Journal of Applied Developmental Psychology 31 (2010) 238–248

Contents lists available at ScienceDirect

Journal of Applied Developmental Psychology

Language skills in low-SES rural Appalachian children: Kindergarten to middle childhood

Mary E. Reynolds *, Margaret Fish

Marshall University, Huntington, West Virginia, United States

ARTICLE INFO

Article history:
Received 10 December 2008
Received in revised form 30 January 2010
Accepted 1 February 2010
Available online 12 March 2010

Keywords:
Literate language
Morphology
Appalachian English
Phonological working memory

ABSTRACT

This study examined the development of language in low-SES rural Appalachian children from kindergarten through middle childhood. Findings showed that the children's language skills improved significantly between kindergarten and middle childhood, with all middle childhood language means within the average range. However, all areas of language except the ability to correctly interpret nonliteral language remained significantly below normative population means. Girls performed significantly better than did boys and higher-SES girls performed better than lower-SES girls. Nonliteral language and receptive syntax were relative strengths and vocabulary and pragmatic judgment were relative weaknesses. Use of grammatical markers of Appalachian English was not related to language skills and, as a group, these children demonstrated adequate phonological working memory. Standardized measures of morphology and syntax best classified children into groups who received remedial services for reading or other language-related tasks and those who did not. Implications of these finding are discussed.

Introduction

Poverty, or low-socioeconomic status (SES), has been shown to put children at risk for delay in the acquisition of oral language (e.g., Fish & Pinkerman, 2003; Hart & Risley, 1995). In their seminal work, Hart and Risley demonstrated poverty's significant effect on vocabulary growth, with the gap between the number of words produced by higher- and lower-SES children widening over time. Although Fish and Pinkerman found the language skills of primarily low-SES children from rural Appalachia to be commensurate with those of mainstream children at 15 months of age, the low-SES children's language skills had worsened considerably by kindergarten entry. Studies (e.g., Pullen & Justice, 2003) have shown that, when children have poor oral language skills, they are at risk for difficulty with the acquisition of literate language, (i.e., reading and writing), an important predictor of academic achievement. The present study will extend Fish and Pinkerman's work by examining the development of language skills in their cohort of children during the middle childhood years.

Relationships among oral language, literate language, and poverty

Researchers have shown that oral language, which develops exponentially during the infant, toddler, and preschool years, supports the development of literate language (Snow & Beals, 2006; Snow, Burns, & Griffin, 1998). For example, Nation, Clarke, Marshall, and Durand (2004) and Roth, Speece, and Cooper (2002) found oral vocabulary to be strongly correlated to reading comprehension, with Ouellette (2006) demonstrating that vocabulary depth, (i.e., the ability to define words and recognize synonyms), contributed unique variance to the prediction of children's reading comprehension in fourth grade. Cooper, Roth, Speece, and Schatschneider (2002) found that oral language skills, specifically vocabulary, syntax and morphology, supported the development of reading indirectly through the mastery of phonological awareness skills. Children with specific language impairment (SLI), who typically have challenges with all components of language, but especially in the areas of syntax and morphology (Rice, Wexler, & Hershberger, 1998), have been shown to be at particular risk for problems with the acquisition of literate language (Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998).

A considerable body of work shows that poverty, or low-SES, also places children at risk for oral and literate language difficulty. For example, Fish and Pinkerman (2003), Stanton-Chapman, Chapman, Kaiser, and Hancock (2004), and Locke, Ginsborg, and Peers (2002) found that preschool-aged children from low-SES backgrounds scored significantly lower on standardized tests of language than did comparison children from higher-SES backgrounds (Locke et al.) and children in the tests' normative populations (Fish & Pinkerman; Stanton-Chapman et al.). Using spontaneous language samples, Le Normand, Parisse, and Cohen (2008) found that preschool-aged children from higher-SES backgrounds began language production and used multiword utterances at earlier ages than did children from lower-SES backgrounds. As mentioned previously, Hart and Risley (1995) demonstrated poverty's significant effect on vocabulary growth,

* Corresponding author. Office of Assessment and Program Review, Marshall University, One John Marshall Drive, Huntington, WV 25755-2003, United States.
E-mail address: reynoldm@marshall.edu (M.E. Reynolds).

0193-3973/$ – see front matter © 2010 Elsevier Inc. All rights reserved.
doi:10.1016/j.appdev.2010.02.001

with the gap between the number of words produced by higher and lower-SES children widening over time. Given the link between oral vocabulary and reading comprehension (Nation et al., 2004; Ouellette, 2006; Roth et al., 2002), the latter finding is especially noteworthy.

As poverty has been shown to negatively influence the development of oral language, it is not surprising that a substantial amount of research has found poverty to be predictive of poor literacy skills during the school years. For example, Cunningham (2007) showed that poverty was the largest correlate of (low) reading achievement, while McGill-Franzen, Zmach, Solic and Zeig (2006) found that the higher the poverty, the lower the reading achievement of third graders regardless of type of reading program their schools used. Raz and Bryant (1990) reported that middle class children performed better on reading tasks than did children from low-SES backgrounds, even after adjustments for intelligence. At the same time, researchers found that children from low-SES groups showed significant individual differences in language abilities (Fish & Pinkerman, 2003), especially vocabulary knowledge (Weizman & Snow, 2001) and literacy (Snow & Beals, 2006). These differences appeared to be related to factors such as facilitative maternal behavior during infancy, child initiative at age 4, and number of children's books in the family at age 4 (Fish & Pinkerman), density of sophisticated words mothers used during interactions with children in helpful or instructive interactions at age 5 (Weizman & Snow), and exposure to rare words during extended discourse at age 5 (Snow & Beals).

Although poverty seems to negatively affect children's acquisition of oral and literate language, there appear to be significant individual differences in language skills among low-SES children. Additionally, factors such as child sex may influence the course of language development.

Sex differences in oral language

Research has shown that, at least during the early years, typically developing girls outperform boys on standardized tests of oral language (Fish & Pinkerman, 2003; Locke et al., 2002; Van Hulle, Goldsmith, & Lemery, 2004). Additionally, Craig and Washington (2002) found that preschool and kindergarten aged girls produced a greater number of different words in spontaneous language samples than did similarly aged boys, while Le Normand et al. (2008) found that girls younger than 36 months used more words and a greater diversity of word types (i.e., nouns, verbs, adjectives, etc.) than did boys of the same age. Lyytin, Laakso, Poikkeus, and Rita (1999) found that girls performed better than boys in measures of symbolic play at age 14 months and that these measures were predictive of vocabulary production at age 2 years. Although gender differences in symbolic play had disappeared by age 2 years, girls at this age continued to demonstrate greater vocabulary production than did boys.

However, findings regarding sex differences in language performance during the school age years have been mixed. While Craig, Washington, and Thompson (2005) found that first through fifth grade girls outperformed boys in mean length of communication unit and production of complex syntax, the effect sizes were small and the female advantage for number of different words had disappeared. Other researchers found no difference between middle childhood aged boys and girls on their ability to understand figurative language (Nippold, Allen, & Kirsch, 2001; Nippold, Moran, & Schwarz, 2001), on their vocabulary knowledge (Nippold, Allen, & Kirsch), or reading and listening comprehension (Nippold, Moran, & Schwarz). Van de gaer, Pustgens, Van Damme, and De Munter (2009) reported that boys and girls in their longitudinal study performed similarly on language measures upon entering secondary school, while Yarbrough and Johnson (1980) found that boys and girls had comparable reading ability by seventh grade. Finally, Van de gaer, Pustgens, Van Damme, and De Munter (2006) found no difference in overall (oral and literate) language performance between boys and girls in high achieving academic tracks at the end of secondary school, while they found differences (favoring girls) among students in lower achieving tracks.

Taken together, these findings suggest that sex differences in children's language development are more pronounced during the preschool than in the school-aged years. As children grow older, the effects of sex appear to be mitigated by other factors, such as overall academic performance.

Effect of formal education on performance on standardized measures of language

Fazio, Naremore, and Connell (1996) found that the performance of children from low-SES backgrounds on standardized tests of language improved significantly between kindergarten and second grade. They suggested that this may have been due to the influence of the school culture, which resulted in children being more familiar with test taking. In a group of African-American children, Craig and Washington (2004) found a significant decrease in the children's use of the morphological markers of African-American English between kindergarten and first grade. They further found that, the larger the decrease in dialect use, the better the children's performance on standardized tests of receptive oral vocabulary and reading.

While limited, this research suggests that the school culture exposes children to a greater variety of vocabulary and language use than that they experienced in the home. It also raises the possibility of a relationship between non-standard dialect use and children's performance on standardized language tests, a possibility we will explore in more depth in this study.

