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Performance of African American Preschool Children From Low-Income Families on Expressive Language Measures

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Abstract

The purposes of the study were to determine (a) the ability of two spontaneous language measures, mean length of utterance in morphemes (MLU-m) and number of different words (NDW), to identify African American preschool children at low and high levels of language ability; (b) whether child chronological age was related to the performance of either group; and (c) the relationship between maternal education and the performance of children on MLU-m, NDW, and on the Expressive Communication (EC) subscale of the Preschool Language Scale–3. Analyses revealed that children with low language abilities performed lower on the language sampling measures than did those with high language abilities. Using MLU-m and NDW successfully classified 72.1% children with low language abilities and 75.4% children with high language abilities. Children's MLU-m and NDW were positively related with age. Children differed in their expressive language measures related to maternal education levels.

Keywords

language sampling measures, preschool, low income, maternal education

The ability of assessment tools to distinguish young children who are at risk for language delays from those with typical language development is the key to accurate identification. Children from low-income families are exposed to multiple risks, such as lower maternal education, that may put them at greater risk for language delays (Stanton-Chapman, Chapman, Kaiser, & Hancock, 2004). African American children from low-income families have tended to score lower than the norm on the standardized tests (Qi, Kaiser, Milan, Yzquierdo, & Hancock, 2003; Restrepo et al., 2006; Washington & Craig, 1999) and have been identified in greater numbers for early speech and language interventions due to language delays than expected in the general population (La Paro, Justice, Skibbe, & Pianta, 2004).

Identification of Potential Language Delays

Identifying children with potential language delays on the basis of their relative placement in the normative distribution is a useful method for interpreting children's language performance on standardized tests. Paul (2000) stated that "standardized testing is the only valid, reliable and fair way to establish that a child is significantly different from other children" (p. 43), although she acknowledged that "many tests in the language area are not constructed as well as they might be" (p. 4). However, some children with disabilities cannot be tested using standardized tests, for example, those with expressive language disorders (Eisenberg, Fersko, & Lundgren, 2001). It may also be challenging for young children from low-income families to be tested on standardized tests. Therefore, norm-referenced standardized tests alone may not be sufficient for distinguishing children with language impairments from typically developing children with normal language (Plante & Vance, 1994) and for accurately identifying African American children with language delays (Thomas-Tate, Washington, Craig, & Packard, 2006).

Language samples based on children's spontaneous speech and language are a useful source of language assessment information (e.g., Fey, 1986; Miller, 1981). Language sampling methods have been used to collect information on a

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child's ability to use language in context (Van Keulen, Weddington, & DeBose, 1998) and to identify language impairment (M. Dunn, Flax, Sliwinski, & Aram, 1996; Hewitt, Hammer, Yont, & Tomblin, 2005). Stockman (1996) stated that "we can be optimistic concerning [language sampling analysis] LSA as a screening tool for preschool linguistic minority children" (p. 358). Language sampling and calculation of linguistic indicators based on language samples are also widely used strategies for assessing African American children's language skills (Horton-Ikard & Weismer, 2007; Oetting & Newkirk, 2008; Washington & Craig, 2004). Washington and Craig (2002) proposed that children's expressive and receptive language abilities could be assessed more accurately during a conversation in a less structured situation than during standardized language testing. However, language sample analysis (LSA) has not been sufficiently developed to be used "as a nonbiased procedure for identifying language delay" (Stockman, 1996, p. 358). As language sample measures are not standardized, it is difficult to establish reliability for this method (Paul, 2000). Even researchers and speech and language clinicians who employ this method in their studies or clinical practice might use different methods for eliciting and analyzing the language samples. Thus, it is difficult to compare across different populations used in various studies. Mean length of utterance in morphemes (MLU-m) and number of different words (NDW) are also influenced by context and by partner language. The same child may produce slightly different language when sampled in different contexts and across time, and across professionals (Eisenberg et al., 2001). In addition, developmental norms for MLU have not included a large sample of low-income African American children (Miller, 1981).

Chronological Age (CA) and MLU-m

Examining the relationship between child CA and MLU-m is also important as it can identify children whose development of syntax requires further evaluation (Miller & Chapman, 1981). Miller and Chapman (1981) found a significantly positive correlation between age and MLU in a sample of 123 middle- to upper middle–class children in a midwestern state. Children ranged in age from 17 to 59 months. MLU was also found to increase with age in the study of 74 typically developing Cantonese-speaking children, 27 to 68 months of age in Hong Kong (Klee, Stokes, Wong, Fletcher, & Gavin, 2004).

