Assessment of Early Developing Phonological Awareness Skills: A Comparison of the Preschool Individual Growth and Development Indicators and the Phonological Awareness and Literacy Screening–PreK

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Research Findings: Assessing the development of early literacy skills is necessary in order to identify children with delays, provide appropriate intervention, and monitor progress. The purpose of the current study was to compare the data obtained from 2 curriculum-based assessments of phonological awareness skills in a sample of low-income, urban preschoolers. Participants included 227 children from Head Start and other community-based preschool classrooms located in a midwestern city. The Preschool Individual Growth and Development Indicators (IGDIs) and the Phonological Awareness and Literacy Screening–PreK (PALS-PreK) were administered in the fall and spring of the year. Results suggested that the PALS-PreK was more advantageous than the IGDIs in terms of providing meaningful data for this group of children. The IGDIs appeared to be more appropriate for developmentally advanced preschoolers in this population. *Practice or Policy:* There remains a critical need for assessments of emergent literacy that are appropriate for diverse groups of preschool children and can feasibly be used for monitoring development.

Emergent literacy consists of the skills that facilitate the development of conventional reading abilities (Whitehurst & Lonigan, 1998). In its meta-analysis of early literacy research, the National Early Literacy Panel (2008) identified several emergent literacy skills that consistently predicted later reading achievement (beyond the influences of IQ and socioeconomic status), including alphabet knowledge, phonological awareness, print awareness, and oral language. Research has consistently shown that children who enter school behind their peers in emergent literacy skills are unlikely to catch up and may fall further behind over time (e.g., Scarborough, 2001; Snow, Burns, & Griffin, 1998). In addition, children with delayed language and literacy

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development at kindergarten are at high risk for being referred for special education services (Whitehurst & Lonigan, 1998).

A consensus among researchers in the area of literacy acquisition is that prevention of early reading difficulties during the preschool years is more effective than remediation of reading failure during the school-age years (Craig, Conner, & Washington, 2003; Marston et al., 2007). Given that many at-risk children demonstrate reading delays upon entering kindergarten, efforts to prevent reading failure for this group must begin in preschool, if not earlier (Washington, 2001). Prevention is dependent on early identification of children who are at risk for later reading difficulty and frequent monitoring of children's growth. Assessing children's progress over time is critical for determining children's potential for learning and for measuring the impact (or lack thereof) of educational modifications to facilitate skill acquisition (Invernizzi, Landrum, Teichman, & Townsend, 2010).

Traditional norm-referenced tests are often used to determine children's eligibility for services and to evaluate outcomes; however, there are significant disadvantages associated with this practice when using the preventive model with at-risk children. First, norm-referenced tests generally do not assess curriculum-based skills. Therefore, the results do not provide educators with useful data for modifying instruction to help children advance in the chosen curriculum (Deno, 1985). Second, norm-referenced tests are generally biased against cultural and linguistic minorities, resulting in overidentification for special services (Washington & Craig, 2004). Biases may occur when test formats are unfamiliar to nonmainstream children (Terrell & Hale, 1992) and/or the norming sample is largely composed of children from majority backgrounds (Wyatt, 2012). Third, norm-referenced tests often assess content that is less familiar to cultural and linguistic minorities (Hammer, Farkas, & Maczuga, 2010). Taken together, these findings suggest that children from minority backgrounds may score lower on traditional standardized tests because of a variety of influences distinct from the children's actual skill set or potential for learning (see Fuchs & Fuchs, 2006, for a review). The latter two points are particularly concerning given that a large proportion of children participating in publicly funded early childhood programs (e.g., Head Start) are from culturally and linguistically diverse backgrounds.

The need for sensitive measurement of curriculum-based skills has been highlighted by the implementation of response to intervention (RTI; Gettinger & Stoiber, 2007; VanDerHeyden, Snyder, Broussard, & Ramsdell, 2007). A primary goal of RTI is to improve the accurate identification of children with learning disabilities through universal screening and monitoring of learning over time versus identification based on a discrepancy model (i.e., significantly lower achievement than would be expected based on age, intelligence, and experience; Justice, McGinty, Guo, & Moore, 2009). In an RTI approach children who are at risk and/or not progressing as expected through general educational programming are provided with supplemental small-group or individual instruction (Justice et al., 2009). A comprehensive assessment system in RTI involves the use of both benchmark measures (e.g., universal screeners) and progress-monitoring measures (Justice et al., 2009). Benchmark and progress-monitoring measures may be identical, with the primary difference being the frequency of administration (Justice et al., 2009). In order to effectively implement RTI in early childhood, one must identify appropriate assessments tools. Although the RTI approach for school-age children is supported by a growing body of evidence, RTI in early childhood is an emerging practice, with many aspects (e.g., assessment approaches and benchmarks) still under debate (National Professional Development Center on Inclusion, 2012). In addition, in the age of increased accountability,

outcomes assessment is critical for demonstrating that preschool educational programs, such as federally funded Head Start (which received approximately $7.2 billion in 2009; National Head Start Association, 2011), are positively impacting children's emergent literacy development (Invernizzi et al., 2010).