Main purpose of the study

The main purpose of the present study was to investigate the language skills of a cohort of primarily low-SES children from rural Appalachia during the middle childhood period. Our participants, whose infancy and preschool language abilities were reported in Fish and Pinkerman's (2003) article, have been involved in a longitudinal study of families from rural Appalachia since their births. They were recruited from rural West Virginia for several reasons. First, West Virginia is the only state entirely within the Appalachian region (Appalachian Regional Commission, 2008) and has been defined as part of the "core" region of Appalachia (Williams, 2002). Second, low-SES children from rural West Virginia are at risk for language and academic problems due to low parental income and education. For example, in 2006 39% of West Virginia children were living in families where no parent had full-time year-round employment and 80% in households where the head did not have a college degree (Annie E. Casey Foundation, 2008). Third, although children from Appalachia have been included in previous longitudinal studies of social and intellectual development (e.g., NICHD Early Child Care Research Network, 2005; Pettit, Bates, & Dodge, 1997), Fish and Pinkerman reported results from the only longitudinal study that focused exclusively on low-SES rural Appalachian children.

In their study, Fish and Pinkerman (2003) compared the children's language abilities during infancy and preschool, as measured by standardized tests of language, with those of the tests' normative populations. The measures administered were the *MacArthur Communicative Development Inventory/Words and Gestures* (*CDI*; Fenson et al., 1994) at 15 months and the *Preschool Language Scale — Third Edition* (*PLS-3*; Zimmerman, Steiner, & Pond, 1992) at 4 years and shortly before kindergarten entry. The rural Appalachian children's *CDI* scores were similar to those reported by Fenson et al. for a group of children from predominantly well educated, middle class families. However, results of the *PLS-3* at both 4-years and prior to kindergarten entry showed that the majority of children scored more than one standard deviation below the mean, with boys scoring significantly lower than girls. These results suggested that the children might be at risk for difficulty with the acquisition of literate language and hence, for academic failure.

To follow these children's language development into the middle childhood years, the current study sought to answer these questions: First, "Will the language skills of low-SES children from rural Appalachia, as measured by standardized tests of language, improve between kindergarten and middle childhood and if so, will there be sex or SES (as measured by whether or not children's families received public assistance) differences in improvement?" Second, "Will the language skills, as measured by standardized tests of language, of low-SES children from rural Appalachia, which were significantly below those of the normative population prior to kindergarten entry, remain so during middle childhood and will there be sex or SES differences in standardized language performance?"

Based on previous research, we hypothesized that exposure to the academic culture of public schools would result in a significant improvement in children's scores on standardized tests of language between kindergarten and middle childhood. We further hypothesized that our participants would show individual differences in standardized language performance, with children from higher-SES backgrounds outperforming children from lower-SES backgrounds. Although research on the influence of child sex on language performance during the middle childhood years has resulted in mixed findings, we hypothesized that, if a difference existed between boys and girls, girls would outperform boys. We based this hypothesis on the observation that, as a group, all children's language scores had been depressed before kindergarten. Since Van de gaer et al. (2006) found that girls in lower achieving academic tracks outperformed boys in language tasks during secondary school, we hypothesized that this might be the case for our participants. Finally, based on research showing that poverty has a negative relationship to language performance, we hypothesized that our participants' mean performance on standardized language tests would remain below that of the tests' normative populations.

In addition to these questions, we wanted to investigate possible relationships between Appalachian dialect, present to some extent in the majority of children in this study, working memory and language performance. Finally, we wanted to see which contemporaneous measures of oral language would best differentiate children identified by teachers as struggling with academic areas of language, such as reading and language arts, and those who were not. We will expand on these issues in the sections that follow.

Relationships among poverty, minority group status, use of standard English, and performance on standardized tests of language

Studies have shown poverty and minority group membership to be strongly correlated (Brooks-Gunn, Klebanov, Smith, Duncan, & Lee, 2003; Dollaghan et al., 1999). Therefore, it has been difficult to determine the relative contribution of each factor to performance on standardized tests of language. In addition, many children living in poverty speak non-standard varieties of English (Beron & Farkes, 2004; Ellis Weismer et al., 2000; Hart & Risley, 1995). Language researchers have pointed out that norm-referenced tests are heavily knowledge dependent and tend to follow the rules of Standard American English (SAE) (Campbell, Dollaghan, Needleman, & Janosky, 1997; Ellis Weismer et al.), which may account for the finding that children who speak non-standard varieties of English often achieve lower scores on these tests than do children from SAE speaking communities. While not members of a minority group, many of the children in the Fish and Pinkerman (2003) study spoke a non-standard regional dialect, Appalachian English (for descriptions of this variety of English, see Wolfram, Adger, & Christian, 1999).

Some researchers have suggested that SES factors may play a larger role in language performance (Dollaghan et al., 1999; Lawrence & Shipley, 1996) than speaking a non-standard variety of English, while others have found that controlling for SES levels did not eliminate differences between SAE speaking groups and non-SAE speaking groups on standardized measures of receptive (Craig & Washington, 2004; Restrepo et al., 2006) and expressive (Restrepo et al.) vocabulary. Using a measure of *dialect density*, computed by dividing the number of tokens of non-SAE grammatical markers to total words spoken, Craig and Washington (2004) found that African-American first through fifth grade children with higher *dialect density* scores performed significantly more poorly on standardized tests of reading and receptive vocabulary than did children with lower *dialect density* scores. If using some markers of non-SAE negatively affects language and academic performance, it may be so because SAE is the language of the school curriculum (Thompson, Craig, & Washington, 2004). To see if use of Appalachian dialect influenced our participants' performance on standardized tests of language we asked the following question, "If language skills, as measured by standardized tests of language, remain significantly below the population mean during middle childhood, will this result be explained in part by the effect of non-standard dialect use?" Based on Craig and Washington's findings, we hypothesized that *dialect density* would be negatively correlated with standardized language test scores, (i.e., the greater the use of non-standard dialect, the lower the scores on standardized language tests).

The answer to this question should help to shed light on the relative contributions poverty and non-standard dialect use make to children's performance on standardized measures of language. Next, we will examine the relationship between working memory and language ability.

Relationship between working memory and language ability

Whether children from low-SES families are more likely to achieve lower scores on standardized tests of language than children from higher-SES families due to the tests' language bias or due to poverty, their performance may result in incorrect diagnoses of SLI. Although the cause of SLI is not known, a large body of research suggests that short-term (Conti-Ramsden, Botting, & Faragher, 2001) or working (Gillam, Cowan, & Marler, 1998; Marton & Schwartz, 2003) memory may be impaired in children with SLI. Short-term memory refers to an individual's ability to retain a small amount of information over a short period of time. The term "working memory," often used synonymously with "short-term memory," tends to put more emphasis on the mental operations of short-term memory storage (Medin & Ross, 1992).

Researchers have shown that processing-dependent measures, such as nonword repetition tasks, reliably differentiated children with SLI from children with typically developing language skills in majority populations who speak SAE (Dollaghan & Campbell, 1998; Ellis Weismer et al., 2000). Since processing-dependent measures do not use background knowledge, Campbell et al. (1997) hypothesized that they might provide non-biased measures to reliably distinguish children with language differences from children with SLI in non-SAE speaking populations. To test their hypothesis, Campbell et al. used both a norm-referenced (knowledge-dependent) language test and a processing-dependent nonword repetition task to compare a group of boys, most of whom were African-American, to an Anglo-American group. The minority group scored significantly lower than the Anglo-American group on the knowledge-dependent standardized language measure, but did not differ on the nonword repetition task. These findings suggest that, although children from minority groups may score lower than comparison groups on standardized tests of language, their language processing abilities appear to be equivalent to those of majority children.

In an attempt to partially replicate these findings, we asked the following research question, "If language skills, as measured by standardized tests of language, remain significantly below the population mean during middle childhood, will this result be explained in by poor processing skills?" Because our participants were enrolled in the study as part of a community sample at birth and could be expected to resemble a typically developing cohort, we hypothesized that, as a group, they would show processing ability, as measured by a nonword repetition task, within the normal range.

To this point, we have asked questions about our participants' oral language ability during middle childhood and what factors, e.g., sex,

poverty, non-standard dialect use, and working memory, might influence it. Next, we turn to the question of which language factor or factors best predict use of language in the academic context during middle childhood.

Factors related to school-based language functioning during middle childhood

Given that knowledge-dependent components of language, such as vocabulary (Nation et al., 2004; Roth et al., 2002), have been found to be highly predictive of success in reading, we hypothesized that compromised language input due to poverty during the preschool years may put children, even when they demonstrate working memory capacity within the normal range, at risk for later difficulty with the acquisition of literate language. However, we recognized that our children's language abilities likely would not be independent of their nonverbal cognitive abilities because, while Bishop (1992) stated that children with SLI had nonverbal cognitive abilities that were superior to their oral language skills, Locke et al. (2002) found that many low-SES children demonstrated higher nonverbal cognitive than language skills. Finally, Heokstra, Bartels, and Boomsma (2007) found language and nonverbal cognitive abilities to be closely related in many typically developing children. As mentioned previously, as part of a community sample, it seemed reasonable to predict that our participants would be typically developing and more likely than not to demonstrate a relationship between language and nonverbal cognitive skills.

