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Dialect variation, dialect-shifting, and reading comprehension in second grade

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Abstract

The purpose of this study was to examine second graders' (n=680) changing spoken nonmainstream American English (NMAE) use in relation to their oral language and reading comprehension achievement. Fall NMAE production was negatively associated with fall achievement scores. NMAE production generally decreased from fall to spring. Students who qualified for the US Free and Reduced Lunch program (FARL) and who had stronger language skills were more likely to decrease their NMAE use (i.e., dialect shifting) than their peers who did not qualify for FARL or their peers with weaker language skills. Dialect shifting for a sub-sample of 102 students who used substantial amounts of NMAE at the beginning of the school year was predicted by school context, controlling for reading and language skills – in general, students who attended more affluent schools dialect shifted to a greater extent than did their peers who attended higher poverty schools. Greater dialect shifting in this group predicted gains in reading comprehension from fall to spring.

Keywords

Nonmainstream American English; Reading Comprehension; Dialect-Shifting

Among the most perplexing and seemingly intractable issues in education today are the observed differences in academic performance between children from different race, language, and socioeconomic groups, often called the *achievement gap* (Chatterji, 2006; Darling-Hammond, 2004, 2007; Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005; Fishback & Baskin, 1991; Haycock, Jerald, & Huang, 2001; Jencks & Phillips, 1998a; Ladson-Billings, 2006). These differences in academic achievement have been observed since the late 1960s (Darling-Hammond, 2004; Darling-Hammond et al., 2005; Haycock et al., 2001; Jencks & Phillips, 1998c; Lee, 2002). The most recent National Assessment of

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Education Progress (NAEP) scores indicate that all American students are demonstrating improved reading achievement compared to previous years (National Center for Education Statistics, 2013). However, these improvements have not closed the achievement gap between African American and White students or between children living in low income and more affluent households. Shockingly, in the 2013 NAEP Reading sample, 83% of African American children scored at or below Basic level. The Basic achievement level on NAEP standardized tests represents only partial mastery of the subject—an important distinction because when considering the ability to function in school, compete for jobs, and ultimately contribute to society, proficient language and reading abilities are a basic necessity for academic well-being and overall quality of life.

A number of individual factors have been identified as likely contributors to the achievement gap, including poverty, language, family, schooling, and community factors, with many researchers suggesting that cumulative risk models may be more helpful in understanding weaker achievement (e.g., Burchinal, Roberts, Hooper, & Zeisel, 2000; Pungello et al., 2010; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987; Vernon-Feagans, Hammer, Miccio, & Manlove, 2001). Recently, researchers have returned their focus to one potential risk factor that may be particularly impactful for the reading achievement gap: spoken dialect variation. It has been hypothesized children's use of dialects that differ from the mainstream dialect they encounter in the classroom might contribute in some way to the achievement gap. To date, most of the evidence is correlational using concurrent data; very few studies have examined associations between students' spoken dialect use and their achievement over time. Moreover, most of these investigations have focused on basic word reading skills, as opposed to more advanced skills. Thus, in this longitudinal study, dialect variation and its association with students' language and reading comprehension gains were examined during second grade.

Spoken Dialect Variation and Early Word Reading Skills

For decades, researchers in many other nations have questioned whether dialect variation is related to academic achievement (Siegel, 1999). In the United States, these studies have focused on numerous nonmainstream American English (NMAE) dialects, whose forms, content, and use are distinct and vary significantly from what is has been termed School English or standard or mainstream American English (MAE). Ample sociolinguistic research confirms that these NMAE dialects are not incorrect or "bad" English, despite the negative stigma that they often carry (Charity Hudley & Mallinson, 2011; Pearson, Connor, & Jackson, 2013; Wolfram & Schilling-Estes, 2006). Rather, NMAE dialects are rule-governed linguistic systems, and speakers systematically produce these alternative forms in specific contexts to convey the same semantic and syntactic information produced with MAE. The majority of that research has concerned African American English (AAE) use among African American children, adolescents, and adults (e.g., Craig & Washington, 2004; Labov, 1972; Oetting & Pruitt, 2005; Washington & Craig, 1998). However, researchers have studied other NMAE dialects, including Southern American English (e.g., Oetting & Garrity, 2006), Appalachian English (Garn-Nunn & Perkins, 1999), and Latino English (Gutiérrez-Clellen & Simon-Cereijido, 2007). These studies focused on describing and characterizing children's production and use of specific features of these NMAE dialects in specific contexts.

The present study sample is racially and ethnically diverse and located in the Southeastern U.S., where Southern White English and Southern African American English are used widely among both White and African American children. Although distinctions have been made in the literature, recent research findings suggest that these two NMAE dialects are converging and share many overlapping features (Oetting & Garrity, 2006; Oetting & McDonald, 2001, 2002; Oetting & Pruitt, 2005; Wolfram & Schilling-Estes, 2006). The term NMAE is used here and children's production of NMAE forms is considered in a continuous fashion (as opposed to identifying children as speaking a specific NMAE dialect). In doing so, the intention was not to collapse all NMAE dialects into one dialect. Rather, this study is focused on the relation between the frequency with which children produce these NMAE forms in speech and their performance on reading and language measures.

Because NMAE features do not align well with print, it has been hypothesized that these speech-print mismatches could create confusion while trying to grasp what appear to be inconsistent phoneme-grapheme correspondences, grammatical constructions, and semantic targets and could be associated with poor reading achievement (Charity Hudley & Mallinson, 2011; Labov, 1995; Pearson, et al., 2013). An increasing number of longitudinal and cross-sectional studies have examined this relationship (e.g., Charity, Scarborough, & Griffin, 2004; Craig, Zhang, Hensel, & Quinn, 2009; Hernandez, Folsom, Al Otaiba, Greulich, Thomas-Tate, & Connor, 2012; Labov & Baker, 2010; Terry, Connor, Thomas-Tate, & Love, 2010; Terry, Connor, Petscher, & Conlin, 2012). Although primarily focused on spoken AAE use among African American children, across these studies, researchers have observed significant relationships between children's spoken NMAE production and beginning reading and reading-related skills, including alphabet knowledge, phonological awareness, vocabulary, and word reading. Importantly, when examined in diverse samples, researchers have found these relations to be independent of socioeconomic status (SES) and race differences (e.g., Hernandez et al., 2012; Terry et al., 2010; 2012).

For example, in a relatively large longitudinal study (n=224), Hernandez and colleagues (2012) found that children's spoken NMAE production at the beginning of kindergarten was negatively correlated with their word reading, phonological awareness, and expressive vocabulary skills in kindergarten and composite reading achievement at the end of first grade. In a smaller longitudinal sample (n=49), Terry and Connor (2012) found that children's NMAE production at the end of kindergarten contributed negatively and independently to variance in word reading skill at the end of first grade, even after accounting for phonological awareness skills.

What about Reading Comprehension?

Findings that NMAE use is associated with early reading skills (e.g., decoding, phonological awareness; word reading) and that children who use more NMAE in school contexts tend to perform more poorly on word reading measures incite a focus on early intervention to change children's spoken dialect use and perhaps prevent reading achievement gaps. Yet, it is important to keep in mind that the oft-cited reading achievement gap is gauged primarily by differences in performance on measures of more advanced reading skills. Take, for example, the NAEP, where "proficient" readers are described as being able to make inferences and draw conclusions from grade-level text. Similarly, reading scores on most state-mandated achievement tests and other global reading achievement tests (e.g., *Measures of Academic Progress*, *Stanford Achievement Tests*, *Iowa Test of Basic Skills*, *Metropolitan Achievement Tests*) reflect performance on items requiring students to answer questions about connected texts at the sentence and passage level. Thus, if spoken dialect variation is critical to approaches aimed at alleviating or preventing the reading achievement gap, then its relation to reading comprehension must be explored.

At first glance, it may seem nonsensical to propose a relation between spoken dialect variation and reading comprehension. Kendeou and colleagues have argued that, despite differences in their foci, most theoretical models of reading comprehension suggest that successful comprehension requires the creation of a coherent mental representation of the text in memory (Kendeou, van den Broek, White, & Lynch, 2009; Kendeou, van den Broek, Helder, & Karlsson, 2014). Is it plausible to expect speech-print mismatches to interfere with the construction of mental representations of text?

