	.149**
5. Number of books					—	.175**	.061	-.116	.225***	.166**	.229***	.236***	.180**	.256***
Psychological factors														
6. Academic competence SS ^S						—	.512***	-.368***	.208***	.617***	.660***	.326***	.491***	.543***
7. Social skills SS ^S							—	-.653***	.196***	.244***	.236***	.179***	.280***	.245***
8. Problem behavior SS ^S								—	-.004	-.05	-.074	-.036	-.108	-.13
Cognitive factors														
9. Syntax ^{DIBELS}									—	.271***	.347***	.616***	.557***	.496***
10. Letter Naming Fluency ^{DIBELS}										—	.679***	.338***	.454***	.524***
11. Letter-Word Identification raw ^W											—	.444***	.525***	.671***
12. Picture Vocabulary raw ^W												—	.496***	.467***
13. Phonological Awareness ^T													—	.605***
14. First grade SAT-10														—

Note: DVAR = dialect variation; D = Diagnostic Evaluation of Language Variation Test (Seymour, Roesper, & de Villiers, 2003); SS = standard score; S = Social Skills Rating System (Gresham & Elliott, 1990);

DIBELS = Dynamic Indicators of Basic Early Literacy Skills (Kaminski & Good, 1998); W = Woodcock-Johnson-III Test of Achievement (Woodcock, McGrew, & Mather, 2001); T = Test of Preschool Early Literacy (Lonigan, Wagner, Torgesen, & Rashotte, 2007); SAT-10 = Stanford Achievement Test—Tenth Edition.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4. Regression Model Results Predicting End-of-First-Grade Reading Achievement

	Model 1			Model 2			Model 3		
	B	SE	β	B	SE	β	B	SE	β
Constant	554.80	17.46		320.27	57.37		368.137	57.53	
Ecological factors									
DVAR ^{DIBELS}	−0.55	0.11	−.33***	−0.47	0.10	−.28***	−0.1	0.1	−.058
Years of pre-K	4.30	3.24	.09	0.36	2.92	.01	−3.7	2.7	−.073
Parent education	7.59	3.42	.15**	4.98	3.08	.10*	3.3	2.8	.066
Time spent reading	5.82	4.56	.08	4.77	4.05	.07	4.1	3.6	.056
Number of books	0.11	4.12	.00	−0.22	3.66	−.00	0.1	3.2	.002
Psychological factors									
Academic competence SS ^S				2.11	0.31	.45***	0.6	0.4	.133***
Social skills SS ^S				0.45	0.28	.04	−0.2	0.3	−.064
Problem behavior SS ^S				0.31	0.31	.07	−0.3	0.3	−.071
Cognitive factors									
Syntax ^{DIBELS}							0.7	0.3	.192***
Letter Naming Fluency ^{DIBELS}							0.2	0.2	.043
Letter-Word Identification raw ^W							3.3	0.8	.331***
Picture Vocabulary raw ^W							0.9	1.4	.042
Phonological Awareness ^T							1.9	0.8	.168**
Model summary									
F	11.16***			16.78***			18.98***		
F change	11.16***			21.03***			14.23***		
R	.45			.62			.74		
R ²	.20			.38			.54		
Adjusted R ²	.19			.36			.51		
R ² change	.20			.18			.16		

Note: DVAR = dialect variation; D = *Diagnostic Evaluation of Language Variation Test* (Seymour, Roeper, & de Villiers, 2003); SS = standard score; S = *Social Skills Rating System* (Gresham & Elliott, 1990); DIBELS = *Dynamic Indicators of Basic Early Literacy Skills* (Kaminski & Good, 1998); W = *Woodcock-Johnson-III Test of Achievement* (Woodcock, McGrew, & Mather, 2001); T = *Test of Preschool Early Literacy* (Lonigan, Wagner, Torgesen, & Rashotte, 2007).

* $p < .1$. ** $p < .05$. *** $p < .01$.

Our first research aim was to describe the concurrent correlations among these elements measured at kindergarten entry and their relations to first grade reading performance. We found dialect variation was moderately related to number of books in the home and parental education, but it was only weakly related to other ecological factors such as years of preschool, time spent reading, or the psychological factor of academic competence. Dialect variation was not related to either social skills or problem behavior, but it did have a moderate correlation with most cognitive factors, including first grade reading performance, indicating that students who spoke more NMAE at the start of kindergarten tended to have weaker first grade reading performance.

It was notable that parent education, also within the ecological domain, was significantly positively correlated to all but one factor across all of the domains (ranging from .146 to .363); this remaining significant correlation was small

and negative, suggesting that less parent education was weakly related to increased problem behavior. Notably, parent education had slightly stronger relations to cognitive factors than did the time parents reported that they spent reading to their children or the number of books they had in their homes.

In the psychological domain, teacher-reported academic competence showed moderate correlations to students' early literacy skills and to their first grade reading performance. Within the cognitive domain, the strongest relations were between letter naming and letter-word reading and between syntax and vocabulary.

In summary, our hypothesis, that elements of the three domains would correlate with end-of-first-grade reading skills and, for the most part, with each other, was confirmed. The strongest correlation with end-of-first-grade reading performance was the letter-word reading performance in fall of kindergarten.

Did Kindergarten-Entry Skills Within the CMR Domains Predict First Grade Reading?

Our second research aim was to model the contributions of kindergarten-entry ecological, psychological, and cognitive domains as predictors of end-of-first-grade reading achievement. Although we anticipated that dialect variation would play an important role in predicting reading, once our model accounted for cognitive factors, dialect variation no longer was a significant unique predictor of reading. The final model, which included measures in all three domains, accounted for 54% of the variance in first grade reading scores. In this final model, children who entered school with stronger morpho-syntactic skills, letter-word identification, and phonological awareness (all in the cognitive domain) and whose kindergarten teachers tended to perceive them as academically more competent (in the psychological domain) were more likely to achieve stronger reading skills by the end of first grade.