So, we asked a final question, "Which contemporaneous measures of language and nonverbal intelligence best predict membership in one of two middle childhood language status categories: those who receive or have been referred for remedial services for reading and/or other language-related skills (remedial services group) and those who do not receive such services (typically developing group)?" Based on previous research that has shown oral language, especially vocabulary knowledge, to be a strong predictor of school age literate language, we hypothesized that measures of language would best predict the need for school-based remedial services for language-related skills. We further predicted that, among the language measures taken, vocabulary would be the strongest predictor.

In this sections that follow, we will explain the methodology used to answer each of the questions posed, outline our results for each, and discuss their implications.

Method

Participants

Data to address the research questions of the present investigation were drawn from assessments that occurred 1 month prior to kindergarten, and two during middle childhood.[1]

Sixty Anglo-American children (31 male, 29 female) participated in both middle childhood assessments. To the nearest 3 months, the children ranged in age from 10.00 to 11.75 (M = 10.89, mode = 11.00) during Assessment I and from 11.00 to 12.75 (M = 11.77, mode = 11.75) during Assessment II. They lived in a rural area and their families generally were low-SES. Specifically, maternal education at the time of enrollment in the study ranged from 7 to 13 years (M = 11.05, SD = 1.64). At the time of middle childhood testing, 42 of the 60 children's families (70%; 22 male, 20 female) received public assistance (food stamps, medical card, or cash payment). Sixteen children (27%; 12 male, 4 female) were designated as the remedial services group because they were either receiving or had been referred for remedial (special education or Title I) services for reading and/or speech and language. *Chi-Square* analysis showed that receiving public assistance was independent of child sex, but receiving special services was not; relatively more boys than girls received special services, X^2 (1) = 4.76, $p < .05$.

Setting, materials, and procedures

All assessments were completed at a rural community health clinic serving the area where participants lived. All assessments were videotaped and/or audiotaped for later scoring and interrater reliability checks, and items of standardized assessments were scored by examiners during administration. Measures selected to address the research questions were as follows (please refer to Table 1 for a summary).

Standardized language measures

Prior to beginning kindergarten, the children completed the *PLS-3*, which gives standardized scores for *auditory comprehension* (*PLS-3-AC*), *expressive communication* (*PLS-3-EC*), and *a total language score* (*PLS-3*). Fish and Pinkerman reported that the *PLS-3* was widely used by public school speech–language pathologists to test children suspected to have SLI and that, according to Zimmerman et al. (1992), the test had concurrent validity with other standardized language measures, including the *Peabody Picture Vocabulary Test* (*PPVT*). Fish and Pinkerman also stated that the *PLS-3* "was normed on a sample of children which included approximately the same percentage (15.9%) of primary caregivers with less than a high school education as the US population (17.4%)" (p. 547).

The children completed the *Comprehensive Assessment of Spoken Language* (*CASL*: Carrow-Woolfolk, 1999) during middle childhood Assessment II. This test was chosen because, according to its developers, it assesses the oral language skills children need to successfully acquire literate language. The *CASL*'s core battery included the following tests: *Antonyms* (*CASLAnt*), which tested the children's word knowledge through identifying and retrieving opposites for given words in a decontextualized environment (e.g., children were asked to name the opposite of words such as *last*, *early*, and *shallow*); *Grammatical Morphemes* (*CASLGramMorph*), which tested the children's metalinguistic knowledge of the form and use of grammatical morphemes through the use of analogies (e.g., *tall* is to *taller* as *big* is to *bigger*); *Sentence Comprehension* (*CASLSentComp*), which asked the children to decide if pairs of sentences with different surface structures had the same or different meanings (e.g., a) Mary's books fell — The books that belong to Mary fell; b) Mary's books fell — Mary and her books fell); *Nonliteral Language* (*CASLNonLit*), which

Table 1
Assessments by type and time of administration.

Variable	Measure	Test session administered
Standardized language	*PLS-3-AC*	Prior to kindergarten
	PLS-3-EC	Prior to kindergarten
	CASLAnt	Middle childhood session 2
	CASLGramMorph	Middle childhood session 2
	CASLSentComp	Middle childhood session 2
	CASLNonLit	Middle childhood session 2
	CASLPragJudg	Middle childhood session 2
Dialect	*Dialect density*	Middle childhood session 1
Processing	*Nonword*	Middle childhood session 1
Nonverbal cognitive ability	*TONI-3*	Middle childhood session 1

[1] Comparing those who completed the study through middle childhood (n = 60) with those who had infancy data but dropped out during either preschool or middle childhood (n = 38), two demographic differences were found. Mothers who had not completed high school at the initial assessment were more likely to drop out than those who had ($X^2_{[1]}$ = 4.60, $p < .05$). Similarly, mothers who had given birth to their first child when they were less than 18 years old more frequently dropped out ($X^2_{[1]}$ = 4.19, $p < .05$). There were no differences in infant language scores or preschool language scores between those who completed the entire study and those who did not.

tested the children's ability to derive the meaning of figurative language, sarcasm, and indirect questions from contextual cues (e.g., *She lay on the deck chair and watched the bright yellow ball move slowly from one side of the sky to the other. What was she watching?*); and *Pragmatic Language* (*CASLPragJudg*), which tested the children's ability to use pragmatic rules appropriately in given situations (*The students are eating lunch in the cafeteria. Ted starts talking about the worm he dissected in science class. Two of the students get up and leave the table without finishing their lunch. Why?*).

Each test yielded a separate score, thus enabling us to evaluate the children's language in four areas: content (*CALSAnt*), form (*CASLGramMorph* and *CASLSentComp*), use (*CASLPragJudg*), and supralinguistics (*CASLNonLit*). The *CASL*'s developers reported that intercorrelations among the individual tests were moderate, suggesting that each measured something unique, but that they could be reliably combined to form a composite language score. The composite score was important to the present investigation, as it allowed us to compare overall standardized language performance between kindergarten and middle childhood. Like the *PLS-3*, the *CASL* was shown to have criterion-related (concurrent) validity with several other standardized tests of language, including the *PPVT*.

The *CASL* was normed on a representative sample of 1700 individuals between the ages of 3 and 21. The sample was stratified to mirror the characteristics of the U.S. population in terms of gender, ethnicity, mother's educational level, and geographic location (divided into Northeast, North Central, South, and West). Although Appalachia was not specified as a separate geographic region for norming purposes, twelve states within the Appalachian region, including West Virginia, were included in the sample. Additionally, children with specific learning disability, speech and language impairment, mental retardation, and emotional disturbance were included in the sample in approximately the same proportion as they have been identified in the U.S. population. The *CASL*'s internal consistency also was shown to be high (and standard errors of measurement low) for the 11–12 year-old age band. Specifically, these were .96 (*SEM* = 2.9) for the core composite, .90 for *CASLAnt* (*SEM* = 4.7), .91 for *CASLGramMorph* (*SEM* = 4.6), .78 for *CASLSentComp* (*SEM* = 7.0), .91 for *CASLNonLit* (*SEM* = 4.4), and .86 for *CASLPragJudg* (*SEM* = 5.7).

All components of the core battery of the *CASL* were scored during testing and all administrations of the *CASLPragJudg* and all but one of the administrations of the other components were videotaped for later interrater reliability scoring. An independent rater watched and rescored all of the available tapes. Using a unit-by-unit agreement ratio (Hegde, 2003), interrater reliability was 99.72% for *CASLAnt*, 99.33% for *CASLGramMorph*, 99.82% for *CASLSentComp*, 97.95% for *CASLNonLit*, and 96.65% for *CASLPragJudg*. When a disagreement occurred between the original scorer and independent rater, the first author made the final scoring decision.

Measures of dialect density, language processing, and nonverbal cognition

Children also completed a speaking sample, which was used to determine *dialect density*, and the *Nonword Repetition Task* (*Nonword*: Campbell et al., 1997) during middle childhood Assessment I. The speaking sample was derived from perspective-taking (Song & Fish, 2004) and social cognition (Lucas, 2006) assessments where the examiner presented a story and six hypothetical social situations, respectively, and then asked children to answer several questions requiring them to problem solve and analyze the motivations of the stories' characters. The speaking samples were transcribed by the first author from session videotapes. She coded each transcript for grammatical markers of Appalachian English using examples from Wolfram et al. (1999). She calculated a *dialect density* measure for each child by dividing the number of instances of Appalachian English usage by the total number of words in the child's language sample according to the protocol developed by Craig and Washington (2004). An independent rater, whom the first author judged to have an excellent command of standard American English grammar, coded a randomly selected 20% of the transcripts, resulting in 84.4% agreement.