Maternal Education and Child Language

Numerous studies have provided evidence that maternal education levels are positively associated with language performance as measured by standardized tests among African American children from low-income families (Dollaghan et al., 1999; Qi et al., 2003; Qi, Kaiser, Milan, & Hancock, 2006; Raviv, Kessenich, & Morrison, 2004; Restrepo et al., 2006; Washington & Craig, 1999). Dollaghan et al. (1999) found, with a sample of 240 predominantly European American (approximately 83%) and African American (approximately 17%) 3-year-olds who presented for primary care at pediatric clinics, that children whose mothers had graduated from college had higher scores on the Peabody Picture Vocabulary Test–Revised (PPVT-R; L. M. Dunn & Dunn, 1981) than those whose mothers either had or had not graduated from high school. Magnuson, Sexton, Davis-Kean, and Huston (2009) found, with a sample of mothers who had low educational attainment when their children were 24 months old, that subsequent increases in maternal education were found to be associated with improvements in children's expressive and receptive language skills at 36 months.

In the few existing studies that examined spontaneous language sampling measures in relationship to maternal education, results have been found to be comparable with those of studies that used standardized language tests (Dollaghan et al., 1999; Domsch & Camarata, 2008; Hammer & Weiss, 1999). Dollaghan et al. (1999) found that children whose mothers had a college degree had a higher MLU-m and a larger NDW than did their peers whose mothers had or had not graduated from high school. Children whose mothers had not graduated from high school did not differ in MLU-m or NDW from those whose mothers had graduated from high school but not from college. Hammer and Weiss (1999) observed six African American mother–child dyads from low-income families (11.8 years of maternal education on average) and six African American dyads from middle-income families (14.7 years on average) during play activities. They found that children from middle-income families averaged more than twice as many vocalizations per episode as the children from low-income families. Similar results regarding the relationship between maternal education and child's MLU were also found in a clinical sample by Domsch and Camarata (2008), who studied the effects of maternal education and language use on vocabulary development and MLU in twenty 2-year-old children with late language emergence. They reported a positive association between maternal education and child MLU. However, no association was found between maternal education and child NDW (words per 15-min sample).

Although a growing body of literature has demonstrated the link between maternal education level and child language skills, some researchers have found no direct relationships between these two variables (Westerlund & Lagerberg, 2008). Reilly et al. (2009) found only small positive relationships between maternal education levels and child expressive vocabulary at 24 months. It is possible that other factors might mediate the relationship between maternal education and child's language skills; for example, quantity and quality of the mother–child interaction and communication style (Bornstein, Haynes, & Painter, 1998; Hart & Risley, 1995; Hoff & Tian, 2005; Westerlund & Lagerberg, 2008). Maternal education could influence the amount and richness of the language stimulation the mother provides for her child, which, in turn, could influence the child's developing language (Hoff-Ginsberg & Tardif, 1995). Mothers from low-income families might use more directive styles (Hoff-Ginsberg, 1991) or more nonverbal means of communication, such as pointing gestures (Pan, Rowe, Singer, & Snow, 2005), when communicating with their children. Pan et al. (2005) found that the variety of words mothers used, not the amount of talk, was the best predictor of growth in child vocabulary production. The influence maternal education has on a child's language skills might also be mediated by shared reading experiences. Westerlund and Lagerberg (2008) found that maternal education was positively linked to frequent reading, which, in turn, was found to be positively related to children's expressive vocabulary size.

MLU-m is the most commonly derived measure from spontaneous language samples (e.g., Brown, 1973; Miller, 1981). It has been reported to differentiate children with language disorders from typically developing children who use Mainstream American English because children with language disorders tend to delete morphemic inflections (Seymour, Bland-Stewart, & Green, 1998). Other researchers found that MLU-m could differentiate between children with and without language delays (Hewitt et al., 2005; Rice, Redmond, & Hoffman, 2006). Although MLU-m can give a rough picture of a child's syntax development of an MLU of six morphemes, it may not capture changes in the complexity of the syntactic structure in language in children (Van Keulen et al., 1998). For example, a 3-year-old who says, "Me and sister hungry" may have lower language ability in terms of syntax development than a child who says, "I am very hungry."