Curriculum-based measurement is an evidence-based alternative to norm-referenced testing for assessing students' increasing proficiency on curriculum-based outcomes (Deno, 1985). Curriculum-based measures (CBMs) are progress-monitoring tools that are designed to be psychometrically sound, simple, efficient, inexpensive, sensitive to change over time, and useful for facilitating instructional decisions. Measures selected for CBMs are considered to be vital signs of achievement, analogous to blood pressure serving as a sign of general health. Ideally, CBMs are administered frequently using parallel forms of equal difficulty. When one is considering CBMs for emergent literacy skills, strong candidates for outcome measures should be strongly predictive of later reading, a key component of most curricula, and directly measurable in young children. Phonological awareness skills emerge early and continue to develop through the school-age years, are related to later reading outcomes, and are common activities in the preschool classroom, making them an excellent option for curriculum-based measurement.

Phonological awareness is a metalinguistic skill that allows children to manipulate and break down sounds in language, such as knowing that words are made up of syllables and phonemes (Torgesen & Mathes, 2000). Phonological awareness skills have repeatedly been shown to be strongly linked to later reading skills (e.g., Scarborough, 2001; Stanovich, Cunningham, & Cramer, 1984) and are increasingly targeted in early childhood curricula, based on recommendations from the National Early Literacy Panel (2008), federal initiatives such as Early Reading First that stress the importance of implementing criteria grounded in scientifically based reading research (U.S. Department of Education, 2009), and changing state mandates and national standards for early childhood education (cf. Phillips, Clancy-Menchetti, & Lonigan, 2008). Two of the earliest emerging phonological awareness skills are recognition of rhyming and alliteration, which makes them important skills to consider when working with young children who have limited emergent literacy skills.

Children's awareness of rhyming words emerges around 3 years of age (Lonigan, Burgess, & Anthony, 2000). Bryant, Bradley, Maclean, and Crossland (1989) documented a significant relationship between children's knowledge of nursery rhymes and later reading skills in their longitudinal study, which followed children between the ages of 3;4 and 6;3 (see also Bryant, MacLean, Bradley, & Crossland, 1990). However, additional studies have shown that early rhyming skills have a limited direct relationship with learning to read (Duncan, Seymour, & Hill, 1997; Lonigan et al., 2000). Although there are conflicting data documenting the direct link between children's early rhyming skills and later reading outcomes, the ability to rhyme continues to play an important role in early education. Multiple studies have documented that rhyming skills have a direct link with more advanced phonological awareness skills (Anthony & Lonigan, 2004; Bryant et al., 1990). Rhyming activities facilitate interaction with language and literature and are common across preschool curricula and classrooms (e.g., Opening the World of Learning; Schickedanz, Dickinson, & Charlotte-Mecklenburg Schools, 2005). In addition, rhyming and experimentation with words and speech sounds may play to the strengths of children from a variety of cultural backgrounds. For example, research has indicated that African American culture values ''charismatic'' language and speech (Terrell & Hale, 1992, p. 6). As a group,

African American children have been found to entertain audiences through language play (Nichols, 1989) and show a talent for creating oral stories (Curenton & Justice, 2004).

Another phonological awareness skill that often emerges during the preschool years is alliteration (also termed *Beginning Sound Awareness*), which is the ability to recognize words that begin with the same phoneme. A common alliteration task cues children to identify words that begin with the same phoneme when presented with additional foil(s) (e.g., ''What begins with the same sound as *bat*? *Hat, ball,* or *goal*?''). The ability to complete alliteration tasks emerges after the onset of rhyming skills (Anthony & Lonigan, 2004). Compared to rhyming skills, alliteration skills are more sophisticated and require greater knowledge of sounds within words (rather than similarities at the syllable level). Such higher level skills that tap phoneme awareness have been more directly linked to children's emergent literacy skills (Hulme, 2002).

Two commonly used packages that assess rhyming and alliteration are the Preschool Individual Growth and Development Indicators (IGDIs; Early Childhood Research Institute on Measuring Growth and Development, 1998) and the Phonological Awareness and Literacy Screening–PreK (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004). Although these assessments examine the same underlying phonological awareness constructs, there are variations in the methods used to collect the data from children. A description of each assessment is provided next.

IGDIs

The IGDIs are CBMs that were developed to assess language and literacy skills in children ages 3 to 5. The specific measures include Picture Naming, Rhyming, and Alliteration. (Picture Naming measures children's naming ability and is not discussed in detail here). Rhyming and Alliteration measure early phonological awareness skills. The IGDIs are typically administered at least three times per year (McConnell, Priest, Davis, & McEvoy, 2002; Missall, McConnell, & Cadigan, 2006). The IGDIs are widely used measures of emergent literacy skills. According to their website (igdis.umn.edu), the IGDIs have more than 10,000 users and have tested more than 150,000 preschool children. To the best of our knowledge, the IGDIs are the only preschool language and emergent literacy CBMs currently available.

The psychometric properties of the IGDIs have been investigated in a series of studies that were summarized in Missall and McConnell's (2004) technical report. Both Rhyming and Alliteration were found to have moderate to high test–retest reliability coefficients ($rs = .62–.89$; Priest, Silberglitt, Hall, & Estrem, 2000). Both Rhyming and Alliteration were found to have moderate to high levels of criterion validity when compared to measures of vocabulary, print awareness, and phonological awareness ($rs = .34–.79$; McConnell et al., 2002). Priest et al. (2000) tested the construct validity of Rhyming and Alliteration by correlating children's performance with their age and documented moderate age-related changes in the measures ($rs = .46$ and .61, respectively).