Following collection of the speaking sample, all but three children either read or repeated the list of words taken from the *Goldman–Fristoe Test of Articulation — Second Edition* (Goldman & Fristoe, 2000) to rule out the influence of articulation errors on nonword repetition. Three children who did not complete the articulation test were judged to be free of articulation errors based on an analysis of their earlier speaking samples. Next, each child was told that he or she would hear 24 nonsense words from the *Nonword Repetition Task*. The nonwords ranged in length from one to four syllables, with six nonwords of each length. The 24 nonwords were recorded onto a compact disk using the voice of the first author and a Seinheizer 421 studio microphone. The auditory signal was digitized into a Pentium 4 Computer using Sound Forge 6 software. These audio segments were burned onto a compact disk (CD) using a 52× burner and Nero software.

The nonwords were presented to each participant in the following manner. The CDs were placed in a CD player (Onkyo Dx 1400), which was connected to a Marantz cassette recorder, Model PMD430. Each participant heard the nonwords through a pair of earphones (Sony Mora 106LP) inserted into the earphone jack of the CD player. The experimenter used an additional earphone, plugged into the earphone jack of the tape recorder, so that she could hear each nonword as she presented it to the participant. An omnidirectional dynamic microphone (Electro-Voice 635A) was attached to the tape recorder. Both stimulus nonwords and each child's repetitions were recorded onto audiocassettes for later scoring, as were each child's production of the words from the articulation screener.

To determine each child's *Nonword* score, the total number of phonemes produced correctly was counted and converted to the percentage of phonemes produced correctly. Substitutions and omissions of phonemes were counted as errors. Distortions and additions were not counted as errors. The only exception to these rules was for two participants who consistently substituted/f/for voiceless/th/in the medial position of words and for a third who made this substitution in all word positions on the articulation test. Since these substitutions were judged to be articulation errors, rather than manifestations of a phonological working memory problem, they were not counted as errors on nonwords.

The first author scored each audiotape of the articulation test and the nonwords. An independent rater scored 20% of audiotapes chosen randomly. Using a unit-by-unit ratio, interrater reliability was 96.4% for the nonwords and 99.72% for the articulation test. Disagreements were resolved by the first author after re-listening to the tapes.

To assess nonverbal cognitive abilities, children completed the *Test of Nonverbal Intelligence-Third Edition* (*TONI-3*; Brown, Sherbenou, & Johnsen, 1997), a norm-referenced measure of nonverbal intellectual abilities, including abstract reasoning and problem solving, during middle childhood Assessment I. This test was chosen because, according to its publishers, neither the test, nor individual items, showed any significant influence of SES, geographic region, or rural/urban status. Additionally, it does not require participants to read, write, speak, or listen and is, therefore, free of language influence. The test was normed on a sample of over 3000 participants who matched the demographics (age, sex, race, ethnic group, and SES) of the United States according to the 1990 census.

Results

Preliminary analyses

Missing data

We first inspected all variables for missing data across the 60 participants. Ten participants (four from the remedial services group [all male] and six from the typically developing group [3 male,

3 female]) were missing data on one or more variables for reasons including examiner error in not administering all items, no basal or ceiling obtained, the child refusing to complete some or all items of a measure, or the family not participating in the pre-kindergarten assessment.

Conditional mean imputation (McKnight, McKnight, Sidani, & Figueredo, 2007), utilizing *CASL* test means for the child's group (remedial or typically developing) was used to estimate and replace *CASLGramMorph* scores for three participants with incomplete data due to examiner error and *CASLSentComp*, *CASLNonLit*, and *CASLPragJudg* scores for one participant who refused to finish these tests. A similar strategy employing the child's 4-year *PLS-3* scores was used to estimate and replace the *PLS-3 Expressive Communication* scores for two children, one who refused to finish the test prior to kindergarten and one missing data due to examiner error. Two participants were missing *Nonword* data because the examiner administered only 22 of the 24 nonwords to one and 20 of the 24 nonwords to the second. Based on the rationale suggested by Schafer and Graham (2002) we used the "averaging available items" replacement method for these participants.

The following data were coded as missing: the pre-kindergarten *PLS-3* (1 participant) because this family did not participate in the pre-kindergarten assessment and the *Nonword* data for two children who refused to do the task.

Data cleaning

After missing values had been replaced, we inspected each distribution for normality. To do this, we calculated the *z*-statistic for each continuous variable by dividing its skewness and kurtosis by their standard errors (Tabachnick & Fidell, 2001). Using an alpha level of .001, skewness and kurtosis were significant (distribution was not normally distributed) for the *Nonword* (see Table 2). Specifically, the *Nonword* was significantly negatively skewed. Using the recommendations of Tabachnick and Fidell, we performed a transformation on this distribution. *Nonword* scores were first reflected and then log transformations were applied, resulting in acceptable skewness ($z = 0.92$, *ns*), and kurtosis ($z = 0.83$, *ns*).

Main or principal analyses

Change in standardized language scores between kindergarten and middle childhood

To determine the change in standardized language scores between kindergarten and middle childhood, as well as possible relationships between child sex, SES, and change, we used a mixed model ANOVA, with sex (male/female) and SES (public assistance or no public assistance) as the between-subjects factors and language measure (*PLS-3* scores and *CASL* Core Scores) as the within-subjects factor. These children's *PLS-3* mean ($n = 59$) prior to kindergarten was 79.05 ($SD = 12.94$) and their *CASL* Core mean ($n = 59$) during middle childhood was 88.44 ($SD = 13.92$). An analysis of the within-subjects factor showed a significant main effect for language measure, $F(1, 55) = 33.88$, $p < .05$. The interactions of sex by language measure, $F(1, 55) = 1.80$, *ns* and SES by language measure, $F(1, 55) = .11$, *ns*, were not significant. An analysis of the between-subjects factors showed a significant main effect for sex, $F(1, 55) = 4.80$, $p < .05$, but the main effect for SES was not significant, $F(1, 55) = 1.66$, *ns*. The interaction between sex and SES also did not reach significance, $F(1, 55) = 2.59$, *ns*. Using the *CASL* Core's standard error of measurement we calculated the 95% confidence interval for the children's obtained mean to be 82.44 to 94.32 ($SD = 13.92$). We then conducted a second ANOVA with repeated measures comparing the *PLS-3* mean to the mean of the children's *CASL* Core at the lower end of the 95% CI. Results showed that the difference between these means just failed to reach significance, $F(1, 55) = 3.89$, *ns*. Taken together, results show that these children demonstrated significant improvement in their language skills, as measured by obtained scores on standardized measures, between preschool and middle childhood regardless of sex or SES. However, we cannot say with 95% confidence that their true scores improved significantly, and girls continued to score significantly higher than boys on standardized tests of language during middle childhood (see Fig. 1).

Comparison of sample and population middle childhood language scores

We compared the children's ($n = 60$) performance on the five *CASL* tests with the tests' population means. With an adjusted alpha level of .01 to control for Type I error, a series of one-sample *z*-tests showed statistically significant differences between our participants' mean scores on four of the *CASL* tests and the tests' population means of 100 (*CASLAnt*, $z = -5.84$, $p < .01$; *CASLGramMorph*, $z = -4.24$, $p < .01$; *CASLSentComp*, $z = -2.85$, $p < .01$, and *CASLPragJudg*, $z = -6.66$, $p < .01$). The difference between the population mean and the *CASLNonLit*, $z = -2.25$, *ns*, was not significant. However, as shown in Table 3, *CASL* test means were all within the average range (85–115) and there was overlap between our participants' 95% confidence intervals and the normative population on all *CASL* tests.

We also wanted to see if there would be sex and SES differences across the five *CASL* tests. To do this, we used a mixed model ANOVA, with sex (male/female) and SES (public assistance or no public assistance) as the between-subjects factors and language domain (*CASLAnt*, *CASLGramMorph*, *CASLSentComp*, *CASLNonLit*, and *CASLPragJudg*) as the within-subjects factor. Results showed significant main effects for language domain, $F(4, 53) = 20.02$, $p < .05$ and sex, $F(1, 56) = 7.17$, $p < .05$. The main effects were qualified by significant interactions between language domain and sex, $F(4, 53) = 5.32$, $p < .05$ and between sex and SES, $F(1, 56) = 5.23$, $p < .05$. Analysis of males showed a significant main effect for language domain, $F(4, 26) = 13.12$, $p < .05$, while results for females showed significant main effects for both language domain, $F(4, 24) = 14.51$, $p < .05$ and SES, $F(1, 27) = 7.43$, $p < .05$. These results suggest that language scores did not differ between SES groups among males, but that females whose families did not receive public assistance scored significantly higher than did those whose families received public assistance.

Table 2
Means, standard deviations, skewness, kurtosis, and *z* statistics for each continuous variable.