NDW in samples of 50 or 100 utterances is another measure of language complexity that has been widely used during preschool years. NDW has been found to differentiate children with typical linguistic development from same-aged peers with language disorders (Watkins, Kelly, Harbers, & Hollis, 1995). Horton-Ikard and Weismer (2007) found that African American children from low-income families used a smaller NDW than their peers from middle-income families. NDW could discriminate typically developing children from their peers with language disorders who were both from mainly lower middle class (Klee, 1992). However, Klee (1992) cautioned that NDW might not be a good measure to compare across children, as the sample size (number of lexical tokens) can influence the NDW. It is important to use NDW as a supplement to other measures rather than as the sole measure for diagnosing children with language disorders (Watkins et al., 1995).

Most studies that have used language sampling measures to identify preschool children with language impairment have included children from middle- and high-income families, and many were conducted with clinical samples. A paucity of literature exists on the relationship between maternal education and children's language abilities as measured by language sampling methods. Our current study added a contribution to the existing literature by improving understanding of two widely used measures of spontaneous language production with African American preschool children from low-income families.

The purposes of the study were to determine (a) the ability of two spontaneous language measures, MLU-m and NDW, to identify African American preschool children at low and high levels of language ability; (b) whether child CA was related to the performance of either group; and (c) the relationship between maternal education and the performance of children on MLU-m, NDW, and on the Expressive Communication (EC) subscale of the Preschool Language Scale–3 (PLS-3; Zimmerman, Steiner, & Pond, 1992). Specific research questions were as follows:

Research Question 1: Do children with low language abilities (scoring ≤77 on the PLS-3 Total Language Scale) also score low on measures of MLU-m and NDW?

Research Question 2: To what extent do the combined measures of MLU-m and NDW predict language group membership (low and high language)?

Research Question 3: Are MLU-m and NDW associated with CA of children in low and high language groups?

Research Question 4: To what extent do MLU-m, NDW, and PLS-3 expressive mean scores differ by maternal education levels?

Method

Participants

The study included a total of 205 African American boys (n = 112) and girls (n = 93) who were part of a longitudinal study of early language development. They were recruited from one Head Start center and 11 child care centers located in low-income neighborhoods in the Nashville, Tennessee, metropolitan area. The mean age of the children was 43 months (SD = 3.59, range = 36–51 months). The children selected for participation were from monolingual English-speaking homes, were typically developing, and had normal medical histories. None of the children had Individualized Education Plans (IEPs) except for those with speech and language impairments (SLIs). Approximately 96% of children in the sample were from families that received state income, housing, or child care subsidies. The remaining 4% were children enrolled in a Head Start program that served children from families with annual incomes less than US$9,000. Most (80%) of the mothers were not married. With regard to education, 21% of the primary caretakers had less than a high school education, 27% had their general education diploma (GED) or a high school diploma, 45.6% had some college education, and 6.4% had college degrees. Because of the very low percentage of mothers who received college degrees in our study, we combined the mothers who received college degrees with those who had some college education. To address the first three research questions of the study, we further classified 130 African American boys (n = 78) and girls (n = 52) drawn from the larger sample of 205 children into two groups, low and high language, according to their PLS-3 Total Language scores. The low language group (n = 61) consisted of children who achieved standard scores of 77 or less (1.5 *SD* below the established mean of 100 on the PLS-3 Total Language scale); the high language group (n = 69) consisted of children who achieved standard scores of 92 or higher on the PLS-3 Total Language scale. These cutoff scores were chosen to ensure that there was no overlap between the two groups. For children who scored between 76 and 91 on the PLS-3 Total Language scale, 55% were girls. The mean age was 42.81 (*SD* = 3.71). The mean value of MLU-m for this group of children was 3.40 (*SD* = 0.80). The mean value of NDW was 95.99 (*SD* = 22.07). The mean standard score of the PLS-3 EC was 86.61 (*SD* = 5.27).