The clinical utility of the IGDIs has been demonstrated in various studies. For example, Missall et al. (2006) examined the performance of 69 preschool children on the IGDIs. Using hierarchical linear modeling they found that at 59 months (the median age) the average Rhyming and Alliteration scores (6.6 and 5.3, respectively) were significantly different than 0. They also found that the average slopes, or rates of growth, for both Rhyming and Alliteration exhibited a significant increase over time (.40 and .21, respectively). In terms of predictive validity, Missall

et al. (2007) found that the IGDIs were significantly predictive of oral reading fluency scores at both the end of kindergarten and the end of first grade in a sample of 116 urban preschoolers from a low-income school district. Smith (2009) also examined the predictive validity of the IGDIs with 241 urban, low-income children and found that performance on the IGDIs during preschool was significantly related to children's performance on third-grade state reading tests.

PALS-PreK

Another widely used assessment of preschool children's emergent literacy development is the PALS-PreK. The PALS-PreK assesses emergent literacy fundamentals and includes tasks designed to be developmentally appropriate for 4-year-old children. The PALS-PreK measures children's phonological awareness skills with three subtests: Beginning Sound Awareness (i.e., recognition of alliteration), Rhyme Awareness, and Nursery Rhyme Awareness. The PALS-PreK contains three additional subtests that were administered but not reviewed in this study: Name Writing, Alphabet Knowledge, and Print and Word Awareness. The PALS-PreK is criterion referenced, and benchmarks are provided for the spring of the 4-year-old prekindergarten year. According to the test manual, interrater reliability for the phonological awareness tasks was high ($r = .99$). Concurrent validity was moderate with measures of phonological awareness, print awareness, and general academic development (rs = .41–.71). Test–retest reliability for the phonological awareness tasks at 2 weeks was high (rs = .84–.88; Invernizzi et al., 2010). According to Invernizzi et al. (2010), the PALS-PreK is among the most commonly used preschool literacy assessments. For example, in the 2008–2009 school year more than 1,400 preschool teachers utilized the PALS-PreK with more than 21,000 children.

Justice, Invernizzi, Geller, Sullivan, and Welsch (2005) examined the performance of 2,161 English-speaking preschoolers (4 to 5 years of age) on the PALS-PreK. The sample was diverse in terms of race and ethnicity, and all children were at risk because of low income or various other factors. Results showed measurable (but small) differences between 4- and 5-year-old children. In addition, African American children and Caucasian children performed similarly on the majority of subtests. Hispanic children achieved lower scores (on average) than the other ethnic groups. Justice et al. (2005) concluded that the PALS-PreK is a valuable tool for screening children's emergent literacy skills, monitoring progress, and engaging in instructional decision making; however, they recommended additional research examining the emergent literacy skills of Hispanic children. In addition, examining children younger than 4 years is warranted, given that most preschool programs include children between 3 and 5 years old.

IGDIs AND PALS-PreK COMPARISON

The IGDIs and PALS-PreK are similar in that they both measure preschool children's phonological awareness skills; however, several differences are readily apparent. Unlike the PALS-PreK, the IGDIs were originally designed to be a CBM. For example, emergent literacy development is assessed using only two measures (i.e., Rhyming and Alliteration), the subtests have brief administration times (i.e., Picture Naming, 1 min; Rhyming and Alliteration, 2 min each), and different stimuli of comparable difficulty are presented during each test administration. Although the PALS-PreK is a curriculum-based assessment, it is not a true CBM because it is typically only

administered twice per year using the same stimuli. The PALS-PreK could be administered more often, but the time required to administer the entire test (20–25 min according to the test manual, but closer to 40 min in our own experience) is too prohibitive for frequent administrations to be feasible. Compared to the IGDIs, the PALS-PreK includes more demonstration and modeling of the tasks, and there are no time limits for responding. In addition, all items within each subtest are administered (i.e., there are no basals or ceilings), whereas the IGDIs require that children pass a specified number of trial items before proceeding with the testing. The PALS-PreK is a comprehensive assessment of emergent literacy development and includes three measures of phonological awareness, two of which focus on rhyming. Both the IGDIs and PALS-PreK were designed to measure skills predictive of later reading achievement, but neither was specifically designed for assessing children from culturally, linguistically, or economically diverse backgrounds.

PURPOSE OF THE STUDY

There is a critical need to assess children's emergent literacy skills for screening, progress-monitoring, and program evaluation purposes. The PALS-PreK and IGDIs were developed to fill that need, yet little is known about their appropriateness for measuring young children's phonological awareness skills, especially the skills of children most at risk. The purpose of the current study is to compare these two measures of early phonological awareness for at-risk preschoolers and evaluate their ability to provide meaningful data on children's skills and tracking progress over time. By comparing two measures with different administration procedures that both address the same underlying skills, we can determine whether one method is more appropriate for use with children from diverse, low-income backgrounds whose experiences and communication styles may differ from mainstream expectations. If children perform differently across the measures, we can examine the properties of the assessments themselves and attempt to explain differences in performance. The specific aims of the current research include the following:

1. To determine whether the IGDIs or PALS-PreK is a more sensitive measure of phonological awareness development at the preschool level. For this analysis, we examine the percentages of children for whom a score greater than zero was obtained for each subtest.
2. To document the concurrent and predictive relationships between the IGDIs and PALS-PreK subtest scores.
3. To measure the extent to which the IGDIs and PALS-PreK subtest scores relate to other emergent literacy and general development measures.