Spoken dialect variation and lower-level reading comprehension processes

First, we argue that it is important to consider that the formation of these representations rests on the developmental interactions between multiple cognitive, linguistic, and environmental processes, including lower-level processes (e.g., decoding, vocabulary, fluency, syntax) that develop rapidly in younger children and higher-level processes (e.g., inferencing, attention control, monitoring) that develop more slowly as children get older (Kendeou et al., 2014). Moreover, it is hypothesized that automatization of lower-level processes allows the reader to devote more mental resources to higher-level processes (Perfetti & Hart, 2002). Previous studies have shown that spoken dialect variation can have some bearing on these lower-level processes, in particular those related to language ability.

For example, researchers have observed African American children, in particular those from low-income households, to perform poorly on standardized vocabulary measures (Champion, Hyter, McCabe, & Bland-Stewart, 2003; McCabe & Champion, 2010; Qi, Kaiser, Milan, & Hancock, 2006; Restrepo, Schwanenflugel, Blake, Neuharth-Pritchett, Cramer, & Ruston, 2006; Williams, Terry, & Metzger, 2013). Significant, negative correlations between children's NMAE use and oral vocabulary performance have also been reported (Conlin, 2009; Connor & Craig, 2006; Craig et al., 2009; Terry & Connor, 2012). However, Terry and colleagues (2010) found that this relationship may be mediated by school poverty levels. They found that spoken NMAE use was associated with weaker vocabulary performance only at schools with a large percentage of children participating in free and reduced lunch programs, which also served a higher proportion of African American children.

Relatively few studies have examined children's receptive language, morphological or complex syntax in relation to NMAE production and comprehension performance. Among a sample of 4–7 year-old African American children from middle-income households, Craig, Washington, & Thomson-Porter (1998) found that students' performance on two oral comprehension tasks (answering Wh-questions and comprehension of active and passive sentences) was not significantly related to their spoken AAE production. In a racially and socioeconomically diverse sample of third, fifth, and seventh graders, Isaacs (1996) found no association between NMAE production and performance on oral syntax (e.g., comprehension of conjunctions, passives, before/after) and semantic (e.g., comprehension of Wh-questions, idioms) tasks. Meanwhile, in a longitudinal study with African American children from low-income households, Craig, Connor, and Washington (2003) found that children's oral complex syntax production in preschool predicted their reading comprehension scores on a state achievement tests at the end of first, second, and third grades.

Finally, although focused on phonology, Terry and colleagues (Mitri & Terry, 2014; Terry, 2014; Terry & Scarborough, 2011) have investigated the lexical quality of 4–8 year old NMAE speaker's representations of words that vary in pronunciation between MAE (e.g., *breakfast*) and NMAE (e.g., *breakfast*). In each study, the researchers found that children's performance on measures suggested that their lexical representations of words included both MAE and NMAE forms. For example, when shown a picture of *breakfast* and hearing two alternative dialect-sensitive pronunciations of the target (e.g., *breakfas'*, *breffis*), children stated that each were acceptable ways to name the target and also provided these pronunciations expressively when asked to name the item. When asked to repeat non-word items with such dialect-sensitive pronunciations (e.g., *re-noy-tist*), children often provided the correct NMAE substitution of the nonword (e.g., *re-noy-tis*). Overall, these findings suggest that young NMAE speakers have lexical representations of words that are not low quality or imprecise; rather, they may include information that is different from MAE speakers. These differences may create confusion when choosing between which MAE or AAE forms to draw upon in the lexicon while reading, or they may simply slow down the automaticity of lower-level comprehension processes, thereby inhibiting higher-level processes that also aide text comprehension.

Spoken dialect variation as more than "speech-print mismatches"

Second, although much of the research on the relation between reading and dialect variation has focused on phonological and morphosyntactic differences between MAE and NMAE, we argue that the mechanisms underlying this relationship may be just as important as surface-level speech-print mismatches. In fact, some linguists argue that focusing on specific features reduces NMAE dialects to an incomplete system that is only characterized by those features (Green, 2011). Dialects reflect language form (e.g., phonology, morphology, syntax), content (e.g., semantics), and usage (e.g., pragmatics)—all of which are important to reading development; therefore, a more comprehensive look at the ways in which spoken dialect variation might interact with basic and more advanced reading skills is warranted. Recently, researchers have suggested that one means of doing so is to investigate *change* in dialect use (Craig, et al., 2009; Craig, Kolenic, & Hensel, 2014; Terry & Connor, 2012; Terry et al., 2012).

Change in dialect use is often referred to as dialect-shifting, style-shifting, or code-switching. Dialect-shifting involves varying one's speech styles for specific contexts, and includes both increasing and decreasing feature production in one dialect and substituting features of one dialect with features of another (Wolfram & Schilling-Estes, 2006). It has been argued that successful dialect-shifting requires some level of linguistic and metalinguistic awareness, as a speaker needs to be aware of the linguistic and sociolinguistic features of different language variations to shift between them appropriately. Two types of studies have examined dialect-shifting in relation to reading achievement: those examining shifting across linguistic contexts and those examining shifting over time.

With regard to dialect-shifting behavior, researchers have observed significant decreases in children's NMAE production during the early elementary grades, with significant shifts in absolute production frequency rates reported between kindergarten and first grade (Craig & Washington, 2004; Terry & Connor, 2012), kindergarten and second grade (Craig et al., 2014), first grade and second grade (Terry et al., 2012), and third and fifth grades (Isaacs, 1996). In a longitudinal sample, Terry and colleagues found that, between first and second grade, increasing MAE production (and decreasing NMAE production) was predicted by children's expressive vocabulary and non-word repetition skills at the beginning of first grade—both linguistic skills (Terry et al., 2012). In another longitudinal sample, Craig and colleagues investigated second graders' dialect-shifting, which, in that study, was demonstrated by the ability to use more MAE in contexts that presupposed more MAE (e.g., story retell with a book) than NMAE (e.g., picture description). They found that dialect shifting was predicted by performance on phonological, morphological, and pragmatic awareness measures, even after controlling for oral vocabulary (Craig et al., 2014).

With regard to shifting across linguistic contexts, Craig and colleagues reported that school-aged children's use of AAE features in writing was directly associated with reading achievement whereas spoken AAE use was not related to achievement (Craig et al., 2009). That is, children who used more AAE features on the writing task (an academic context) tended to demonstrate weaker reading achievement. As another example, Connor & Craig (2006) gave preschoolers two oral language tasks that varied in their expectation for MAE production. They found that children who produced AAE features frequently while retelling a story (low expectation for MAE) also produced more MAE features while completing a sentence imitation task (high expectation for MAE). Moreover, these same children who used more AAE in speech also performed better on rhyming and word reading measures than children who used AAE moderately. Finally, in a cross-sectional study, Ivy and Masterson (2010) found that third graders produced AAE features at similar rates in spoken and written contexts whereas eighth graders used significantly more AAE features in spoken rather than written contexts.

Previous studies on spoken dialect variation and reading comprehension

Third, we argue that more research is necessary in this area because very few studies have examined the relationship between spoken NMAE use and measures of reading comprehension skills. Earlier investigations during the first wave of dialect variation and reading studies reported no direct relationship between children production of AAE features and reading comprehension skills (Goodman & Buck, 1973; Harber, 1982). More recently, Craig, Thompson, Washington, and Potter (2004) found that, among African American second through fifth graders', spoken AAE production was negatively associated with Accuracy and Rate scores on the *Gray Oral Reading Tests, 3rd Edition* (Wiederholt & Bryant, 1992), but unrelated to Comprehension scores. Conversely, Charity and colleagues (2004) found that, among second graders, spoken NMAE production accounted for additional significant variance in Passage Comprehension scores on the *Woodcock Reading Mastery Test-Revised* (WRMT-R; Woodcock, 1987), even after accounting for letter word reading and decoding skills.

With regard to associations between dialect-shifting and reading comprehension skills, in a longitudinal study examining shifting over time (n = 49), Terry and colleagues observed that greater dialect shifting during the first grade year predicted stronger performance on the Passage Comprehension subtest of the *Woodcock Johnson Tests of Achievement, 3rd Edition* (WJ3; Woodcock, McGrew, & Mather, 2001) at the end of first and second grades (Terry et al., 2012). Additionally, in a longitudinal study examining shifting across linguistic contexts, Craig and colleagues found that, in kindergarten through second grades, dialect-shifting was correlated significantly with performance on the Word and Passage Comprehension subtests of the WRMT-R (Craig et al., 2014). In both studies, children who decreased their NMAE production (and increased their MAE production) in linguistic contexts that presupposed MAE demonstrated stronger reading comprehension skills. Hence, although there is emerging evidence that dialect shifting may be associated with reading comprehension and language skills, it is not clear which child and context factors might influence dialect shifting.