Ecological domain: Predicting reading from NMAE dialect and morpho-syntactic skills, home literacy, and parental education. Our study contributes to the existing, albeit equivocal, findings of the literature that has examined the relation among dialect and reading within populations of speakers of NMAE. In our first step, we found that ecological variables assessed at kindergarten entry accounted for 20% of the variance in first grade reading scores. In that initial model, we found that more dialect variation predicted weaker literacy skills; however, once variables from the cognitive factor were added, the relative importance of dialect variation in uniquely predicting reading outcomes decreased. The presence of a moderately negative relationship between dialect and reading is consistent with findings from two previous investigations (Connor & Craig, 2006; Craig et al., 2009). However, Connor and Craig (2006) found that use of NMAE decreased from fall to spring whereas vocabulary increased from fall to spring. Craig and colleagues (2009) found that in both written and oral assessments of NMAE, as features of NMAE decreased, reading achievement scores increased.

This study also adds to the existing literature by having added home literacy factors within the ecological domain. Specifically, we conducted a home literacy survey to address years of preschool, parent highest level of education, number of children's books in the home, and amount of time per day the child spent reading. When we examined the correlations prior to running the regression, among our home literacy predictors, parent education had the strongest correlation to reading. The importance of parent education in predicting language was consistent with a larger sample of younger and mostly Black children by Qi et al. (2006).

Psychological domain: Predicting reading from teacher-reported academic competence, social skills, and problem behavior. We observed that both social skills and problem behavior were not significant predictors of reading beyond initial

language and literacy scores, and they did not explain unique variance in the prediction of reading scores. However, there was a trend that teacher-rated academic competence in kindergarten predicted first grade reading skills. Therefore, teachers' perceptions of students' performance within the psychological domain does appear to play a role in predicting reading achievement, yet the impact may likely operate through elements assessed directly within the cognitive domain.

Cognitive domain: Predicting first grade reading from kindergarten reading, and expressive vocabulary. Within the cognitive domain, our study measured expressive vocabulary and morpho-syntactic, phonological, and kindergarten-entry literacy skills. It is not surprising that kindergarten entry skills in letter-word reading and phonological awareness were significant predictors of first grade reading. On the other hand, although vocabulary was moderately correlated to first grade reading, it was not a significant independent predictor of reading in our study once the other ecological and psychological factors were accounted for. This is contrary to Connor and Craig (2006), who found vocabulary was a significant predictor of reading. Differences between their study and ours could be the result of different measures, different samples, or different reading instruction.

Limitations and Directions for Future Studies

Like all studies, this study had limitations that warrant caution in making interpretations while offering directions for future studies. Though the sample studied was diverse and fairly large, replication with larger samples is needed, as this would allow for a more sophisticated examination of mediators and moderators of literacy development within the CMR framework.

Two additional limitations are related to the home literacy survey. Our surveys were sent home to parents to be completed independently; thus, we relied on self-reporting. Related to this, parents did not answer each question; that is, on some questions the response rate was around 80%. Future research could involve direct observation of the home environment and a direct count of books and library usage and could observe and code parent-child book-reading styles.

Next, a relatively large number of predictor variables were used in this study, yet only about 56% of the variance in first grade reading could be accounted for by fall-of-kindergarten measures. Clearly, other variables belonging to the instructional methods used in the classroom might contribute to reading growth across kindergarten and first grade. Although we did not find that any of our ecological factors remained significant after accounting for students' cognitive factors, future research with larger samples could examine the direct and indirect paths to reading using more sophisticated statistical analyses such as structural equation modeling methods. Finally, this study was longitudinal and

correlational, and hence our causal claims are necessarily limited, although they can inform future experiments designed to improve performance on those malleable factors that reliably predicted first grade reading outcomes.

Implications for Practitioners and Researchers

Thus, in spite of these limitations, there are several potentially important implications for practitioners and researchers from our findings, in conjunction with prior research. First, the strength of the relation between kindergarten letter-word identification and first grade reading reemphasizes the importance of teaching phonics, phonemic awareness, and sight word skills early in children's school career. A student's ability to identify letters and words has a positive effect on reading ability (NELP, 2008; NRP, 2000). The fewer letters or words a student can identify in kindergarten, without additional intervention, the weaker his or her first grade reading scores are likely to be (NELP, 2008). Weaker decoding skills, in turn, constrain students' ability to read fluently enough to understand a text's meaning.

Second, although our study is correlational, and should not be interpreted causally, educators and researchers should be aware of the potential importance of morpho-syntactic skill in predicting first grade reading above and beyond initial reading and phonological awareness. The DELV, which assesses both dialect variation and morpho-syntactic skills, may be an important assessment for students who speak NMAE.

Third, additional research is needed to examine potentially important aspects within the psychological domain, including motivation and interest, and gender differences. Future research could also more carefully explore other elements of the ecological domain, by closely observing the home literacy environment and parental involvement and by accounting for the impact of the classroom instructional environment including child by treatment interactions.

In summary, our findings suggest that variables within the ecological or psychological domain may not predict reading achievement above and beyond elements within the cognitive domain. Morpho-syntactic skill and letter-word reading and phonological awareness, within the cognitive domains, were significant factors in predicting reading achievement. Teachers' ratings of academic competence also appeared important, and this trend approached significance. Though dialect played a role in predicting first grade reading, the significance of this role diminished whether other cognitive variables were included in the model. When considering reading outcomes of children who are speakers of NMAE, it may be important to assess and provide targeted instruction of morpho-syntactic skill, as well as the usual suspects of phonological awareness, word reading, decoding, and fluency, within early intervention.

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