METHOD

Participants

Participants included 227 children ($M_{age} = 43.4$ months, $SD = 6.3$, age range = 30–58 months), monolingual English speakers, enrolled in Head Start programs or community-based preschools located within an urban midwestern city. The classrooms were participating in an Early Reading

TABLE 1
Participant Characteristics

Year	n	Age[a]	Gender	Race	PPVT-4[b]	Low-income	Special needs
Year 1	92	43.0 (5.9)	49% Male 51% Female	73% African American 9% Hispanic/Latino 14% White 3% Biracial 1% Unknown	93.6 (14.6)	100%	5%
Year 2	40	43.6 (6.7)	55% Male 45% Female	50% African American 15% Hispanic/Latino 25% White 10% Biracial	97.2 (14.2)	85%	5.0%
Year 3	95	43.7 (6.4)	52% Male 48% Female	59% African American 15% Hispanic/Latino 17% White 6% Biracial 1% Asian 2% Unknown	90.2 (14.5)	100%	0%
Total	227	43.4 (6.3)	51% Male 49% Female	63% African American 12% Hispanic/Latino 17% White 6% Biracial 1% Asian 1% Unknown	92.8 (14.7)	97%	3%

Note. PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition.
[a]Chronological age in months: mean (*SD*).
[b]Standard score: mean = 100 (*SD* = 15).

First project that administered several assessments each fall and spring to monitor children's progress. All classrooms implemented Opening the World of Learning, a preschool curriculum with a language and literacy focus. As can be seen in the bottom row of Table 1, the majority of children were from minority backgrounds, and nearly all of the children (97%) were classified as low income. The demographics of the sample are representative of many at-risk populations across the country (Kominski, Jamieson, & Martinez, 2008). Children's performance on the Peabody Picture Vocabulary Test–Fourth Edition (PPVT-4; Dunn & Dunn, 2007) is summarized in Table 1 to document children's vocabulary comprehension.

Data were collected from three cohorts of children over three consecutive years. The composition of participants was similar for all cohorts (see Table 1, Rows 1, 2, and 3). There were no significant differences among the three cohorts for chronological age or PPVT-4 scores: age, $F(2, 223) = 0.34$, $p = .71$, $\eta^2 < .01$; PPVT-4 scores, $F(2, 223) = 2.06$, $p = .13$, $\eta^2 = .02$. There were no substantial differences across cohorts in terms of gender, racial composition, percentage of children from low-income families, or percentage of children identified as having special needs. Because the differences between the three cohorts were modest and we were not making comparisons across the cohorts, all children were combined into a single sample.

Measures and Procedures

The Preschool IGDIs were administered three times during the school year (fall, winter, spring). The fall and spring data are reported here (i.e., data that were concurrent with the PALS-PreK administrations). The Picture Naming subtest was administered first, followed by the Alliteration and Rhyming subtests. Per test guidelines, if children were not able to name all four sample cards at the start of the Picture Naming subtest the entire test was discontinued and zeros were recorded for all three subtests. For Rhyming and Alliteration, children needed to answer two of four trial items correctly before proceeding to the actual testing. Children's scores are based on the number of items answered correctly within the time limits (Picture Naming, 1 min; Rhyming and Alliteration, 2 min each). The PALS-PreK was administered in the fall and spring of the year. The phonological awareness subtests included Beginning Sound Awareness (i.e., recognition of alliteration), Rhyme Awareness, and Nursery Rhyme Awareness. For each phonological awareness subtest, scores are based on the number correct out of 10 possible. Additional subtests included Upper-Case Alphabet Recognition (naming letters; maximum of 26 points) and Print and Word Awareness (pointing to words, showing text directionality, etc.; maximum of 10 points). As described previously, all items on each subtest were administered, and there were no time limits for responding.

Examiners included university students enrolled in a speech-language pathology program and professional consultants with extensive experience in child assessment. Student examiners participated in rigorous trainings conducted by certified speech-language pathologists. First students were given an overview of each assessment and a demonstration of the test administration. They were also provided with reference materials for each test (e.g., quick reference guides summarizing administration and scoring procedures). Students then engaged in guided practice of test administration procedures, followed by independent practice. Prior to testing children, each student was observed conducting a practice administration to verify his or her fidelity to test procedures. Once students began actual testing, they were observed administering each assessment on multiple occasions. For each student, the combination of training, practice, and observation is estimated to be between 5 and 7 hr per assessment, depending on the complexity of the measure and the clinical skill of the student. The professional consultants were also observed by the speech-language pathologists to ensure fidelity to test procedures. All test score

TABLE 2
Mean Values (*SD*) and Percent Non-Zero Scores on the PALS-PreK and IGDIs in the Fall and Spring

Variable	Time	PALS-PreK			IGDIs	
		Beginning Sound Awareness	*Rhyme Awareness*	*Nursery Rhyme Awareness*	*Alliteration*	*Rhyming*
Mean (*SD*)	Fall	1.9 (3.0)	3.3 (2.4)	3.2 (2.3)	3.8 (2.4)	5.3 (3.5)
	Spring	4.5 (3.8)	5.5 (2.7)	4.7 (2.5)	5.7 (3.7)	7.3 (4.5)
Percent non-zero scores	Fall	45%	85%	86%	23%	22%
	Spring	78%	99%	95%	38%	46%

Note. PALS-PreK = Phonological Awareness and Literacy Screening–PreK; IGDIs = Preschool Individual Growth and Development Indicators.

sheets for the entire data set were reviewed by a second trained examiner and/or a certified speech-language pathologist to ensure accurate scoring. Children's average performance on each of the tasks is summarized in Table 2.