Purpose of the Study

Overall, these findings suggest that spoken NMAE use (both absolute frequency rates and shifting between MAE and NMAE) is related to beginning reading ability. Moreover, the early elementary years appear to be significant time point for changes in NMAE use relative to academic achievement. Specifically, findings from the longitudinal studies suggest that, if NMAE use does not change significantly after first grade, then children who continue to produce many NMAE features in speech may be more likely to struggle with reading skills. If so, then what happens to the reading achievement of second graders who continue to use NMAE frequently in school? Do these students continue to develop dialect-shifting ability and, if so, is it related to language and reading ability? What role does spoken dialect variation play in their development of more advanced reading skills, like reading comprehension?

The purpose of this study was to begin answering these questions by investigating the relationship between NMAE use, language skills, and reading comprehension in for students in second grade, particularly those who are using substantial amounts of NMAE. Second grade (approximately age 7–8 years old) is an important year for reading development; as word reading becomes increasingly strategic, children become less "glued to print", and both the reader and instruction becomes more concerned with comprehension of text (Adams, 2001). Emerging evidence suggests that both early (e.g., word reading, phonological awareness) and more advanced (e.g., oral and text comprehension) reading skills contribute to achievement at this age (Catts, Nielsen, Bridges, & Liu, 2014; Kendeou, van den Broek, White, & Lynch, 2009; Oakhill & Cain, 2012). Moreover, second grade appears to be a pivotal transition period for NMAE use, as previous research suggests that spoken NMAE production rates tend to stabilize by this time point and that dialect production rates and dialect-shifting behavior are associated with word reading at this time (e.g., Craig & Washington, 2004 Terry et al., 2012). Thus, with an eye towards both theoretical and developmental models of reading ability and the applied implications of the relationship between spoken dialect variation and reading achievement, we chose to examine reading comprehension among second graders.

Of particular interest was whether some students continued to decrease their NMAE production significantly in second grade, and if so, what variables contributed to their dialect-shifting and whether this shifting predicted their reading comprehension. The sample included both White and African American students who varied in their spoken MAE and NMAE production and who attended schools that varied in the percentage of children from low-income households, allowing for a more generalizable examination of the relative importance of spoken dialect variation to reading achievement among children while accounting for SES differences.

While, in some respects, the outcomes of this study serve to replicate findings from previous investigations, our primary goal was to extend this line of research by focusing on older readers, more advanced reading skills, and predictive relationships. As noted previously, only a handful of studies have examined the relationship between children's NMAE production and performance on reading comprehension measures, and those that did had mixed results. Moreover, in the most recent work examining the role of dialect-shifting, one study did not report the predictive relationship between dialect-shifting and reading comprehension, focusing instead on word reading (Craig et al., 2014), and the other did not observe significant dialect-shifting behavior among second graders, thus negating analyses of its relation to reading comprehension performance (Terry et al., 2014). As debate continues in the literature about the theoretical and applied importance of dialect variation to reading development and achievement gaps, it is particularly important to address these issues among children who are not just learning to read but also those who are now reading for understanding. In sum, although previous investigations have included second graders, this study extends the research literature by (1) investigating outcomes for a longitudinal sample and (2) including oral language, including vocabulary and non-word repetition, and reading comprehension measures, as opposed to word reading and phonological awareness measures. Thus, the research questions were as follows:

1. To what extent did students change their spoken NMAE production during second grade?

2. What child (language, reading and individual FARL status) and school (school-wide FARL) characteristics are related to changes in NMAE production?

3. To what extent are changes in spoken NMAE in second grade associated with changes in oral language skills and reading comprehension?

Methods

Participants

The second graders (*n*=680; mean age = 7.8 years, range 7–10 years; 50 % male) who participated in this study were participating in a larger investigation of child by instruction interaction effects on reading outcomes (Connor, Morrison, Fishman, et al., 2011; Connor, Morrison, Fishman, Schatschneider, & Underwood, 2007; Connor, Morrison, Schatschneider, et al., 2011) and included 81% of the sample. Participants in the sample drawn for this study were selected because they received the *Diagnostic Evaluation of Language Variation, Screening Test* (DELV-S; (Seymour, Roeper, & deVilliers, 2003) in the fall of their second grade year. Students who received the DELV-S compared to those who did not differed significantly only with regard to chronological age – students who did not receive the DELV-S were older on average (9.7 compared to 7.8 years of age). The sample was ethnically diverse, as 252 (37%) were African American, 318 (47%) were White, and 110 (16%) were Multiracial, Hispanic, or Asian descent. 47% qualified for the US Free and Reduced Price Lunch (FARL) program, a widely used marker of family poverty. Of the children qualifying for FARL, 78% were African American (75% of African American children), 13% were White (19% of White children), and the remaining were Hispanic (38% of Hispanic children), multiracial (36% of multiracial children), Asian (40% of Asian children), or not reported. Fewer than 3% were receiving support for speaking English as a second language.

Children attended one of 8 schools in 34 classrooms with socioeconomically and ethnically diverse student bodies in large metropolitan area of the Southeastern United States. School SES levels, represented by the percentage of students qualifying for and participating in FARL programs, ranged from 4% to 96%. White children were less likely to attend the highest poverty schools whereas African American children were more likely to attend higher poverty schools (see Table 1).

Measures

Diagnostic Evaluation of Language Variation Screening test—The DELV-S was administered individually to students in a quiet place in the school in the fall and spring of the 2007–2008 school year, by trained research staff following standardized procedures. The assessment has two parts: Part I is used to characterized the extent to which students are using non-mainstream dialect and Part II is used to identify whether students are at high, moderate, low or no risk for oral language difficulties. Using Cronbach's coefficient alpha, the DELV-S for this sample has an average reliability score of .88. We describe each part below.

On Part I, children are presented with pictures of actions, and asked to repeat verbatim statements, complete cloze statements, or answer questions. Responses are scored as the production of NMAE forms, MAE forms (Column A and B respectively), not scorable (Column C) or no response (Column D). Items tap both phonological features (e.g., teef, teeth) as well as morphosyntactic features of NMAE including third person singular with plural subject (e.g., … the mom always ____ the stroller: push, pushes), subject verb agreement with have/got, use of don't/do not for third person singular and the use of copula was/were. Totals of columns A and B are then used to categorize students as speaking with strong, some, or no variation from MAE according to the test's criterion scores.

Students' responses to Part 1 of the DELV-S were used to assess spoken NMAE use for this study. In addition to the categorical scores, we computed a dialect variation score (DVAR) by calculating the percentage of dialect variation using only responses to parts A and B because responses to part C were more representative of language errors and less of NMAE. Nor was Column D (i.e., no response) used. The formula used was the total number of items where the child used NMAE (Column B) divided by the total number of items where the child used either NMAE or MAE (Column A + B) multiplied by 100 = DVAR. As such, DVAR is the percentage of scored items that varied from MAE. This procedure was applied in previous research on DVAR using the DELV-S (e.g., Terry et al., 2010; 2012) and is similar to that applied in other studies (Charity et al., 2004).

Part II assesses potential risk for language disorder by assessing variations of language that are not related to NMAE use. On this section, children are asked to respond to wh-questions (e.g., who played with what?), demonstrate appropriate use of language features in cloze statements, and repeat non-words verbatim. The DELV-S Part II provides a categorical score based on students' responses: lowest risk, low to medium risk, medium to high risk, and highest risk for language disorder. To create a continuous score for the DELV-S Part II, Petscher, Connor and colleagues (2011) examined the psychometrics of the DELV-S Part II and found that there were two separate factors, a language factor (items 1–11) and a non-word repetition factor (items 12–17). Petscher and colleagues then used Item Response Theory (IRT) to create developmental scales scores (DS; mean = 500, SD = 100), which capture growth over time, and Standard scores, which control for age (SS; mean = 100, SD = 15), and provided conversion tables. We converted children's raw scores to DS and SS scores using this table (see Table 1). DS scores for the morphosyntax language and non-word repetition scores were used in the analyses to represent children's oral language skills.