Data Collection

A team of nine undergraduate students, graduate students, and research staff in special education and speech and language pathology administered the PLS-3. Each child was tested individually in a room outside the child's classroom by one of the nine randomly assigned testers who were blind to the research question. The PLS-3 subscales took approximately 30 min to administer. Six testers were European American; three were African American; all were female. A MANOVA revealed nonsignificant variations in PLS-3 standard scores across child participants relative to the race of the examiner. Standardized testing and spontaneous language sampling were conducted in a counterbalanced order, reducing the potential for order effects.

Videotaped spontaneous language samples were elicited during dyadic interactions with one of the trained examiners in an unstructured free play context. The examiner followed a standard protocol developed by Hemmeter and Kaiser (1994) and used a standard set of age-appropriate toys (e.g., barn and animals, Mr. Potato Head, car racing set, puppets, bubbles, kitchen utensils, food items, a miniature playhouse, and manipulatives) during the interaction. Toys were selected to allow each child to construct a variety of activities (Miller, 1981) so that the most spontaneous speech and language could be elicited. Before the video camera was turned on, the examiner told the child, "You can play with any of these toys. I cannot talk to you unless you talk to me first." After that, the examiner started the video camera. The examiner was trained to keep the use of yes/no questions and open-ended questions to a minimum (0–5), and follow the child's lead in play and conversation. Besides these questions, the interaction was child directed in the elicitation. The examiner responded only minimally, repeated what the child said, or gave brief answers if the child asked a question, without giving extra words. Children were engaged in conversation related to the toys they chose to play with from a basket. Miller (1981) and Owens (1999) recommended that children be allowed to choose the activities and items that they could manipulate because they might tend to communicate more when they focus on activities rather than on talking. The examiner played with the child on a play mat using these materials for 30 min. Based on rules for calculating MLU from Brown (1973), the sample length was 100 utterances. If fewer than 100 child utterances occurred, the examiner conducted a second session for another 30 min and then combined these two sessions.

Measures

PLS-3. The PLS-3 is designed for use with children from birth through 6 years of age. It assesses children's receptive and expressive language abilities using two standardized subscales, Auditory Comprehension (AC) and EC. In an earlier study, Qi et al. (2003) examined the performance of 701 African American preschool children from low-income families and found the PLS-3 to be appropriate for use with this population. They also found that the PLS-3 total scores could be used to distinguish children with language delays from those with typical language development (Qi et al., 2003). Each child's responses were scored in accordance with the examination manual. Raw scores were converted to standard scores and percentiles. The psychologist who trained the assessment team completed at least two reliability observation sessions with each examiner during the administration of the PLS-3.

Language sample measures. The videotaped language samples were transcribed and coded (separated) into units for analysis of grammatical morpheme use by the research assistants, following the conventions of the Kid Talk Language Transcription Coding Manual (Kaiser & Delaney, 1997), which are compatible with Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1993). Based on the first 100 utterances, MLU-m and NDW were calculated by the SALT program. All child utterances were transcribed; however, only complete and intelligible utterances were included in the calculations of MLU values, and only the intelligible words were used in the calculation of NDW. Functors were counted as separate morphemes (e.g., *smell + ed* counted as two morphemes). However, compound words (e.g., *breadstick*) and contracted forms (e.g., *won't*)

Table 1. Means, Standard Deviations, Range, *F* Values, Effect Sizes, and Significance Levels (*p*) on the Language Measures for Children in the Low and High Language Groups

	Low language (*n* = 61)			High language (*n* = 69)					
Measures	*M*	*SD*	*Range*	*M*	*SD*	*Range*	*F*	Cohen's *d*[a]	*p*
MLU-m	2.97	0.51	1.63–3.99	3.71	0.67	2.20–5.57	49.79	1.24	.001
NDW	82.93	18.97	25–117	105.38	17.73	69–159	48.57	1.22	.001
PLS-4 EC	73.48	4.48	66–88	101.83	9.43	83–133	367.60	3.87	.001

Note: MLU-m = mean length of utterance in morphemes; NDW = number of different words; PLS-3 EC = Preschool Language Scale–3 Expressive Communication subscale scores.

[a]Effect sizes were computed based on Cohen's *d*, which is a measure of the difference in means divided by the pooled standard deviation across the two groups. Effect sizes are coded so that positive effect sizes indicate worse functioning among children with low language abilities.

were counted as one single morpheme. The NDW was based on stems or word roots (e.g., *sings* and *sing* were counted as one word). Each language sample was transcribed by a trained coder and verified by a second coder before analysis. Intertranscriber agreement for MLU-m and NDW was determined from independent transcriptions and coding of 20% of randomly selected transcripts. The correlations for the two measures computed for the original and the second transcriptions were .92 for MLU-m and .94 for NDW.