RESULTS

Sensitivity to Early Phonological Awareness Development

To examine the sensitivity of each assessment for measuring preschoolers' phonological awareness development we had to first establish a criterion for a score that reflected sensitivity to early skill development. Liberal criteria would include successfully attempting at least one item or accurately completing at least one item on the test. More conservative criteria would require children to answer a defined number of items correctly (e.g., at least three items correct), similar to a basal score. The risk with a liberal criterion is that children who do not have the skill may be overrepresented in the sample. The risk with a conservative criterion would be overly excluding children who have limited skill yet are providing meaningful data. Because we were interested in documenting the performance of children with emerging phonological awareness skills, we chose a liberal criterion for determining measurement sensitivity. Subsequent analyses determined whether the data collected were meaningful. For the current study, measurement sensitivity on each subtest was defined as any score greater than zero (i.e., completing at least one item correctly). For each subtest of the PALS-PreK and IGDIs we calculated the percentage of children who scored greater than zero by dividing the number of children with scores of 1 or higher by the total number of children in the sample ($n = 227$). The results are summarized in Table 2.

For the PALS-PreK, the highest percentages of children were able to complete the Rhyme Awareness and Nursery Rhyme Awareness subtests, followed by Beginning Sound Awareness. There was a notable increase in the spring percentages for each subtest on the PALS-PreK. The rate of non-zero scores for the IGDIs was considerably lower than for the PALS-PreK. In the fall, less than a quarter of the children successfully completed one or more items on either of the IGDIs phonological awareness tasks. Although there was a notable increase in the spring, the percentage of non-zero scores was still limited to well less than half of the sample.

Concurrent and Predictive Relationships Between the IGDIs and PALS-PreK Subtest Scores

Because floor effects were observed for many of the subtests on the IGDIs and PALS-PreK, it was not surprising that most of the variables did not have a normal distribution. Therefore, a series of nonparametric Spearman's rho correlation coefficients were calculated between all of the phonological awareness tasks from the PALS-PreK and IGDIs. Separate analyses were completed for data collected in the fall and spring (see Table 3). Within the PALS-PreK, concurrent relationships of moderate strength were observed between each of the subtests in the fall (rs $= .37–.49$). Similarly, a moderate correlation was observed between the two subtests on the IGDIs in the fall ($r = .51$). It should be noted that the correlation between IGDIs measures was calculated using a small percentage of the total data set ($n = 23$). This subset of children likely had the strongest phonological awareness skills of all of the participants. When we related subtests across measures

TABLE 3
Concurrent Correlation Coefficients Between PALS-PreK and IGDIs Subtests Collected in the Fall (Above
Diagonal) and Spring (Below Diagonal)

		PALS-PreK			IGDIs	
Measure	Subtest	1	2	3	4	5
PALS-PreK	1. Beginning Sound Awareness	—	.37**	.49**	.09 ($n = 58$)	.26 ($n = 52$)
	2. Rhyme Awareness	.43**	—	.42**	.22 ($n = 58$)	.63** ($n = 52$)
	3. Nursery Rhyme Awareness	.48**	.46**	—	.45* ($n = 58$)	.52** ($n = 52$)
IGDIs	4. Alliteration	.53** ($n = 89$)	.48** ($n = 89$)	.46** ($n = 89$)	—	.51* ($n = 23$)
	5. Rhyming	.51** ($n = 108$)	.72** ($n = 108$)	.55** ($n = 108$)	.49** ($n = 56$)	—

Note. $n = 226$ unless otherwise noted. PALS-PreK = Phonological Awareness and Literacy Screening–PreK;
IGDIs = Preschool Individual Growth and Development Indicators.
*$p < .05$. **$p < .01$.

in the fall, moderate to strong correlations were observed between IGDIs Rhyming and the two
PALS-PreK rhyme awareness subtests ($rs = .52–.63$); there was a nonsignificant correlation
between IGDIs Rhyming and PALS-PreK Beginning Sound Awareness. Correlations between
IGDIs Alliteration and each of the PALS-PreK subtests were notably weaker ($rs = .09–.45$);
scores on the PALS-PreK Nursery Rhyme Awareness were the only measure significantly
correlated with IGDIs Alliteration scores.

Upon examining the interrelationships between the PALS-PreK subtests collected in the
spring, we found that the pattern of correlations was similar to what was observed in the fall
(see Table 3). All correlations were significant and moderate in strength ($rs = .43–.48$). The
correlation between the two IGDIs subtests was very similar in both the fall and the spring.
The correlations between the IGDIs Rhyming and PALS-PreK subtests strengthened from fall
to spring. There was a substantial increase in correlation strength between Alliteration on the
IGDIs and each of the PALS-PreK measures.