Woodcock-Johnson Tests of Achievement-III—Students' reading comprehension and vocabulary skills were assessed using two subtests of the *WJ3 (*Woodcock, McGrew, & Mather, 2001) in the fall, winter and spring of the school year. Assessments were administered to children individually by trained research assistants following standardized procedures. On the Passage Comprehension subtest, students were asked to read and complete cloze passages by providing a single semantically and syntactically appropriate word (reliability = .73). On the Picture Vocabulary subtest, students were asked to name a series of increasingly less familiar pictures (reliability = .77). Using the publishers' software, raw scores for each subtest of the WJ3 were converted to W scores, which is a variation of a Rasch score and were used in all analyses. Raw scores were also converted to standard scores (SS; mean = 100, SD = 15), which are provided in Table 1.

Results

In general, students made gains in reading comprehension and vocabulary that were typical according to standardized norms with standard scores not changing from fall to spring (see

Table 1). Results from Part 1 of the DELV-S revealed that 71.9% of the students were judged to be speaking with little to no variation from MAE (group mean Fall DVAR = 9.42); 9.6% demonstrated some variation from MAE (group mean Fall DVAR = 35.28); and 14.8% demonstrated strong variation from MAE (group mean Fall DVAR = 66.78). Students with higher fall DVAR percentages generally showed weaker reading and language skills with fall reading comprehension, vocabulary, language, and non-word repetition skills negatively correlated with fall DVAR (see Table 1). Overall, African America children were most likely to be identified by the DELV-S as demonstrating strong variation from MAE (13% of the sample, 36% of African American children) or some variation from MAE (7% of the sample, 19% of African American children), Chi-square (24) = 194.86, $p < .001$. Hence, approximately 55% of African American children and 5% of White children were using measureable amounts of NMAE according to the DELV-S.

Change in NMAE Use from Fall to Spring

Because students were nested in classrooms, hierarchical linear modeling latent growth curve analyses (HLM, Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004) were used to examine whether students' DVAR scores changed from fall to spring (see Table 2 and Figure 2). Data were modeled at three levels, repeated measures by time (month, fall = 1; spring = 9, fixed so no random effects for the time variable) nested in students, nested in classrooms. Results revealed that students' use of NMAE significantly decreased by 0.28% per month for a fitted mean decrease of 2.24% fall to spring ($d = .21$). However, this varied as a function of students fall DVAR (a fall DVAR X time interaction). Students with higher fall DVAR scores generally decreased their use of NMAE more than did students with lower fall DVAR scores (see Figure 2).

Child and School Characteristics that Predict Changes in NMAE from Fall to Spring

Using the model described above, we then added child and classroom/school level variables to our model. We built the model systematically starting with student and school FARL (see Table 3). This model revealed that both student and school FARL predicted higher DVAR overall but that only student FARL predicted change in DVAR (i.e., time) with some evidence of a student X school FARL interaction effect on change in DVAR (see Figure 3). Overall, students who did not qualify for FARL and attended more affluent schools demonstrated the lowest levels of DVAR in the fall and spring, which did not change. Students who *did not* receive FARL but attended higher poverty schools demonstrated DVARs that were similar to students who received FARL and attended more affluent schools. However, they did not change their dialect use whereas students who qualified for FARL and attended a more affluent school showed significant decreases in DVAR. Students who received FARL and attended higher poverty schools demonstrated the highest DVARs, on average in the fall with slightly lower DVARs in the spring.

We then added students' picture vocabulary, language, non-word repetition, and reading comprehension scores as time-varying covariates. Non-word repetition did not significantly predict DVAR ($p = .508$) and so was trimmed from the model. Results reveal that as children demonstrated weaker vocabulary, language, and reading comprehension skills over the school year, they generally demonstrated higher DVAR scores overall.

We then examined student FARL interaction effects with vocabulary, language, and reading comprehension, controlling for school FARL and Fall DVAR. The student FARL X reading comprehension and picture vocabulary interactions did not significantly predict DVAR or time ($p > .35$) so both were trimmed from the model to preserve parsimony. The final model is provided in Table 4 and Figure 4. Most notable is that student FARL no longer predicts DVAR or change in DVAR (i.e., time). School FARL and fall DVAR both predict change in DVAR. Overall, as school FARL percentages increase, students' overall DVAR and DVAR change (i.e., time) increase. There is a significant language X student FARL interaction effect on DVAR, (see Figure 4). The findings are complex and the extent to which students decrease their spoken NMAE depends on both their FARL status and their language skills. Students with weaker language skills who also receive FARL have the greatest rates of NMAE and tend to increase their NMAE use from fall to spring. Students who have weaker language skills and do not receive FARL also tend to have higher DVARs but DVAR decreases sharply from fall to spring. Students who do not receive FARL and have strong language skills tend to start with higher DVARs in the fall and these percentages decrease by spring. Finally, students who have stronger language skills and do receive FARL tend to use less NMAE in both the fall and spring with an increase over time. However, spring DVARs are still low (DVAR = 18.5% when language is at the 75th percentile for the sample). Overall, we observed decreasing use of spoken NMAE for students with the exception of students with weaker language skills who received FARL. Their DVARs were high in the fall and increased from fall to spring.

Predicting DVAR among children who use substantial amounts of NMAE in the Fall

To look more closely at the children who, according to the DELV-S used moderate to strong NMAE, we selected children who had DVAR scores of 40% or greater in the fall (moderate to strong variation from MAE, see Figure 2). There were several reasons for chosing 40% or greater. First, within this sample, we found that these children were more likely to demonstrate dialect-shifting over the course of the school year. Second, examining the distribution of DVAR fall scores revealed a distribution heavily skewed toward less dialect use, which leveled off at about 40% DVAR, finally, 40% is in line with the DELV-S developers categories of NMAE use. Thus, these analyses can serve as a more stringent examination of constructs that predict dialect-shifting in second grade.

One hundred and two children met this criterion. This smaller sample was 85% African American, 6% White, and 4% multiracial with the remaining 5% children Asian or Hispanic. Eighty percent of the children in this sample qualified for FARL. We then applied the same model with DVAR as the outcome but were careful to trim non-significant variables to preserve parsimony and power with this smaller sample. Results are provided in Table 5 and Figure 5 and reveal that students with stronger reading comprehension and language skills showed generally lower DVAR scores, keeping in mind that these were entered as time varying covariates so that their influence was ongoing throughout the school year. There was also a school FARL X Time (month) interaction trend ($p = .057$) such that, on average, all students decreased NMAE use from fall to spring but rates of decrease were more rapid as school poverty decreased.

Changes in DVAR scores Predict Reading Comprehension

To examine whether change in DVAR from fall to spring predicted reading comprehension, we created two variables to represent dialect shifting or change in NMAE use from fall to spring. The first was Delta DVAR, which were the empirical Bayes residuals of the DVAR slope (i.e., month) from fall to spring, which are computed automatically by the HLM software and control for shared classroom variance. Delta DVAR was normally distributed with a mean of 0 (SD = 10.11) and a range from −20.75 to 21.77, where 0% indicates no change, a negative value indicates spoken NMAE use is decreasing and a positive value indicates that spoken NMAE is increasing from fall to spring. Second, we examined ordinary least squares residuals, which are less conservative than the empirical Bayes residuals because they do not control for shared classroom variance. This variable had a mean of 0 (SD = 21.94) and ranged from −45.0 to 47.25. With reading comprehension as the outcome, we entered Delta DVAR and fall reading comprehension, vocabulary, language, non-word repetition, and student FARL at level 1 and school FARL at level 2. Results (see Table 6) revealed that the more children decreased their NMAE use from fall to spring (i.e., negative Delta DVAR), the greater were their gains (residualized change) in reading comprehension and the effect was moderate (*d = .28 for a 10.11 point change in delta DVAR)*. The student and school FARL X Delta DVAR effects did not significantly predict spring reading comprehension (p = .841 and .301 respectively) and so although children at higher poverty schools tended to use more NMAE, the effect of Delta DVAR was the same regardless of school FARL. Results using ordinary least squared residuals were highly similar, most likely because there was limited between classroom variance in reading comprehension scores (intraclass correlation, ICC = .037, $p > .50$).

We also investigated whether we would achieve the same results if we considered reading comprehension over time (fall = 1, winter = 5, spring = 9) using latent growth curve modeling with HLM. We tested whether there was a non-linear association over time (time squared) but the quadratic trend was not significant and so was trimmed from the model. The language and vocabulary measures were entered as time varying covariates. Delta DVAR and student FARL were entered at level 2 (the child level) and school FARL was entered at the classroom level for both intercept and time. Because there was no between measure variability over time, we fixed the slope (i.e., no r_1). Results provided in Table 7 and Figure 6 reveal that controlling for language, vocabulary, and FARL, Delta DVAR predicts students' growth in reading comprehension over time and that the more children dialect shift, the greater the rate of growth in reading comprehension.