Variable	*n*	*M*	*SD*	Skew	*SE* skew	*z*	Kurtosis	*SE* kurtosis	*z*
PLS-3-AC	59	83.83	11.66	−.05	.311	−.16	.49	.613	.80
PLS-3-EC	59	78.39	14.35	.48	.311	1.53	.37	.613	.60
TONI-3	60	90.75	12.36	.61	.309	1.98	.43	.608	.71
Nonword	58	89.20	08.93	−2.46	.314	−7.84*	6.58	.618	10.64*
Dialect density	60	.01	.01	.60	.309	1.94	−.04	.608	−.07
CASLAnt	60	88.68	12.43	.38	.309	1.23	.07	.608	.11
CASLGramMorph	60	91.77	16.82	−.68	.309	−2.21	−.05	.608	−.08
CASLSentComp	60	94.47	13.91	.37	.309	1.20	−.48	.608	−.78
CASLNonLit	60	95.63	11.84	.25	.309	.82	.84	.608	1.38
CASLPragJudg	60	87.07	15.49	.00	.309	.01	.32	.608	.53

* $p < .001$.

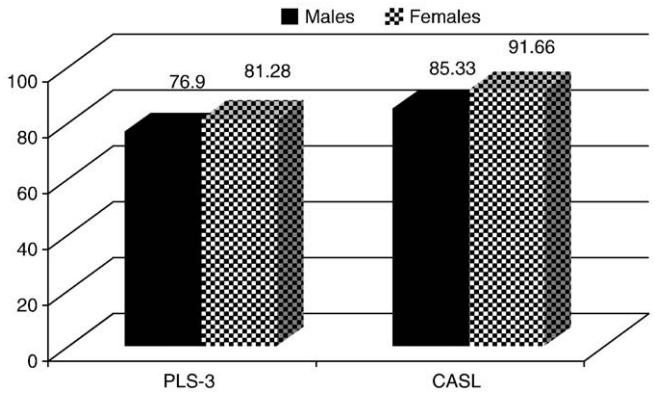

Fig. 1. Comparisons of *PLS-3* and *CASL* scores by sex.

To further investigate the main effect for language domain, we conducted a series of paired samples *t*-tests to see if there were significant differences on the children's performance among the *CASL* tests. Using an adjusted alpha level of .005 to control for Type I error, we found significant differences between *CASLSentComp* and *CASLPragJudg*, $t(59) = 3.98$, $p < .005$, between *CASLSentComp* and *CASLAnt*, $t(59) = -3.24$, $p < .005$, between *CASLNonLit* and *CASLPragJudg*, $t(59) = 6.99$, $p < .005$, and between *CASLNonLit* and *CASLAnt*, $t(59) = -6.12$, $p < .005$. These data suggest that these children's receptive syntax and their ability to understand the meaning of nonliteral language from contextual cues were stronger than their vocabulary knowledge and their ability to appropriately use the pragmatic rules of language.

Finally, to examine the interaction of language domain by sex, we conducted two series of paired samples *t*-tests, one for males and one for females, to see if there were significant differences on performance among the *CASL* tests for each group. An adjusted alpha level of .005 was used to control for Type I error. For males we found significant differences between *CASLSentComp* and *CASLPragJudg*, $t(30) = 3.62$, $p < .005$ and between *CASLNonLit* and *CASPragJudg*, $t(30) = 6.35$, $p < .005$. For females we found significant differences between *CASLGramMorph* and *CASLAnt*, $t(28) = -4.89$, $p < .005$, between *CASLSentComp* and *CASLAnt*, $t(28) = -3.71$, $p < .005$, between *CASLNonLit* and *CASLAnt*, $t(28) = -7.59$, $p < .005$, and between *CASLNonLit* and *CASLPragJudg*, $t(28) = 3.646$, $p < .005$. These data suggest that the girls in this sample showed a significant weakness in vocabulary skills as compared to other areas of language, whereas the boys demonstrated a significant weakness in pragmatic skills.

Examination of dialect density and processing ability

We first measured non-standard dialect use, (i.e., Appalachian English), by calculating a measure of *dialect density*. According to Craig and Washington's (2004) protocol, we divided the number of grammatical markers of Appalachian English by the total number of words children used in response to examiners' questions regarding the story and hypothetical situations. Our participants displayed only 16 of the 37 different types of Appalachian English grammatical markers identified by Wolfram et al. (1999). Of the 16 different types, the majority of tokens involved either some aspect of the verb phrase, e.g., they *was*, I *seen*, she *done*, she *don't*, I had *went*, or multiple negation, e.g., *not* climb *no* more. Our participants' *dialect density* ranged from 0 (0%) to .039 (3.9%) ($M = 0.013$; $SD = 0.009$), a mean of 1.3%, compared to a mean of .039 (3.9%) among African-American children between first and fifth grades studied by Craig and Washington. Pearson Product Moment Correlations revealed no significant relationships between *dialect density* and any *CASL* test.

To determine if working memory, as measured by performance on the *Nonword*, might be related to language performance, we conducted Pearson Product Moment Correlations between the transformed variable, *Nonwordlog* and the *CASL* tests. As with *dialect density*, we found no significant relationships between *Nonwordlog* and any of the *CASL* tests. In addition, our participants' median *Nonword* score of 91.67, was nearly identical to the mean *Nonword* score of Campbell et al.'s (1997) non-minority participants (91.08), suggesting that, as a group, our participants had processing skills comparable to those of a typically developing group. Taken together, these findings suggest that our participants' standardized language performance cannot be explained either by the use of Appalachian English or by poor processing skills.

Factors that best classify middle childhood language group membership

Before determining the best set of variables to predict middle childhood language group membership (typically developing and remedial services), we ran *t*-tests to see if the language groups differed on the *TONI-3* and *CASL* tests. Results showed that groups differed significantly on the *TONI-3*, $t(58) = 3.48$, $p < .05$ and on all *CASL* tests: *CASLGramMorph* $t(58) = 8.42$, $p < .05$; *CASLAnt*, $t(52.93) = 5.17$, $p < .05$; *CASLNonLit*, $t(58) = 4.41$, $p < .05$; *CASLPragJudg*, $t(58) = 2.77$, $p < .05$; and *CASLSentComp*, $t(58) = 2.48$, $p < .05$.

To determine which of the *CASL* tests and/or the *TONI-3* were most useful in differentiating children in the remedial services group from those in the typically developing group, we entered those six variables into a stepped discriminate function analysis with language group as the dependent variable. *CASLGramMorph* entered the analysis at step 1 and *CASLSentComp* at step 2, at which point no further improvement in prediction was obtained. Group means were 99.23 v. 71.25 for *CASLGramMorph* and 97.05 v. 87.38 for *CASLSentComp*. Together, these two variables correctly classified 12 out of 16 children in the remedial services group for a rate of 75%, and 43 out of 44 children in the typically developing group for a rate of 97.7% (overall correct classification rate was 91.7%), *Wilkes* $\lambda = .438$; *Eigenvalue* $= 1.28$, *Cannonical* $r = .75$, χ^2 $(2, N = 60) = 47.09$, $p < .001$. Thus, children's language group was best predicted by a combination of their ability to identify and use correct language forms and their ability to interpret the meanings of sentence pairs with different syntactical surface structures.

Table 3
Obtained means (*OM*), standard error of measure (*SEM*), and 95% confidence intervals (CI) for the normative population and the Appalachian sample on each test of the *CASL* Core.

Normative population				Appalachian sample			
CASL test	*OM*	*SEM*	95% CI	*CASL* test	*OM*	*SEM*	95% CI
CASLAnt	100	4.7	90.6–109.4	*CASLAnt*	88.68	4.7	79.28–98.08
CASLGramMorph	100	4.6	90.8–109.2	*CASLGM*	91.77	4.6	82.57–100.97
CASLSentComp	100	7.0	86.0–114.0	*CASLSC*	94.47	7.0	80.47–108.47
CASLNonLit	100	4.4	91.2–108.8	*CASLNL*	95.63	4.4	86.83–104.43
CASLPragJudg	100	5.7	88.6–111.4	*CASLPJ*	87.07	5.7	75.67–98.47

Discussion

The results from this study, considered together with those presented by Fish and Pinkerman (2003), point to the continuing importance of environmental factors on children's long term language development.

Language improvement from preschool to middle childhood

As predicted, the language skills of this primarily low-SES group of children from rural Appalachia, as measured by obtained scores on standardized language tests, improved significantly between kindergarten entry, when they tested below the average range, and middle childhood, when they obtained means on each component of the *CASL* within the average range. Moreover, the children's language performance improved regardless of sex or SES status. As has been found for

other low-SES samples (e.g., Fazio et al., 1996), during the elementary school years, the gap between low-SES rural Appalachian children's language scores and national normative scores decreased. Since Fish and Pinkerman (2003) reported completing an item analysis of the *PLS-3*, which did not suggest general SES or cultural bias, it seems reasonable to conclude that the children's academic experience between kindergarten and middle childhood may have contributed to their improved standardized language test scores. Likewise, Kainz and Vernon-Feagens (2007) reported that, while family and child variables predicted children's initial reading ability upon kindergarten entry, school characteristics (which could be either positive or negative) were better predictors of reading development over time.