The predictive relationships between fall and spring were calculated for each of the subtests
using nonparametric Spearman correlations (see Table 4). Weak to strong correlations were
observed within the PALS-PreK subtests ($rs = .25–.72$). The strongest predictive relationship

TABLE 4
Predictive Relationships Between Fall and Spring

	PALS-PreK			IGDIs	
Group	Beginning Sound Awareness	Rhyme Awareness	Nursery Rhyme Awareness	Alliteration	Rhyming
All children	.45**	.25**	.72**	.17 ($n = 33$)	.40* ($n = 38$)

Note. $n = 226$ unless otherwise noted. PALS-PreK = Phonological Awareness and Literacy Screening–PreK;
IGDIs = Preschool Individual Growth and Development Indicators.
*$p < .05$. **$p < .01$.

was observed for the Nursery Rhyme Awareness subtest in the fall and spring ($r = .72$). Within the IGDIs, weak to moderate correlations were observed ($rs = .17–.40$). Again, these correlations were based on a small percentage of the total sample.

Relationships of IGDIs and PALS-PreK Subtest Scores to Other Emergent Literacy and General Development Measures

The final set of analyses documented the relationship between each of the phonological aware-ness subtests and other measures of emergent literacy and general development. The first three columns in Table 5 summarize the intercorrelations for the PALS-PreK data collected in the fall and spring. The PALS-PreK subtests exhibited correlations of moderate strength with the other emergent literacy PALS-PreK measures (i.e., Upper-Case Alphabet Recognition, Print and Word Awareness). In terms of the developmental and language measures, Nursery Rhyme Awareness, Beginning Sound Awareness, and Rhyme Awareness were moderately correlated with the PPVT-4 ($rs = .44–.53$). Upon comparing these intercorrelations from the fall to spring, we observed slight increases in correlation strength for nearly all of the measures. Most of the increases were modest, with the largest increases observed in the correlations between Nursery Rhyme Awareness and the other measures of emergent literacy and general ability.

The correlations between the IGDIs phonological awareness tasks and other measures of gen-eral development are summarized in the last two columns of Table 5. The Alliteration subtest of the IGDIs exhibited weak to moderate correlations with other emergent literacy PALS-PreK measures ($rs = .14–.21$) and also with the PPVT-4 ($r = .30$). Compared to Alliteration, the Rhyming subtest of the IGDIs showed stronger relationships with all measures ($rs = .38–.46$). When we compared the intercorrelations collected in the fall to the measures collected in the spring, there were minimal changes in correlations between the IGDIs Rhyming scores and all other measures. There was a substantial improvement in the spring correlations between IGDIs Alliteration and the PALS-PreK Print and Word Awareness and PPVT-4 scores.

TABLE 5
Fall PALS-PreK and IGDIs Data Correlated With Other Measures of Emergent Literacy and General Development

| Time | Measure | PALS-PreK | | | IGDIs | |
		Beginning Sound Awareness	Rhyme Awareness	Nursery Rhyme Awareness	Alliteration	Rhyming
Fall	PALS-PreK Upper-Case Alphabet Recognition	.47**	.40**	.57**	.21	.38**
	PALS-PreK Print and Word Awareness	.52**	.42**	.55**	.14	.43**
	PPVT-4 fall	.45**	.44**	.53**	.30*	.46**
Spring	PALS-PreK Upper-Case Alphabet Recognition	.58**	.47**	.52**	.51**	.52**
	PALS-PreK Print and Word Awareness	.58**	.47**	.50**	.39**	.59**
	PPVT-4 spring	.53**	.45**	.64**	.50**	.59**

Note. PALS-PreK = Phonological Awareness and Literacy Screening–PreK; IGDIs = Preschool Individual Growth and Development Indicators; PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition.
*$p < .05$. **$p < .01$.

Overall, PALS-PreK Nursery Rhyme Awareness and IGDIs Rhyming appeared to have the advantage over the other tasks in terms of the strength of concurrent and predictive relationships (however, note that substantially fewer children completed the IGDIs Rhyming subtest than the PALS-PreK Nursery Rhyme Awareness task).

DISCUSSION

Sensitivity to Early Phonological Awareness Development

Results indicated that less than one quarter of the children achieved scores of 1 or higher on the IGDIs in the fall, whereas substantially more of the children could successfully complete at least one item on the PALS-PreK. These results were surprising given that the IGDIs were designed for preschoolers and are widely used by early childhood educators. However, previous research has also revealed floor effects on the IGDIs, particularly for children younger than 48 months of age (Estrem & McConnell, 2006; Missall et al., 2006, 2007; Smith, 2009). Although the PALS-PreK was not intended to be used before 4 years of age, the 3-year-old children in this sample were quite successful at producing non-zero scores on the tasks. Higher rates of non-zero scores on the PALS-PreK may have been due to factors related to test administration. For example, administration of the PALS-PreK involved more modeling and explanation by the examiner than that of the IGDIs; therefore, children had the opportunity to learn the tasks as a result of the test procedures. Also, all items on the PALS-PreK were administered with no basals or ceilings, increasing the possibility that children would answer at least one item correctly. These aspects of the PALS-PreK administration, particularly the increased opportunity to learn the test format and expectations, may have been beneficial for the culturally diverse children included in the current sample who initially may have been unfamiliar with the testing procedures.