Data Analysis

First, we conducted ANOVA to examine the group difference on the two language sampling measures. The magnitude of the group difference was estimated using Cohen's *d* as a measure of effect size. Cohen's *d* reflects the differences in group means in pooled standard deviation units. By conventional standards (Cohen, 1988), an effect size of $d = 0.2$ is considered a small effect, $d = 0.5$ is considered medium effect, and $d = 0.8$ is considered a large effect. Second, we performed a logistic regression to determine whether the combined measures of MLU-m and NDW could predict the language group membership. Third, we ran linear regression analyses, using MLU-m or NDW as the dependent variable, and age and language group as independent variables, to determine the degree to which MLU-m and NDW and age were related. Finally, we performed an ANCOVA using maternal education level and gender as independent variables, child's age as covariate, and MLU-m, NDW, and PLS-3 EC scores as dependent variables to test whether observed language measures differed by maternal education level. A Type I error rate (α) of .05 was applied to each statistical test.

Results

Descriptive Analysis

The mean value of MLU-m in the entire sample was 3.38 (*SD* = 0.74, range = 1.33–6.26). The mean score of NDW was 95.26 (*SD* = 21.62, range = 8–159). The mean standard score on the PLS-3 EC subscale was 88.72 (*SD* = 12.25, range = 66–133). MLU-m evidenced a large positive relationship with NDW, $r = .72$, $p < .01$, two-tailed. The PLS-3 EC subscale score was moderately correlated with the MLU-m, $r = .41$, and NDW, $r = .37$, respectively, both *p*s < .01, two-tailed.

Group Differences

We examined whether children classified in the low language group based on the PLS-3 total scores also scored low on the language sampling measures such as MLU-m and NDW. An ANOVA revealed that children in the low language group (*M* = 2.97, *SD* = 0.51) had significantly lower MLU-m values than did children in the high language group (*M* = 3.71, *SD* = 0.67), $F(1, 128) = 49.79$, $d = 1.24$, $p < .001$. Children in the low language group also (*M* = 82.93, *SD* = 18.97) had significantly lower NDW values than did children in the high language group (*M* = 105.38, *SD* = 17.73), $F(1, 128) = 48.57$, $d = 1.22$, $p < .001$ (see Table 1).

Examination of MLU-m and NDW and Language Group Membership

A logistic regression was conducted to examine MLU-m and NDW as predictors of language group membership. Of interest was the extent to which the language sampling measures accurately classified the 130 children into their respective groups (low and high) after statistically adjusting for age and gender. This analysis was performed in two steps. A reduced model was first tested with the intercept as the sole predictor of language classification (1 = *high*). Age, gender, MLU-m, and NDW were then added as predictors of language group membership.

The results of the intercept only model were not significant, –2 log likelihood (–2 LL) = 179.72. The addition of the four predictors resulted in a statistically significant logistic regression equation, –2 LL = 124.41, $\chi^2 = 55.31$, $p < .001$. An examination of the odds ratios (ORs) for each

Table 2. Language Measures for Maternal Educational Groups

	Maternal education level			
	Less than high school (n = 43)	High school (n = 55)	Some college education or college (n = 107)	Total sample (N = 205)
Measure	M (SD)	M (SD)	M (SD)	M (SD)
MLU-m	3.24^a (0.72)	3.28^a (0.80)	3.50^b (0.70)	3.38 (0.74)
NDW	89.98^a (25.17)	89.67^a (18.47)	100.27^b (20.54)	95.26 (21.62)
PLS-3 EC scores	86.81^a (12.53)	85.80^a (10.77)	90.98^b (12.52)	88.72 (12.25)

Note: MLU-m = mean length of utterance in morphemes; NDW = number of different words; PLS-3 EC scores = Preschool Language Scale–3 Expressive Communication subscale scores. Means that share superscripts do not differ statistically at α = .05.