Discussion

The principal goal of this investigation was to investigate the associations among spoken NMAE use, language skills, and reading comprehension in the second grade. Several, perhaps not surprising, findings emerged from the analyses. For instance, students who spoke more NMAE were more likely to be African American, were more likely to qualify for FARL, and generally performed more poorly on reading and language measures. In addition, spoken NMAE production rates generally decreased over the school year, with students who spoke more NMAE initially showing greater change over time. Overall, these results are similar to those reported previously in the literature among first graders (Charity et al., 2004; Terry et al. 2010; Terry et al., 2012), and extend the findings to second graders. That said, by focusing in on second graders and reading comprehension, the results of this study add three unique findings that we highlight here.

Dialect-shifting behavior over time in second grade—First, among those children who began second grade speaking NMAE frequently, changes in spoken NMAE production varied widely, with some children increasing their MAE production, some children increasing their NMAE production, and some children not changing their NMAE production at all. Previous studies suggested that NMAE production rates varied little beyond first grade. That is, most change in production seemed to occur between preschool and first grade and flat-lined between second and fifth grades (e.g., Terry & Connor, 2012; Terry et al., 2012; Craig & Washington, 2004). Conversely, this study provides evidence that NMAE production rates may still be changing significantly in second grade, especially among children who begin the school year producing NMAE frequently. This finding has implications for applied research in this area. Whereas previous research findings would suggest that spoken NMAE use may not be malleable after first grade, these results suggest that malleability could be achieved among older students.

Predicting dialect-shifting over time in second grade—Unique findings about predicting dialect-shifting were also found in this study. First, within the larger, diverse sample, both school and individual child poverty levels had some bearing on dialect shifting. Specifically, as shown in Figure 3, among children who did receive FARL, those who attended more affluent schools demonstrated more shifting than did children who received FARL and who attended less affluent schools. Plus the latter group demonstrated the highest rates of NMAE use in both fall and spring compared to their peers who attended higher poverty schools but did not receive FARL. Second, despite the significant effects of poverty, language ability still mattered to the prediction of dialect shifting behavior within this larger sample. As shown in Figure 4, students receiving FARL who also had weaker language skills increased their NMAE use while their peers with stronger language skills used less NMAE overall from fall to spring. Meanwhile, children who did not receive FARL generally decreased their NMAE use during second grade, irrespective of language ability. Thus it appears that in higher poverty contexts, stronger language skills are associated with less NMAE use, and less poverty, regardless of language skills, is associated with greater dialect shifting from NMAE to MAE during the school year.

Because we found that children who spoke more NMAE were more likely to demonstrate shifting, we examined these relationships within a smaller subsample of moderate to high NMAE users. This more conservative approach revealed a third unique finding: among second graders who are more dense NMAE speakers, dialect-shifting is associated with reading comprehension, and predicted by school poverty levels. That is, although most children decreased their NMAE use, these decreases were more rapid in schools where fewer children participated in FARL programs suggesting that school context may influence dialect use.

Dialect-shifting over time and reading comprehension—Finally, a unique finding in this study is that, among those second graders who began the year speaking NMAE frequently, the more the children decreased their spoken NMAE production during the school year the greater were their reading comprehension gains and we tested this in two ways with the same results. While similar results have been found for word reading skill among first graders (Terry et al., 2012), these findings highlight that the relationship between children's NMAE production and reading achievement extends beyond basic word reading skills to more advanced reading comprehension skills. Moreover, this finding contrasts with previous observations of insignificant relations between dialect use and reading comprehension (e.g., Goodman & Buck, 1973). However, one important distinction between those studies and this one is our inclusion of a measure of change in dialect use. It may be that dialect-shifting ability, as opposed to absolute frequency of dialect use at one point in time, is more important to consider in the development of advanced literacy skills like reading comprehension (Craig et al., 2009). That said, it is important to note that there is some concern that the measure of comprehension used in this study is highly related to children's decoding skills skill (Keenan, Betjemann, & Olson, 2008). However, within this sample, Passage Comprehension scores were only moderately correlated with decoding and phonological awareness measures. Therefore, children's performance on the subtest likely reflected more than basic word reading ability.

The Importance of Dialect-Shifting for Reading Comprehension and Reading Achievement

Overall, the results of this study bring questions about the importance of spoken dialect variation to reading comprehension and reading achievement to the forefront.

Mechanisms through which dialect variation relates to reading comprehension—Given the nature of the reading comprehension measure used in this study, the results from this study suggest that the relationship between reading comprehension and NMAE use may be based in what have been referred to as the lower-level processes that support reading comprehension. Note that successful completion of this task requires proficient use of semantic and syntactic skills to create a passage that makes sense to the reader. Meanwhile, a measure of language predicted changes in dialect use, which then predicted gains in reading comprehension. Perhaps changes in spoken NMAE production independently predicted reading comprehension scores because this variable (appropriate use of MAE on academic tasks) is also indicative of the oral language proficiency that supports reading comprehension skills, rather than differences between NMAE features and standard American English orthographic patterns.

The interactions between oral language proficiency and dialect-shifting are perhaps most evidently displayed in Figure 4. In general, children with weaker oral language skills demonstrated higher DVAR scores at the beginning of second grade. That said, what is most striking is their dialect-shifting relative to their participation in FARL programs. Children from low-income households who began the year with weaker language skills actually increased their NMAE use during second grade. This trend contrasted sharply with that of their peers who also had weaker oral language skills but were not living in low-income households.

Researchers have posited in previous research that children who do not dialect-shift (for whatever reason) and continue to speak NMAE frequently in contexts that presuppose MAE (e.g., academic tasks, writing, and assessments) may be exhibiting weaker linguistic and metalinguistic skill in general, which may negatively influence their reading outcomes above and beyond spoken NMAE use itself (Terry et al., 2010, 2012; Terry & Scarborough 2011). Importantly, these researchers do not contend that NMAE use is indicative of a language deficit or disorder. Rather, they propose that dialect use, like all other elements of oral language, is contextualized. Whether implicit or explicit in nature, proficient use of NMAE or MAE requires an appreciation for the contexts in which each is used appropriately. Being attuned to language in this way, it is posited, is akin to the linguistic and metalinguisic knowledge already known to support the development of reading skills, including semantic and morphosyntactic knowledge. Consequently, individuals lacking this awareness (whether implicit or explicit) may also demonstrate other linguistic and metalinguistic weaknesses, which are likely related to poor reading outcomes beyond speech to print mismatches. Future research could tease apart these possibilities, including whether or not the same pattern of findings emerges among children who speak other NMAE dialects that contrast significantly with English orthography (e.g., Appalachain English).

School poverty effects on dialect-shifting and reading achievement—Unlike the larger diverse sample, it is somewhat surprising that oral language skills did not predict dialect-shifting in the smaller subsample of moderate to high NMAE speakers above and beyond school poverty levels. However, considering that dialect use is contextualized, it is plausible that the relationship between spoken dialect differences and reading achievement may also be mediated, at least in part, by the schooling environment. This effect may reflect the language environment, as more frequent NMAE production is often observed among adults and children living in poverty (Horton-Ikard & Miller, 2004; Labov, 1972; Myhill, 1988; Washington & Craig, 1998). Thus, perhaps children were less likely to dialect-shift in high poverty schools because they were exposed to fewer child and adult models of spoken MAE use both in and out of school.

Alternatively, this effect may reflect the instructional environment, as higher poverty schools are often characterized by lower academic achievement, poorer teacher quality, less parental involvement, inconsistent school attendance, and fewer educational resources (Connor, Son, Hindman, & Morrison, 2005; Fryer & Levitt 2004; Jencks & Mayer, 1990; Lee & Burkam, 2002; Leventhal & Brooks-Gunn, 2000; Orfield & Lee, 2005). Thus, perhaps children were less likely to dialect-shift in high poverty schools because they did not have the kind of instructional support necessary to promote language skills that would beget dialect-shifting in academic contexts.