Task difficulty is another variable that strongly influences children's performance on assessments of emergent literacy (Hall, Culatta, & Black, 2007) and may also explain the higher non-zero rates on the PALS-PreK. Although the formats of the subtests appear to be similar across the IGDIs and PALS-PreK, subtle differences in procedures may have affected task difficulty. For example, during IGDIs Rhyming administration the examiner reads each word on the stimulus card in succession (e.g., *cat, hat, whale, ring*) and then asks the child to point to the picture that rhymes with the target word. As a result, the child must hold the target word in memory and process the comparisons through internal mental representations. The short-term retention of the items combined with analysis as required by the matching component resembles a complex working memory task, which exceeds the capacity of many preschool-age children. During the Rhyme Awareness subtest of the PALS-PreK the examiner says each word pair out loud for the child (e.g., *cat–hat, cat–whale, cat–ring*), thus making comparisons of the words more apparent and reducing the memory load.

The high rates of non-zero scores on the Nursery Rhyme Awareness subtest of the PALS-PreK were unexpected. As described previously, the Nursery Rhyme Awareness subtest requires children to fill in the missing last word, also known as a cloze completion task. The cloze technique requires fewer mental processes than the similarity task described previously, which involves memory of the target word and the ability to compare and contrast. Hall et al. (2007) cautioned that cloze tasks are confounded by children's conceptual and linguistic levels;

however, in the current study, the children may have relied on their conceptual knowledge and the linguistic context of the poems to support their performance. As mentioned earlier, the success of African American children on the rhyming subtests may have been supported by the high cultural value placed on the creative use of oral language for entertainment and social purposes (e.g., Curenton & Justice, 2004; Nichols, 1989; Terrell & Hale, 1992).

In sum, varying degrees of each test's sensitivity to skill development may have been affected by subtest format, administration procedures, task difficulty, and children's familiarity with the task. Several challenges have been identified in developing useful emergent literacy assessments and progress-monitoring tools for early childhood, including highly variable and rapid skill development in children (VanDerHeyden et al., 2007), and designing test formats that are appropriate for young children (Hall et al., 2007). Features of the PALS-PreK, such as increased scaffolding or decreased memory load requirements, made the test more accessible than the IGDIs for this population of students.

Concurrent and Predictive Relationships

Concurrent relationships between the PALS-PreK subtests were stable at both the fall and spring testing. The two subtests of the IGDIs also exhibited a stable relationship at each time point; however, these results are based on small numbers of children because of low participation. In general, the results suggest that within each assessment tool (i.e., PALS-PreK or IGDIs), the subtests measured related but not redundant emergent literacy skills, and these relationships were fairly stable over time. Across measures, the IGDIs Rhyming subtest was significantly correlated with the two PALS-PreK rhyme awareness subtests at both fall and spring. Although the assessments of students' rhyming knowledge were consistent across tests, it is surprising that there was no significant relationship between Beginning Sound Awareness and Alliteration in the fall. These two tasks are essentially the same on both the PALS-PreK and IGDIs, yet there was a very weak relationship. Conversely, there was a significant relationship between Nursery Rhyme Awareness and Alliteration. This unpredicted pattern was likely due to the children's low performance on the Beginning Sound Awareness task in the PALS-PreK resulting in floor effects. In the spring, the two measures were significantly correlated.

When we compared performance on the measures collected in fall and spring, the strongest correlation was observed for Nursery Rhyme Awareness. Substantially weaker correlations were observed for all other measures, demonstrating that performance on Nursery Rhyme Awareness was the most stable throughout the year.

Relationships to Other Literacy and Developmental Measures

We next compared children's performance on the phonological awareness tasks to additional measures of general performance. When we compared two additional PALS-PreK emergent literacy measures (Upper-Case Alphabet Recognition and Print and Word Awareness) to the PALS-PreK phonological awareness tasks, stronger correlations were observed for Beginning Sound Awareness and Nursery Rhyme Awareness compared to the Rhyme Awareness subtest. When we compared the PALS-PreK subtests to the PPVT-4, Nursery Rhyme Awareness had the strongest relationship with PPVT-4 scores.

We expected similar patterns of results for the Rhyme Awareness and Nursery Rhyme Awareness tasks, as they are assessing the same underlying construct: rhyming knowledge. As discussed previously, the advantage for Nursery Rhyme Awareness could be due to the differences in the format of the tasks. The Nursery Rhyme Awareness task may have been more approachable for the students and may have more accurately captured the children's abilities, as demonstrated by the stronger correlations with the additional measures. Alternatively, the stronger correlations could have been due to additional skills required to complete the Nursery Rhyme Awareness task. That is, children may have benefited on the Nursery Rhyme Awareness task from having greater general knowledge and stronger vocabulary skills.

We also expected to see a different pattern of results across the Beginning Sound Awareness subtest and the two rhyming tasks. We expected that the rhyming tasks would have stronger relationships with the other emergent literacy and general development measures because rhyming skills typically emerge before the ability to recognize individual sounds in words. On the contrary, children's recognition of beginning sounds had stronger relationships with the other PALS-PreK tasks compared to performance on the rhyming task. These data demonstrate that not only are at-risk children able to complete the beginning sounds task, the most sophisticated phonological awareness task in these assessment batteries, but they are generating meaningful data when completing the task.

With the IGDIs, a more predictable pattern was observed. Children's performance on Rhyming had much stronger correlations with the external measures compared to performance on Alliteration. Correlations between the IGDIs Alliteration task and the external measures were notably better in the spring compared to the fall, suggesting that children were providing more meaningful data on the task through experiences in school and general maturation.