predictor revealed that age was not a statistically significant predictor of group membership, OR = .93 (95% confidence interval [CI] = [0.81, 1.06]), Wald $\chi^2 = 1.00$, $p > .05$. Gender was not a statistically significant predictor either, OR = 2.16 (95% CI = [0.86, 5.42]), Wald $\chi^2 = 2.74$, $p > .05$. As expected, the two variables of interest (MLU-m and NDW) were statistically significant predictors of language group membership. MLU-m had an OR of 4.17 (95% CI = [1.51, 11.53]) and NDW had an OR of 1.04 (95% CI = [1.01, 1.07]) with Wald χ^2s = 7.58 and 5.86, ps < .01, respectively. It should be noted that, although both predictors were positively related to group membership, MLU-m was a greater predictor of language classification. In addition, using the linear combination of the MLU-m and NDW measures resulted in 73.8% (96 of 130) accurate classification of the language status. Specifically, using the two predictor variables accurately classified 72.1% (44 of 61) of children in the low language group and 75.4% (52 of 69) of children in the high language group.

Relationship Between MLU-m and NDW, and Age

Relationship between MLU-m and age. A linear regression was performed with age in months, language group (0 = *low* and 1 = *high*), and the interaction of the factors as independent variables. The main effect of age was statistically significant, $t(126) = 2.11$, standardized $\beta = 0.23$, $p < .05$. The main effect of the language group and the interaction of language group by age were both nonsignificant, $t(126) = 1.63$, $\beta = 1.49$, $p > .05$, and $t(126) = -1.07$, $\beta = -0.99$, $p > .05$, respectively.

Relationship between NDW and age. As with MLU-m, a linear regression was performed with the same aforementioned independent variables. The main effect of age was statistically significant, $t(126) = 3.51$, $\beta = 0.36$, $p < .001$. In addition, the main effect of the language group and the interaction of age with language group were nonsignificant, $t(126) = 1.83$, $\beta = 1.61$, $p > .05$, and $t(126) = -1.14$, $\beta = -1.21$, $p > .05$, respectively.

Maternal Education and Expressive Language Measures

Table 2 shows the mean scores and *SD*s on two spontaneous language measures and the standard scores and *SD*s on the PLS-3 EC subscale at each maternal education level. Significant differences were identified on the omnibus test with MLU-m as the dependent variable, $F(2, 203) = 3.49$, $p < .05$. Post hoc comparisons showed that children whose mothers had graduated from college or had some college education had significantly greater MLU-m values than children whose mothers had graduated from high school ($d = 0.34$) or had not graduated from high school ($d = 0.35$), both ps < .05.

Similarly, the omnibus test for NDW was significant, $F(2, 203) = 6.70$, $p < .01$. Follow-up comparisons revealed that children whose mothers had graduated from college or had some college education had significantly greater NDW than children whose mothers either had graduated from high school ($d = 0.54$) or had not graduated from high school ($d = 0.44$), both ps < .05.

The omnibus test for the PLS-3 EC scores was also statistically significant, $F(2, 203) = 4.27$, $p < .05$. Children whose mothers had graduated from college or had some college education had significantly higher PLS-3 EC scores than children whose mothers either had or had not graduated from high school ($d = 0.44$ and $d = 0.33$, respectively). On all measures, no statistical differences were observed between children whose mothers had or had not graduated from high school (i.e., all ps > .05).

Discussion

We examined the performance of African American children from low-income families on two language sampling measures and an expressive language measure of a standardized test, the PLS-3, and the relationship between maternal education and child language skills. Our finding showed that the two language sampling measures were highly correlated with each other, indicating that they may have been assessing a common construct. The PLS-3 EC standard scores correlated moderately with the values derived from the two language sampling measures, indicating that the PLS-3 EC scale may be tapping relatively different aspects of expressive language.

Our first finding supports the expectation that children who have low language scores on the standardized test do have language skills as measured by language samples, which are lower than those with high language scores. Effect sizes were large for both MLU-m and NDW. This finding suggested that both measures are sensitive to differences within a population of African American children from low-income families.

The second finding indicated that the combination of the MLU-m and NDW accurately identified the language status of 73.8% of children in our sample. Specifically, the two measures successfully classified 72.1% of children in the low language group and 75.4% of children in the high language group. These findings were consistent with those from other studies that MLU-m and NDW may discriminate between children with and without language delays (Hewitt et al., 2005; Klee, 1992; Rice et al., 2006; Watkins et al., 1995). This finding also suggests that the PLS-3 might be useful in discriminating these two groups of children as the majority of the children in our study were correctly identified by MLU-m and NDW.