Language ability during middle childhood

Despite significant improvement over time, the low-SES rural Appalachian children's mean scores on all but the nonliteral language component of the *CASL* were significantly below those of the tests' normative populations, suggesting that our participants' academic experiences had not completely compensated for low scores at school entry. However, all scores during middle childhood showed overlap with normative population scores at the 95% level of confidence suggesting that, while differences in obtained scores were statistically significant, practical differences were negligible. Moreover, all language means during middle childhood fell within average ranges of performance.

As predicted, results suggested continued differences in language performance based on child sex, with girls outperforming boys. However, SES influences on standardized language performance were seen only for girls. This was surprising, given that receiving public assistance was independent of child sex (20 girls and 22 boys received public assistance, while 9 girls and 9 boys did not). However, a larger proportion of boys than girls (39% of the boys and 14% of the girls) in our sample had been identified through school testing as having language and/or reading problems. Although the mean *Nonword* score of 15 children receiving remedial services did not differ significantly from that of the 43 not receiving such services (one child in each group [both boys] did not complete the *Nonword*), the mean score for 11 boys receiving remedial services was significantly lower than that of 18 boys who did not receive these services. Bishop (2001) suggested that nonword repetition performance might be influenced more by hereditary than by environmental factors, which argues for its being identified as a causal factor in language impairment, as has been suggested by several researchers (e.g., Conti-Ramsden et al., 2001; Dollaghan & Campbell, 1998). Taken together, these findings suggest the possibility that some of the children in the remedial services group (the majority of whom were boys) might have demonstrated language impairment due to genetic rather than to environmental influences. If this were the case, it also could explain the continued better performance of girls over boys in our sample. In the absence of more definitive evidence, however, this conclusion must remain speculative.

As a group, the rural Appalachian children showed relative strengths in the areas of receptive syntax and the understanding of nonliteral language. Indeed, their ability to analyze the meaning of language through the use of contextual cues ($M = 96$) did not differ significantly from that of the test's normative population ($M = 100$) and was significantly higher than vocabulary (in girls) and pragmatic judgment abilities (in girls and boys). Previous research found that idiom (Nippold, Moran et al., 2001) and proverb (Nippold, Allen et al., 2001) understanding was significantly related to reading and language abilities in similarly aged children. While children in the present study who had been identified by school personnel as having reading or other language problems scored significantly lower in all areas of language, including nonliteral language, than did children identified as typically developing, the largest differences between the groups occurred on the use of grammatical morphemes and vocabulary knowledge.

Relative weaknesses for the children in our sample were seen in the areas of vocabulary knowledge and pragmatic judgment. We speculate that the problems with pragmatic judgment, which deals with correct use of language in context, were likely due to our participants not having experienced some of the hypothetical scenarios presented in the *CASLPragJudg*. For example, these children had particular difficulty answering items dealing with making formal introductions and hotel reservations. The finding that our participants continued to have relatively poor knowledge of oral vocabulary agrees with other research that has shown children from low-SES environments to understand and use significantly fewer words than do children from higher-SES backgrounds (e.g., Hart & Risley, 1995; Walker, Greenwood, Hart, & Carta, 1994). These findings are of concern because vocabulary size is strongly related to reading (Roth et al., 2002), especially to reading comprehension (Nation et al., 2004). Fish and Pinkerman (2003) reported that the number of children's books these families reported owning when their children were 4 years of age was significantly related to the children's language performance during kindergarten. Book reading has been shown to be effective in enhancing young children's vocabulary (Justice, Meier, & Walpole, 2005; Wasik & Bond, 2001; Whitehurst et al., 1994). When parents are actively engaged in reading to their children, they have opportunities to explain the meanings of novel words (Wasik & Bond; Whitehurst et al.). Additionally, books written in narrative genre expose children to syntactically complex language and to narrative structure (Kaderavek & Justice, 2005). Finally, it might be speculated that, through early book reading, children are exposed to various types of figurative language, thus enhancing their ability to comprehend these language forms in the academic setting. We suggest that it is imperative that children be exposed to high quality children's literature from a very early age.

Use of Appalachian English and phonological working memory skills

We found no relationship between our participants' use of grammatical markers of Appalachian English and any measure of language, which was surprising since research with other groups of individuals (primarily African-American) who speak non-standard dialects of English did find correlations between speaking these dialects and performance on standardized tests of language (e.g., Ellis-Weismer et al., 2000; Restrepo et al., 2006; Thomas-Tate, Washington, & Edwards, 2004). However, Craig and Washington (2004) reported that African-American children with low dialect usage performed at a level comparable to that of the test's normative population on a standardized test of vocabulary. As noted previously, our participants' mean use of Appalachian English markers was lower (1.3%) than the mean usage (3.9%) Craig and Washington reported for children in their study. Also, Hazen and Fluharty (2004) suggested that Appalachian English differs from one Appalachian community to another and noted that, as do all languages, Appalachian English has evolved over the years, in part due to the influence of the mass media.

As a group, our participants demonstrated adequate phonological working memory abilities, as measured by their performance on the nonword repetition task. As mentioned previously, language impairment cannot be ruled out for at least some of the children receiving school-based remedial services for reading and language. However, only 27% of the children in our sample received these services, while 40% had *CASL* Core scores below the average range. Furthermore, visual inspection of the data suggested that at least two-thirds of the children with below average *CASL* Core scores had average to above average *Nonword* scores. Therefore, we conclude that, for most of our participants with below average standardized language scores, performance is better explained by environmental factors related to

low-SES than by constitutional factors that underlie language impairment.

Variables that classified children into language status categories

Examining the variables that best distinguished children identified as having problems with reading and other language-related tasks from typically developing children provides information useful to program staff and teachers. Contrary to our prediction, a combination of the *CASLGramMorph* and *CASLSentComp* tests (rather than *CASLAnt*) accurately classified 91.7% of the students into their respective groups. However, we note that the *CASLGramMorph* and the *CASLAnt*, on which the two groups of children showed the greatest differences, were significantly correlated, resulting in the *CASLAnt* offering no additional explanation for middle childhood language status group membership over and above that offered by the *CASLGramMorph*.

Overall, however, these findings agree with previous research that shows language to be strongly related to literacy skills during middle childhood. In particular, several other researchers (Cohen, Schiff, & Gillis-Carlebach, 1996; Nation et al., 2001; Rispens, Roeleven, & Koster, 2004) have found significant relationships between reading difficulty and challenges with the morphological aspects of language. Nation et al. found that children who had trouble with reading comprehension performed less well on tests of morphosyntax and semantics than did control children. The children with reading comprehension problems in their study also showed a greater discrepancy than did controls between language and nonverbal ability. Similarly, our typically developing group had language and nonverbal intelligence mean scores that were almost identical. However, the language mean score of the remedial services group was lower than was their nonverbal intelligence mean (suggesting language impairment for some of them), and this difference was even more pronounced for the *CASLGramMorph* test (see Fig. 2).

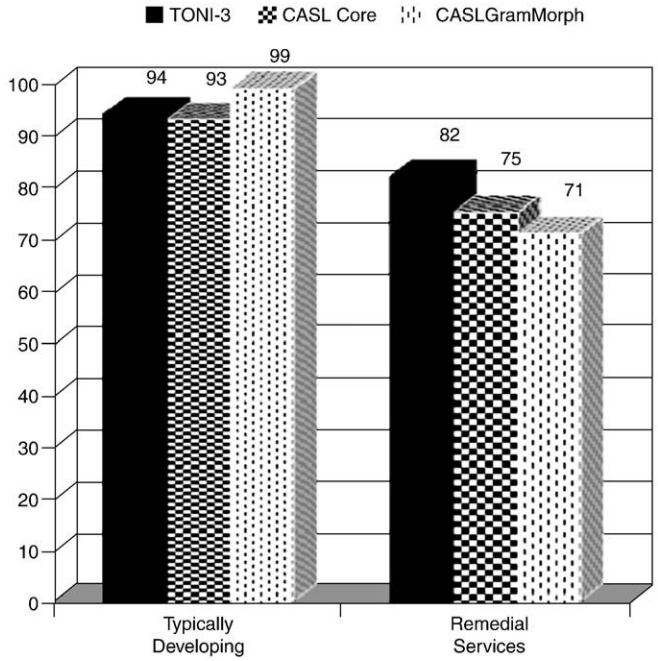

Fig. 2. Comparison of *TONI-3*, *CASL* Core, and *CASLGramMorph* means by language status group.