A final possibility, unrelated to school context, is that dialect-shifting at this age may be less malleable. Keeping in mind that Terry and colleagues (2012) found that changes in spoken NMAE production between first and second grades were predicted by children's oral language skills, perhaps spontaneous dialect-shifting is unlikely to occur by the end of second grade without intervention. Thus, the school context effect may simply reflect more frequent NMAE use among children living in poverty that was less likely to change at this developmental time point. Additional research is necessary to tease apart these possibilities.

Poverty and language—The difference in findings between the larger more diverse sample and smaller more homogeneous sample are also likely due to the smaller sample size and lack of variability in poverty status in the latter group. The overwhelming majority of children in the subsample were from low-income households, attended high poverty schools, spoke more NMAE, and also performed more poorly on both the language and reading measures. Therein lies a complex but problematic characteristic of the study of dialect variation and language and literacy achievement among African American children in the US. Poverty's pervasive effects on achievement are well documented, and findings in this study may suggest that both school and individual child poverty are more consequential for reading comprehension ability than spoken dialect differences. While this interpretation is plausible, we argue that the findings around language (a malleable skill) present an opportunity to focus on a variable that can be responsive to instruction (Carlisle, 2010).

Implications for instruction or intervention—Finally, when considered with the finding that some second graders are still changing their NMAE production, results from this study suggest that NMAE use at this time point may indeed be malleable and could be a target for instruction or intervention. It is important to note that many children in this study (and previous investigations) appeared to shift spontaneously (i.e., decrease the frequency with which they produced NMAE features on an elicited language task) without targeted, dialect-informed instruction. Thus, when considering the benefits of instruction that encourages dialect-shifting, it may be that such instruction is most beneficial for children who are both struggling with reading in school and do not shift spontaneously. Moreover, given that previous research has also shown concurrent and predictive relationships between dialect-shifting and language ability among children from low-income households (Craig et al., 2014; Terry et al., 2012), findings from this study suggest language instruction could be particularly helpful to dense NMAE speakers in second grade.

Conclusion

In sum, although causation is not yet clear, the results of this study and others provide emerging and converging evidence that dialect variation and dialect shifting is worthy of further consideration in research on the development of more advanced reading skills like reading comprehension. As second grade students are transitioning from "learning to read" to "reading to learn", it is important to understand if and how dialect variation might be associated with this process. Given that NMAE forms can vary substantially from MAE in language content, form, and use, it is plausible that these differences may be associated not only with reading comprehension, but also with the lower-level processes and skills that underlie successful text comprehension.

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Feature	Exemplar	Study	Research findings
*Subject Verb Agreement, also known as omission of third person plural	"she go" for "she goes" or "he jump" for "he jumps"	Washington & Craig, (2002)	Use in 86-100% of samples (n=28)
		Oetting & Garrity, (2006)	100% of 4-6 yr.old sample (n=24)
*Use of don't/do not	"he don't like it"	Oetting & Pruitt, (2005);	71% of 4-6 yr.old sample (n=24)
Zero Copula	"you mad at me"	Oetting & Pruitt, (2005); Oetting & Garrity, (2006)	100% of 4-6 yr.old sample (n=24)
		Washington & Craig, (2002)	Use in 86-100% of samples (n=28)
Multiple negatives	"he didn't do nothing"	Oetting & Pruitt, (2005);	79% of 4-6 yr.old sample (n=24)
		Oetting & McDonald, (2001)	
*Regularized past tense was/were	"when we was at the store"	Oetting & Pruitt, (2005);	92% of 4-6 yr.old sample (n=24)
Omission of past tense marker	"I dress them before"	Oetting & McDonald (2001)	36% of 6 yr. old sample (n=31)
		Oetting & Pruitt, (2005);	58% of 4-6 yr.old sample (n=24)
Habitual be	"It be cold outside"	Oetting & Pruitt (2005)	67% of 4-6 yr. old sample (n=24)

Note. *indicates features that are targeted on the DELV-S.

Figure 1.
Features common among African American English and Southern Vernacular English.

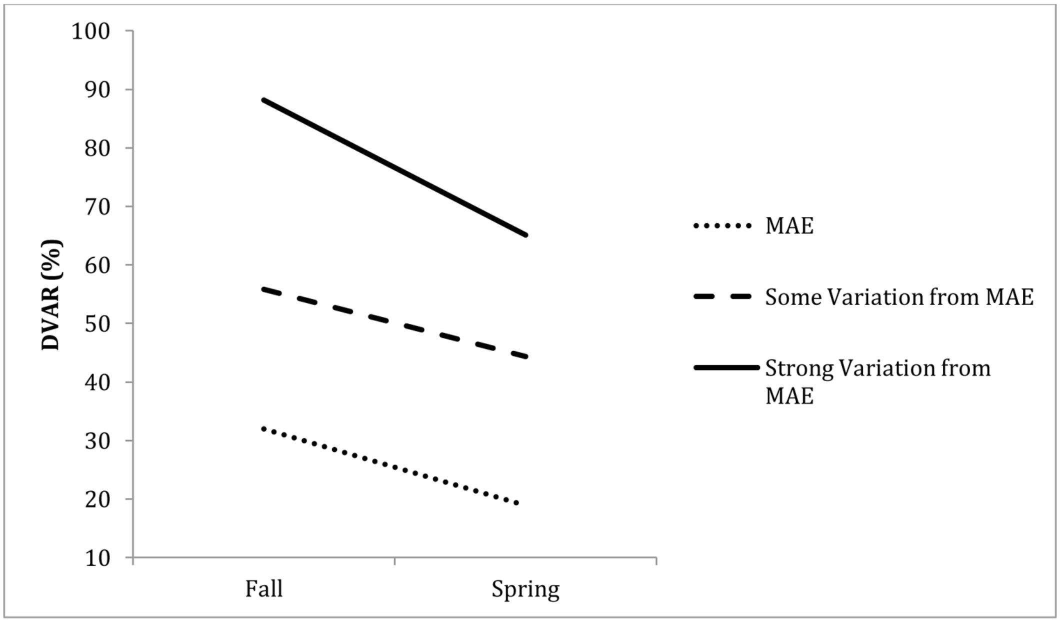

Figure 2.

DVAR use from fall to spring as a function of fall DVAR for students who, according to the DELV-S Part 1 administered in the fall were judged to be using MAE (dotted line, DVAR = 9.42%); some variation from MAE (dashed line, DVAR = 35.28%) and strong variation from MAE (solid line, 66.78%).

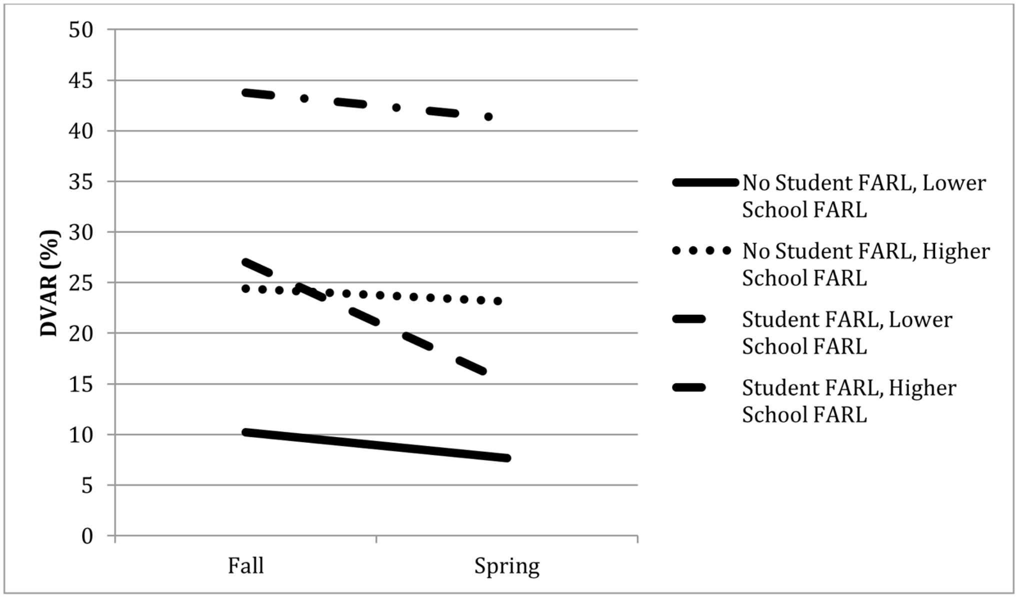

Figure 3.

School FARL is grand mean centered and modeled at the 25th (15% = lower) and 75th percentiles (72% = higher) of the sample, Student FARL is not centered, 0 = not qualified, 1 = qualified.