The third finding revealed that children's age is associated with the language sample measures regardless of language group membership (low vs. high language). This finding is consistent with that of Klee, Schaffer, May, Membrino, and Mougey's (1989) study that there was an association between MLU and age in a sample of children of ages 2 years to 4 years 2 months, who had specific SLI. Our finding is also consistent with that of Rice et al. (2006), who reported an association between MLU and age in a sample of 3-year-old, MLU-equivalent group but not the 5-year-old SLI group. Rice et al. explained this discrepancy by hypothesizing that the relationship between age and MLU is stronger for the earlier stages of MLU growth in children with SLI, such as in Klee et al.'s study, than in the later stages, such as those studied by Rice et al. Our finding confirmed Rice et al.'s hypothesis that children's MLU-m and NDW increases with age.

The final finding showed significant linear trends for MLU-m values, NDW, and PLS-3 EC standard scores, indicating that children's language scores increased with higher levels of maternal education. Specifically, our findings revealed that the children of mothers who had some college education or graduated from college had higher MLU-m, NDW, and PLS-3 expressive scores than children whose mothers had or had not graduated from high school. These findings are consistent with those of Dollaghan et al. (1999), who reported that children whose mothers had graduated from college had significantly higher MLU-m, NDW, and PPVT-R scores than children whose mothers did not attend college. Similar to Dollaghan et al.'s findings, we found no difference in either MLU-m values or NDW between children whose mothers had graduated from high school and children whose mothers had not graduated from high school.

The study by Dollaghan et al. (1999) and our study provided the much-needed information on the association between maternal education and language sampling measures. However, our study adds more information on the language performance for a large sample of African American children from low-income families. This research suggests that considering a factor that influences children's language such as maternal education levels is an important goal for developmental and transactional research.

Limitations, Implications, and Recommendations

There were four limitations of the study. First, although our language sample transcriptions were carefully verified by a second coder, dialect might still play a role in the findings and our study did not include direct measures of dialect use. Second, it was possible that the testing environment might have some effects on the language performance of African American children who came from low-income homes. For example, children with mothers who had higher education might be more comfortable and familiar with the testing environment, including play settings, than children whose mothers had lower education. Although our study included examiners who were African American and we did not find an effect for race with the variables we assessed, it was possible that, because the examiners were all college educated women, their language use might be more like that of the children from middle-socioeconomic status (SES) families than that of the children whose mothers were from lower SES backgrounds. Future research should consider using the participants as informants to set up a testing situation that would be as comfortable to children from lower SES backgrounds as those whose mothers are college educated. It would be also interesting to examine whether children's spontaneous language samples collected from interactions within the home or community environment with familiar interactional partners would yield similar results. Third, as all children participating in this study were from low-income homes, their low SES might influence the NDW for the overall sample. Finally, geographic region might affect the NDW use, as participants were from the southern United States. The results of our study represent a relatively narrowly defined population and thus should not be generalized to other populations.

Despite these limitations, our study has several implications for future research and practice. First, our results provide descriptive information about the MLU-m and NDW of African American children from low-income families and contribute to current understandings of the evaluation potential of MLU-m and NDW for this population. Longitudinal research using language sampling measures is needed to understand the growth trajectory among boys and girls of this at-risk population. Second, our study provides evidence that, within the sample from low-income families, maternal education level is positively associated with children's language skills. Examining family demographic variables may be helpful in predicting which children within low-income populations are most likely to be at high risk for language delays so that effective prevention and interventions can target these children.

Our findings suggest that MLU-m and NDW can be used to identify African American children for potential language delays. Although MLU is a frequently used metric for child language development (Loeb, Kinsler, & Bookbinder, 2000), reliability and validity of this measure for identifying language delays must be considered, given the lack of standardization of language sampling protocols (Eisenberg et al., 2001). We recommend that clinicians and researchers should use both language sampling measures and standardized tests when identifying language delays in children from low-income families. In the current study, a consistent protocol to elicit language was used across children, reliability on transcription was established, and a computer program was used to analyze the language sample data with a high level of consistency. These strategies are likely to yield reliable data for research purposes and might be considered for application in practice as well.

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