Limitations of the study

Although this study contributed new information regarding the language development of low-SES children from rural Appalachia from kindergarten to middle childhood, it had several limitations. First, as is the case with many longitudinal studies, this study has suffered from participant attrition over time. Since initial enrollment 38 (39% of the initial sample) participants have withdrawn from the study. These participants were more likely than those who have remained in the study to have mothers who dropped out of school or were younger than 18 years of age at the time of their child's birth. Thus, the sample remaining in the study during middle childhood represents a slightly higher-SES sample than the original.

Second, among the 60 children who remained in the study, 10 were missing data on one or more measures, resulting in 14 missing data points. Although we were able to use statistically reliable methods to replace 10 of these data points, 4 were coded as missing.

Third, due to the time requirements for data collection during the middle childhood period, a decision was made to collect each participant's data during two sessions. Because of scheduling issues and the number of participants involved, each child's sessions were separated by approximately one year. Although an effort was made to collect like measures in the same session, slightly different results might have occurred if all measures had been collected contemporaneously.

Fourth, our final research question investigated middle childhood predictors for language status groups. Children were assigned to either the typically developing or to the remedial services group based on school report of whether or not the child was enrolled in remedial services for reading or language or had been referred for testing. Although children in WV qualify for such services based on the results of testing, our study did not include standardized test scores for reading.

Future directions

What does the future hold for the children in this study as they enter their adolescent years? Snow, Porche, Tabors, and Harris (2007) found that, for a group of low-SES children they studied, strong oral language and vocabulary skills were necessary, but not sufficient, to ensure academic success. As children moved into middle school and beyond, personal motivation, goal setting and academic planning, and the presence of caring adults in the children's lives also were necessary to ensure academic success. Will the children in our study have these advantages as they move into middle and high school? Fish, Jacquet, and Frey (2002) reported that 90% of rural Appalachian parents want their children to go to college, and in addition, the majority of these children live in homes with strong social support networks. However, child and parental interviews with the second author suggested that the children in this study feel less competent regarding their scholastic and intellectual abilities than other areas of function. Also there is a trend in their local communities toward larger high schools. Care needs to be taken to make sure these children receive the support they need to be successful as they transition to this next phase of their education.

But, what support do they need? What actions should be taken to help these children develop the personal motivation, goal setting and academic planning that Snow et al. (2007) found to be so essential to academic success? While most of the children in the present study live in families with strong networks of caring adults, Antrop-Gonzalez, Velez, and Garrett (2008) found that the presence of caring adults in the school environment, who know the children well enough to offer personal guidance, also is essential to ensure their academic success. However, later childhood is precisely the time when schools become larger and more impersonal. Rather than staying with one teacher throughout the school day, children move from class to class, each with a different teacher. To offer more support during this period, we suggest that middle and high schools adopt a model of academic and personal advising similar to, although considerably more intense than, that used in many colleges and universities. This could be done by redefining the role of the school counselor. In the proposed model, each counselor would conduct ongoing personal and academic

advising with a small group of students. In partnership with parents, counselors would help students to identify and maximize their personal and academic strengths, as well as to set personal and academic goals. Then, counselors, parents, and students would collaboratively identify necessary steps to achieve goals, (i.e. counselors and parents would help students to align behaviors with expectations). In addition to helping students continually evaluate and update their courses of study, counselors would provide thoughtful guidance to help students choose fulfilling co- and extracurricular activities, which are essential to the well rounded individual. Like Antrop-Gonzalez et al., we believe it is of utmost importance that school personnel, as well as parents, maintain high expectations for students, thus challenging them to achieve to their potentials.

Acknowledgments

This study was supported by Grants R40 MC 00091 and R40 MC 00316 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, Department of Health and Human Services, awarded to the second author and by the support of John and Elizabeth Drinko through the Drinko Academy at Marshall University, awarded to the first author. The authors wish to thank the children and parents who participated in the study and the Lincoln Primary Care Center for its support of the project. Additional thanks go to Kristen Neal, Stephanie Bailey, and Conrae Lucas for their help with data collection and to Mary-Michael Lewis, Melinda Daniel, Julia Maury, Bridget Fuller, Matthew Clark, and Colin Reynolds for their help with data analysis. Portions of this manuscript have been presented at the 2004, 2005, 2007, and 2008 American Speech-Language-Hearing Association Conventions.

References

Annie E. Casey Foundation. (2008). http://www.kidscount.org/datacenter/.

Antrop-Gonzalez, R., Velez, W., & Garrett, T. (2008). Examining familial-based academic success factors in urban high school students: The case of Puerto Rican female high achievers. *Marriage & Family Review*, *43*, 140—163.

Appalachian Regional Commission. (2008). *ARC-designated distressed counties.* http://www.arc.gov/index.do?nodeId=27.

Beron, K. J., & Farkes, G. (2004). Oral language and reading success: A structural equation modeling approach. *Structural Equation Modeling*, *11*, 110—131.

Bishop, D. V. M. (1992). The underlying nature of specific language impairment. *Journal of Child Psychology and Psychiatry*, *33*, 3—66.

Bishop, D. V. M. (2001). Genetic influences on language impairment and literacy problems in children: Same or different? *Journal of Child Psychology and Psychiatry*, *42*, 189—198.

Brooks-Gunn, J., Klebanov, P. K., Smith, J., Duncan, G. J., & Lee, K. (2003). The Black–White test score gap in young children: Contributions of test and family characteristics. *Applied Developmental Science*, *7*, 239—252.

Brown, L., Sherbenou, R. J., & Johnsen, S. K. (1997). *Test of nonverbal intelligence — Third edition: TONI-3.* Austin, TX: PRO-ED.

Campbell, T., Dollaghan, C., Needleman, H., & Janosky, J. (1997). Reducing bias in language assessment: Processing-dependent measures. *Journal of Speech & Hearing Research*, *40*, 519—525.

Carrow-Woolfolk, E. (1999). *CASL: Comprehensive assessment of spoken language.* Circle Pines, MN: American Guidance Service.

Cohen, A., Schiff, R., & Gillis-Carlebach, M. (1996). Complexity of morphological, syntactic, and narrative characteristics: A comparison of children with reading difficulties and children who can read. *Megamot*, *37*, 273—291.

Conti-Ramsden, G., Botting, N., & Faragher, B. (2001). Psycholinguistic markers for specific language impairment (SLI). *Journal of Child Psychology and Psychiatry*, *42*, 741—748.

Cooper, D. H., Roth, F. P., Speece, D. L., & Schatschneider, C. (2002). The contribution of oral language skills to the development of phonological awareness. *Applied Psycholinguistics*, *23*, 399—416.

Craig, H. K., & Washington, J. A. (2002). Oral language expectations for African-American preschoolers and kindergarteners. *American Journal of Speech-Language Pathology*, *11*, 59—70.

Craig, H. K., & Washington, J. A. (2004). Grade related changes in the production of African American English. *Journal of Speech, Language, and Hearing Research*, *47*, 450—463.

Craig, H. K., Washington, J. A., & Thompson, C. A. (2005). Oral language expectations for African-American children in grades 1 through 5. *American Journal of Speech-Language Pathology*, *14*, 119—130.

Cunningham, P. M. (2007). High poverty schools that beat the odds. *The Reading Teacher*, *60*, 382—385.

Dollaghan, C. A., & Campbell, T. F. (1998). Nonword repetition and child language impairment. *Journal of Speech, Language, and Hearing Research*, *41*, 1136—1146.

Dollaghan, C. A., Campbell, T. F., Paradise, J. L., Feldman, H. M., Janosky, J. E., Pitcairn, D. N., & Kurs-Lasky, M. (1999). Maternal education and measures of early speech and language. *Journal of Speech, Language, and Hearing Research*, *42*, 1432—1443.

Ellis Weismer, S., Tomblin, J. B., Zhang, X., Buckwalter, P., Chynoweth, J. G., & Jones, M. (2000). Nonword repetition performance in school-age children with and without language impairment. *Journal of Speech, Language & Hearing Research*, *43*, 865—878.

Fazio, B. B., Naremore, R. C., & Connell, P. J. (1996). Tracking children from poverty at risk for specific language impairment: A 3-year longitudinal. *Journal of Speech & Hearing Research*, *39*, 611—624.

Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., & Pethick, S. J. (1994). Variability in early communicative development.*Monographs of the Society for Research in Child Development*, *59*(5) (Serial No. 242).

Fish, M., Jacquet, E., & Frye, H. (2002). Early development of low income rural Appalachian children. *Rural Health Monograph Series (vol 2, no. 1)*. Huntington, WV: Robert C. Byrd Center for Rural Health.

Fish, M., & Pinkerman, B. (2003). Language skills in low-SES rural Appalachian children: Normative development and individual differences, infancy to preschool. *Applied Developmental Psychology*, *23*, 539—565.