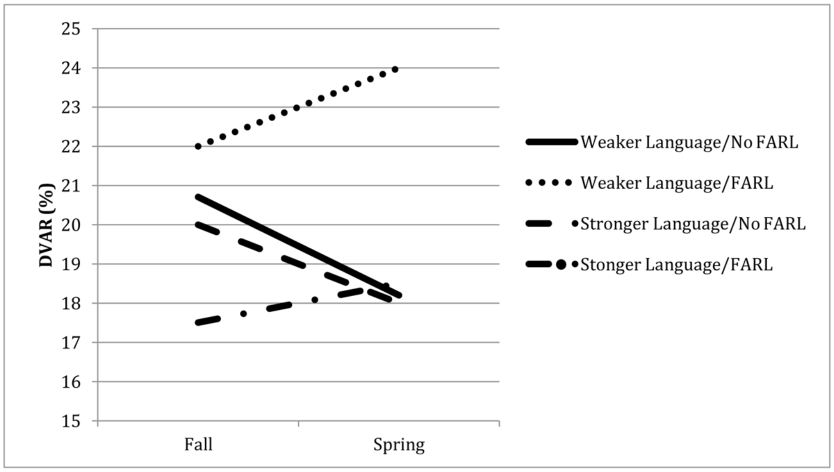

Figure 4.

Changes in Nonmainstream American English (% DVAR) use for the entire sample. Language skills modeled at the 25th (DS = 568) and 75th percentile of the sample mean (DS = 686). FARL = Student receives free or reduced price lunch. School FARL and Fall DVAR held constant at their sample mean.

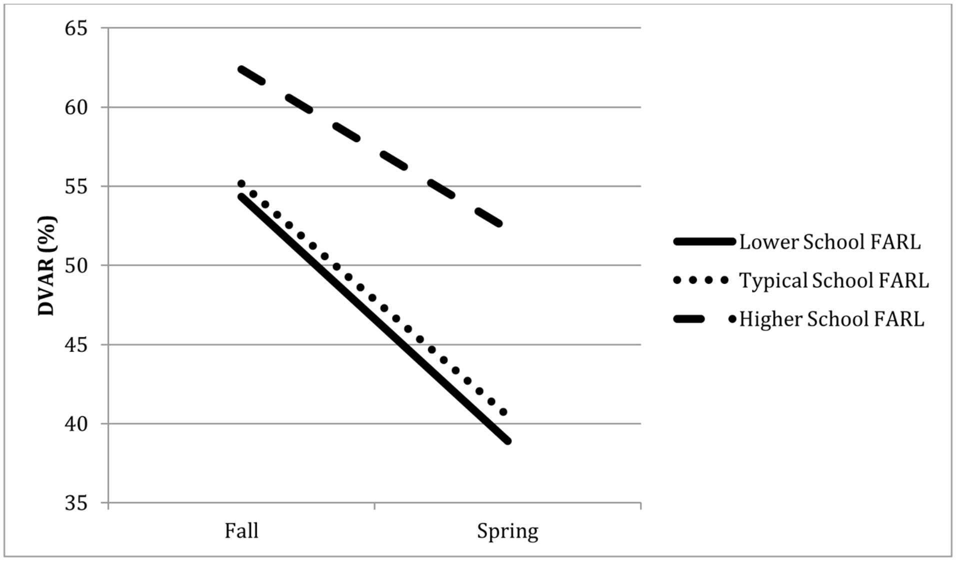

Figure 5.
Change in DVAR for sample of children with DVAR ≥ 40% (n = 102). Students all start with high levels of NMAE use, which is affected by both language and reading comprehension entered as time varying covariates and in this figure, held constant at the mean of the sample. There is a school FARL X Month (time) interaction such that children attending more affluent schools decrease their use of NMAE (i.e., decreasing DVAR) from fall to spring to a greater extent. School FARL is modeled at the 25th (31% = lower), 50th (34.8% = typical), and 75th percentiles (50.3% = higher).

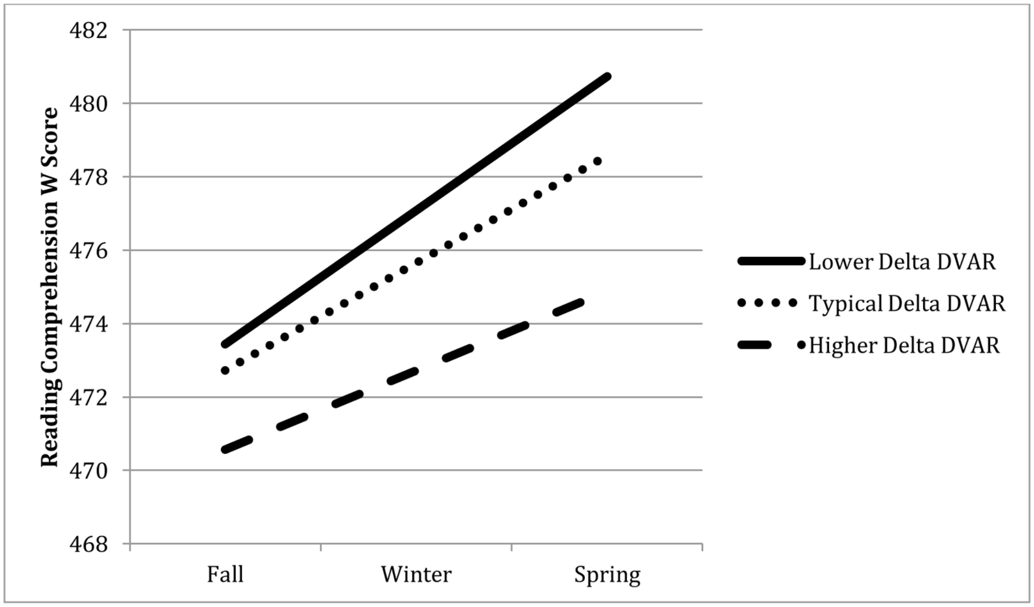

Figure 6.
Predicting growth in Reading Comprehension as a function of Delta DVAR (OLS residuals), where negative Delta DVARs are associated with greater decreases in NMAE use from fall to spring for the sample of 102 children with DVAR scores greater than 40%. Lower, Typical, and Higher Delta DVARs are modeled at the 25th (Delta DVAR = −12.6), 50th (Delta DVAR = −3.17) and 75th percentiles (Delta DVAR = 14.2) of the sample.

Table 1

Fall Assessment Correlations and Descriptive Statistics for Complete Sample (standard deviations in parentheses)

	Fall DVAR	Fall Vocabulary W score	Fall Reading Comprehension (RC) W score	Fall Language DS score	Fall Non-word DS score
Fall DVAR%		$-.424^{***}$	$-.423^{***}$	$-.294^{***}$	$-.142^{***}$
Fall Vocabulary SS			$.538^{***}$	$.360^{***}$	$.138^{***}$
Fall RC SS				$.358^{***}$	$.200^{***}$
Fall Language DS					$.313^{***}$
Fall Means (SD)	20.83% (24.19)	486.75 (11.97)	479.78 (13.74)	625.44 (79.61)	572.69 (79.61)
Mean Fall and Spring	Spring 17.49% (21.63)	Fall SS 99.49 (11.92) Spring 101.43 (10.97)	Fall SS 99.81 (11.41) Spring 99.20 (11.40)	Fall SS 103.00 (25.63) Spring 100.31 (14.50)	Fall SS 100.03 (15.15) Spring 100.11 (14.90)

Demographics of the Sample by School

School	A	B	C	D	E	F	G	H
% FARL	4.3%	16.5%	31.5%	35.0%	63.5%	72.3%	82.3%	89.2%
% African American	7%	14%	35%	44%	72%	75%	78%	97%
% White	79%	63%	59%	44%	16%	13%	0%	0%
% Other including Hispanic, Asian, and Multiracial	14%	23%	6%	12%	12%	12%	22%	3%

Note.

*** $p < .001$;

Vocabulary = WJ3 Picture Vocabulary; RC = WJ3 Passage Comprehension; DS = Developmental Scale Score. SS = Standard Score

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Table 2

Results of HLM Investigating Change in NMAE Use (DVAR) From Fall (F) to Spring

Fixed effect	**Coefficient**	**SE**	***df***	***p***
January DVAR (intercept)	19.69	0.53	39	<.001
Fall DVAR coefficient	0.84	0.02	307	<.001
Time (mean change/month)	−0.28	0.09	306	.005
Fall DVAR X Time coefficient	−0.04	0.00	306	<.001
Final estimation of level 1 and level 2 variance components				
Random effects	Variance	*df*	χ2	*p*
Intercept, r_0	0.49	307	290.92	>.500
Level 1, *e*	109.33			
Final estimation of level 3 variance components				
Intercept u_{00}	4.48	39	70.12	.002

Note. Deviance = 5236.33. Time (Month) and Fall DVAR (FDVAR) were grand mean centered at January = 5.3 and 20.68% respectively. Month coded as Fall = 1; Spring = 9.

Model:

$$DVAR_{tij}=\gamma_{000}+\gamma_{010}*\mathrm{FDVAR}_{ij}+\gamma_{100}*MONTH_{tij}+\gamma_{110}*MONTH_{tij}*\mathrm{FDVAR}_{ij}+r_{0ij}+u_{00j}+e_{tij}$$

Table 3

Predicting NMAE Dialect Use (DVAR) over Time (MONTH)

Fixed effect	**Coefficient**	**SE**	**t-ratio**	***df***	***p***
January DVAR (intercept)	15.19	1.29	11.77	33	<0.001
Effect of SCHFARL	0.27	0.05	5.68	33	<0.001
Effect of STFARL	14.31	2.40	5.97	499	<0.001
STFARL X SCHFARL	0.09	0.07	1.15	499	0.250
Time (Mean change/month)	−0.19	0.18	−1.08	421	0.281
Effect of SCHFARL	.0002	0.006	0.03	421	0.976
STFARL	−0.95	0.34	−2.76	421	0.006
STFARL X SCHFARL	0.02	0.01	1.88	421	0.060
Final estimation of level 1 and level 2 variance components					
Random effects	SD	Variance	*df*	$\chi 2$	*p*
Intercept, r_0	14.03	196.73	485.00	1917.87	<0.001
Level 1, *e*	11.13	123.90			
Final estimation of level 3variance components					
Intercept u_{00}	2.08	4.32	33	48.35	0.04

Note. Deviance = 8356.94, School-wide % Free And Reduced Lunch (SCHFARL) is grand mean centered, Student FARL (STFARL, 0 = did not receive, 1 = received) is not centered. MONTH is time where fall = 1 and spring = 9.

Table 4

Predicting NMAE Dialect Use (DVAR) and DVAR change (Month)

Fixed effect	**Coefficient**	**SE**	**t-ratio**	***df***	***p***
January DVAR (intercept)	19.56	0.77	25.42	32	<0.001
Effect of STFARL	1.26	1.49	0.85	253	0.399
Effect of SCHFARL	0.08	0.02	3.39	32	0.002
Effect of FDVAR	0.79	0.03	31.15	253	<0.001
Time (month) mean	−0.35	0.20	−1.80	242	0.074
Effect of STFARL	0.51	0.41	1.26	242	0.210
Effect of SCHFARL	0.02	0.01	4.02	242	<0.001
Effect of FDVAR	−0.06	0.01	−9.67	242	<0.001
Language	0.001	0.01	−0.14	242	0.892
Language X STFARL	−0.04	0.02	−2.24	242	0.026
Language X FDVAR	0.0005	0.00	1.83	242	0.069
Final estimation of level 1 and level 2 variance components					
Random effects	SD	Variance	*df*	χ2	*p*
Intercept, r_0	0.54	0.29	253	230.4	>.500
Level 1, *e*	10.25	105.07			
Final estimation of level 3 variance components					
Intercept u_{00}	1.60	2.54	32	50.04	0.02

Note. Deviance = 4298.62, School-wide % Free And Reduced Lunch (SCHFARL) is grand mean centered, Student FARL (STFARL, 0 = did not receive, 1 = received) is not centered. Time is in months where fall = 1 and spring = 9.

Table 5

DVAR for smaller sample of children whose DVAR is greater than or equal to 40% (n = 102) predicted from fall to spring (Time) by reading comprehension, language, and school FARL

Final estimation of fixed effects:

Fixed Effect	Coefficient	SE	*t*-ratio	*df*	*p*-value
January DVAR (intercept)	50.46	1.89	26.69	27	<0.001
Effect of SCHFARL	0.24	0.05	4.15	27	<0.001
Time (mean change/month)	−1.91	0.32	−6.01	67	<0.001
Effect of SCHFARL	0.02	0.008	2.60	67	0.012
Reading Comprehension	−0.36	0.12	−3.03	67	0.004
Language	−0.04	0.02	−1.87	67	0.065

Final estimation of level-1 and level-2 variance components

Random Effect	SD	Variance	*d.f.*	χ^2	*p*-value
Intercept, r_0	12.08	146.08	73	191.73	<0.001
level-1, e	13.91	193.45			

Final estimation of level-3 variance components

Random Effect	SD	Variance	*d.f.*	χ^2	*p*-value
Intercept, u_{00}	0.19	0.038	27	24.83	>.500

Note. Deviance = 1729.96. School FARL (SCHFARL) is centered at the sample grand mean. Reading comprehension and Language are time varying covariates.

Table 6

Change in DVAR from fall to spring (Delta DVAR) Predicting Reading Comprehension (RC)

Fixed effect	Coefficient	SE	t-ratio	*df*	*p*
Spring reading comprehension (mean W)	479.28	1.79	267.35	27	<0.001
Effect of SCHFARL	−0.09	0.04	−2.40	27	0.024
Fall Vocabulary (W)	0.15	0.10	1.60	66	0.113
Fall RC (W Scores)	0.60	0.08	7.55	66	<0.001
Fall Language (DS)	0.005	0.01	−0.35	66	0.726
Fall Non-word reading (DS)	0.01	0.01	1.39	66	0.170
Delta DVAR	−0.23	0.10	−2.29	66	0.025
SCHFARL X Delta DVAR effect	−0.003	0.003	−1.04	66	0.301
STFARL	0.46	2.30	0.20	66	0.841
Final estimation of variance components					
Random effects	SD	Variance	*df*	$\chi 2$	*p*
Intercept, r_0	0.31	0.09	27	15.38	>0.500
Level 1, *e*	8.45	71.32			

Note. Deviance = 747.12, School-wide % Free And Reduced Lunch (SCHFARL) and all continuous variables are grand mean centered, Student FARL (STFARL, 0 = did not receive, 1 = received) is not centered. Vocabulary = Woodcock Johnson III (WJ3) Picture Vocabulary W score, RC = WJ3 Passage Comprehension W score. DS = Developmental Scale Score from the DELV-S, Delta DVAR = empirical Bayes residuals.

Table 7

Change in Reading Comprehension (RC) over Time (Month) predicted by Delta DVAR (OLS) and other variables

Fixed effect	**Coefficient**	**SE**	**t-ratio**	***df***	***p***
Spring RC (intercept)	477.28	1.85	257.42	27	<0.001
Effect of SCHFARL	−0.04	0.04	−1.09	27	0.285
Effect of Delta DVAR	−0.14	0.04	−3.35	71	0.001
Effect of STFARL	−3.05	2.41	−1.27	71	0.210
Time (Month)	1.12	0.29	3.86	65	<0.001
Effect of Delta DVAR	−0.01	0.01	−2.09	65	0.041
Effect of STFARL	−0.39	0.34	−1.12	65	0.268
Vocabulary	0.23	0.09	2.72	65	0.008
Language	0.03	0.01	2.94	65	0.004
Non-Word Repetition	0.01	0.01	0.68	65	0.498
Final estimation of level 1 and level 2 variance components					
Random effects	SD	Variance	*df*	χ2	*p*
Intercept, r_0	7.49	56.14	71	264.56	<0.001
Level 1, *e*	6.89	47.48			
Final estimation of level 3 variance components					
Intercept u_{00}	0.19	0.03	27	22.62	>.500

Note. Deviance = 1475.98, RC = Woodcock Johnson III (WJ3) Passage Comprehension, PV = Picture Vocabulary, Language, and Non-word repetition were entered as time varying covariates centered at the sample grand mean. School-wide % Free and Reduced Lunch (SCHFARL) was also grand mean centered. Student FARL (STFARL, 0 = did not receive, 1 = received) was not centered. Time is in months where fall = 1, winter = 5, and spring = 9. Delta DVAR = ordinary least squares residuals of change in DVAR from fall to spring.