Gillam, R. B., Cowan, N., & Marler, J. A. (1998). Information processing by school-age children with specific language impairment: Evidence from a modality effect paradigm. *Journal of Speech, Language, and Hearing Research*, *41*, 913—926.

Goldman, R., & Fristoe, M. (2000). *Goldman Fristoe test of articulation*, second edition Circle Pines, MN: American Guidance Service.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore, MD: Paul H. Brookes.

Hazen, K., & Fluharty, E. (2004). Defining Appalachian English. In M. Bender (Ed.), Linguistic diversity in the South: Changing codes, practices, and ideology (pp. 50–65). Athens, GA: The University of Georgia Press.

Hegde, M. N. (2003). *Clinical research in communicative disorders: Principles and strategies*, (3rd Ed.), Austin, TX: PRO-ED.

Hoekstra, R. A., Bartels, M., & Boomsma, D. I. (2007). Longitudinal genetic study of verbal and nonverbal IQ from early childhood to young adulthood. *Learning and Individual Differences*, *17*, 97—114.

Justice, L. M., Meier, J., & Walpole, S. (2005). Learning new words from storybooks: An efficacy study with at-risk kindergartners. *Language, Speech, and Hearing Services in Schools*, *36*, 17—32.

Kaderavek, J. N., & Justice, L. M. (2005). The effect of book genre in the repeated readings of mothers and their children with language impairment: A pilot investigation. *Child Language Teaching and Therapy*, *21*, 75—92.

Kainz, K., & Vernon-Feagens, L. (2007). The ecology of early reading development for children in poverty. *The Elementary School Journal*, *107*, 407—427.

Lawrence, V. W., & Shipley, E. F. (1996). Parental speech to middle- and working-class children from two racial groups in three settings. *Applied Psycholinguistics*, *17*, 233—255.

Le Normand, M., Parisse, C., & Cohen, C. (2008). Lexical diversity and productivity in French preschoolers developmental and biosocial aspects by developmental, gender, and sociocultural factors. *Clinical linguistics and phonetics*, *22*, 47—58.

Locke, A., Ginsborg, J., & Peers, I. (2002). Development and disadvantage: Implications for the early years and beyond. *International Journal of Language and Communication Disorders*, *37*, 3—15.

Lucas, C. (2006). *Social cognition in children from rural Appalachia: Designing, predicting, and discovering.* Unpublished doctoral dissertation, Marshall University.

Lyytin, P., Laakso, M., Poikkeus, A., & Rita, N. (1999). The development and predictive relations of play and language across the second year. *Scandinavian Journal of Psychology*, *40*, 177—186.

Marton, K., & Schwartz, R. G. (2003). Working memory capacity and language processes in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *46*, 1138—1153.

McGill-Franzen, A., Zmach, C., Solic, K., & Zeig, J. L. (2006). The confluence of two policy mandates: Core reading programs and third grade retention in Florida. *The Elementary School Journal*, *107*, 67—91.

McKnight, P. E., McKnight, K. M., Sidani, S., & Figueredo, A. J. (2007). *Missing data: A gentle introduction.* New York, NY: The Guilford Press.

Medin, D. L., & Ross, B. H. (1992). *Cognitive psychology.* Fort Worth, TX: Harcourt Brace Jovanovich College.

Nation, K., Clarke, P., Marshall, C. M., & Durand, M. (2004). Hidden language impairments in children: Parallels between poor reading comprehension and specific language impairment? *Journal of Speech, Language, and Hearing Research*, *47*, 199—211.

NICHD Early Child Care Research Network (Ed.). (2005). *Child care and child development: Results of the NICHD study of early child care and youth development*. New York, NY: Guilford.

Nippold, M. A., Allen, M. M., & Kirsch, D. I. (2001). Proverb comprehension as a function of reading proficiency in preadolescents. *Language, Speech, and Hearing Services in Schools*, *32*, 90—100.

Nippold, M. A., Moran, C., & Schwarz, I. E. (2001). Idiom understanding in preadolescents: Synergy in action. *American Journal of Speech-Language Pathology*, *10*, 169—179.

Ouellette, G. P. (2006). What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension. *Journal of Educational Psychology*, *98*, 554—566.

Pettit, G. S., Bates, J. E., & Dodge, K. A. (1997). Supportive parenting, ecological context, and children's adjustment: A seven-year longitudinal study. *Child Development*, *68*, 908—923.

Pullen, P. C., & Justice, L. M. (2003). Enhancing phonological awareness, print awareness, and oral language skills in preschool children. *Intervention in School and Clinic*, *39*, 87—98.

Raz, I. S., & Bryant, P. (1990). Social background, phonological awareness, and children's reading. *British Journal of Developmental Psychology*, *8*, 209−225.

Restrepo, M. A., Schwanenflugel, P. J., Blake, J., Neuharth-Pritchett, S., Cramer, S. E., & Ruston, H. P. (2006). Performance on the PPVT-3 and the EVT: Applicability of the measures with African American and European American preschool children. *Language, Speech, and Hearing Services in Schools*, *37*, 17−27.

Rice, M. L., Wexler, K., & Hershberger, S. (1998). Tense over time: The longitudinal course of tense acquisition in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *41*, 1412−1431.

Rispens, J., Roeleven, S., & Koster, C. (2004). Sensitivity to subject–verb agreement in spoken language in children with developmental dyslexia. *Journal of Neurolinguistics*, *17*, 333−347.

Roth, F. P., Speece, D. L., & Cooper, D. H. (2002). A longitudinal analysis of the connection between oral language and early reading. *The Journal of Educational Research*, *95*, 25−272.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*, 147−177.

Snow, C. E., & Beals, D. E. (2006). Mealtime talk that supports literacy development. *New Directions for Child and Adolescent Development*, *111*, 51−66.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Snow, C. E., Porche, M. V., Tabors, P. O., & Harris, S. R. (2007). *Is literacy enough? Pathways to academic success for adolescents.* Baltimore, MD: Paul H. Brookes.

Song, H., & Fish, M. (2004). *A modified manual of Selman's tree climbing story for low-SES rural Appalachian children in middle childhood.* Unpublished manuscript.

Stanton-Chapman, T. L., Chapman, D. A., Kaiser, A. P., & Hancock, D. B. (2004). Cumulative risk and low income children's language development. *Topics in Early Childhood Special Education*, *24*, 227−237.

Stothard, S. E., Snowling, M. J., Bishop, D. V. M., Chipchase, B. B., & Kaplan, C. A. (1998). Language-impaired preschoolers: A follow-up into adolescence. *Journal of Speech, Language, and Hearing Research*, *41*, 407−418.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*, (4th ed.), Boston, MA: Allyn and Bacon.

Thomas-Tate, S., Washington, J., & Edwards, J. (2004). Standardized assessment of phonological awareness skills in low-income African American first graders. *American Journal of Speech-Language Pathology*, *13*, 182−190.

Thompson, C. A., Craig, H. K., & Washington, J. A. (2004). Variable production of African American English across oracy and literacy contexts. *Language, Speech, and Hearing Services in Schools*, *35*, 269−282.

Van de gaer, E., Pustjens, H., Van Damme, J., & De Munter, A. (2006). Tracking and the effects of school-related attitudes on the language achievement of boys and girls. *British Journal of Sociology of Education*, *27*, 293−309.

Van de gaer, E., Pustjens, H., Van Damme, J., & De Munter, A. (2009). School engagement and language achievement: A longitudinal study of gender differences across secondary school. *Merrill-Palmer Quarterly*, *55*, 373−405.

Van Hulle, C. A., Goldsmith, H. H., & Lemery, K. S. (2004). Genetic, environmental, and gender effects on individual differences in toddler expressive language. *Journal of Speech, Language, and Hearing Research*, *47*, 904−912.

Walker, D., Greenwood, C., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development*, *65*, 606−621.

Wasik, B. A., & Bond, M. A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Journal of Educational Psychology*, *93*, 243−250.

Weizman, Z. O., & Snow, C. E. (2001). Lexical input as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology*, *37*, 265−279.

Whitehurst, G. J., Arnold, D. S., Epstein, J. N., Angell, A. L., Smith, M., & Fischel, J. E. (1994). A picture book reading intervention in day care and home for children from low-income families. *Developmental Psychology*, *30*, 679−689.

Williams, J. A. (2002). *Appalachia: A history*. Chapel Hill, NC: The University of North Carolina Press.

Wolfram, W., Adger, C. T., & Christian, D. (1999). *Dialects in schools and communities.* Mahwah, NJ: Lawrence Erlbaum.

Yarbrough, B. H., & Johnson, R. A. (1980). A six-year study of sex differences in intellectual functioning, reading/language arts achievement, and affective development. *Journal of Psychology*, *106*, 55−61.

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (1992). *Preschool language scale-third edition.* San Antonio, TX: The Psychological Corporation, Harcourt Brace Jovanovic.