The results of these analyses should be interpreted with an appreciation for the criterion measures that were used. The strength of this study is the large number of children representing a typical at-risk population who completed a large number of assessments. However, there was not a direct correspondence between the experimental outcome measures and the additional measures of general development. Data demonstrating the validity of the measures would be strengthened by comparing performance on the PALS-PreK and IGDIs to additional measures directly assessing phonological awareness outcomes. The strongest evidence for the validity of the measures came from the intercorrelations among the phonological awareness tasks on the IGDIs and PALS-PreK. The intercorrelations with the additional two emergent literacy measures from the PALS-PreK also provided compelling data supporting the usefulness of the phonological awareness tasks. The most difficult comparisons to analyze were the intercorrelations with scores from the PPVT-4. At the most basic level, the strong correlations with these general measures of performance demonstrate that the phonological awareness subtests were not generating random scores; we feel confident that the significant correlations among the phonological awareness tasks combined with the significant correlations with the measures of general performance document that meaningful data were collected. The biggest risk in overinterpreting the importance of the relationship between the phonological awareness tasks and the PPVT-4 is the possibility that the relationship between the measures was mediated by a broad skill (e.g., general knowledge). Although there may have been some mediation, the relationship was not likely completely mediated, given the face validity of the measures.

Future Directions

The results of the current study suggest that far fewer children were able to participate in the IGDIs than the PALS-PreK. Future research investigating the optimal age ranges for the sensitivity of various phonological awareness measures, and in particular the IGDIs, is warranted. The results also indicate that rhyming appears to have an advantage over alliteration, especially in terms of children's ability to complete at least one item correctly on the corresponding subtests. Rhyming is considered to be an earlier developing phonological awareness skill than alliteration (Anthony & Lonigan, 2004); therefore, it is not surprising that a higher number of children were able to participate in the rhyming subtests. In addition, a strong predictive relationship was observed for fall and spring Nursery Rhyme Awareness scores. Taken together, it may appear that these results suggest evaluating only rhyming during the preschool period. However, as discussed earlier, the relationship between rhyming and later literacy outcomes is inconclusive. Research has shown that phoneme-level skills are better predictors of later reading skills than rhyming, and phoneme awareness instruction is more effective in preschool than in kindergarten, with larger effect sizes on later reading outcomes. (cf. Yeh & Connell, 2008). Recently, researchers have recommended that preschool phonological awareness instruction begin at the phoneme level, excluding pre-phonemic skills (e.g., syllable segmentation, rhyming; Ukrainetz, Nuspl, Wilkerson, & Beddes, 2011; Yeh & Connell, 2008). Although the evidence for measuring phoneme-level skills is compelling, the results of this and previous research indicate that task difficulty needs to be reduced so that younger children can participate in assessments of phoneme-level skills. Future research into alternative task formats involving lower level response requirements and fewer cognitive demands (e.g., fewer choices presented, reduced memory load) is needed. Despite the conflicting findings over the importance of rhyming to reading acquisition, perhaps rhyming is a skill that indirectly measures phonological awareness development, similar to the way CBMs of reading fluency serve as indirect measures of reading comprehension (Deno, 2003). For example, experience with rhyming and incidental exposure to phonological awareness activities during book reading and other activities found in typical preschool curricula may facilitate later reading development (Yeh & Connell, 2008). It has been documented that phoneme-level activities are rarely implemented in Head Start classrooms, whereas attention to rhyming is much more common (Hawken, Johnston, & McDonnell, 2005; Yeh & Connell, 2008). Given the reality of preschool instruction, rhyming may be the most feasible CBM of emergent literacy. In addition, the goal of CBMs is to capture a large developmental window, which affords practitioners the ability to track progress over a greater amount of time given that children demonstrate a wide range of skills. Rhyming assessments may provide more meaningful data across a wide developmental range during the preschool years than phoneme-level tasks.

Although more children could participate in the PALS-PreK, it is too time intensive for frequent administrations to be feasible. Recently the PALS group has developed the PALS Quick Checks assessment, which is substantially shorter than a comprehensive PALS test and was designed for use as a progress-monitoring tool. PALS Quick Checks was developed by breaking the PALS-Kindergarten test into fewer sections. However, such work has not been completed with the PALS-PreK. Another option for assessing early literacy skills is the mCLASS:CIRCLE Early Childhood Assessment (Wireless Generation, 2012), which uses portable software to measure early literacy skills (alphabet knowledge, vocabulary, phonological awareness) and

other aspects of children's development (e.g., social-emotional development, early math). Justice et al. (2009) recommended its use when implementing an RTI approach in early childhood settings. In addition, a revised version of the IGDIs is being developed at the University of Minnesota, although the release date is to be determined (IGDIs, personal communication, February 6, 2012). Further research in the development of emergent literacy CBMs, particularly for culturally and linguistically diverse children, including dual-language and multilingual children, is urgently needed.

SUMMARY AND CONCLUSIONS

It is imperative that useful measures of emergent literacy skills be available for screening, progress-monitoring, and program evaluation purposes. The aim of the current study was to compare the assessment data obtained from two curriculum-based assessments of phonological awareness skills in a sample of low-income, diverse preschoolers. Results indicated that the PALS-PreK was accessible to a greater percentage of the children than the IGDIs, perhaps because of differences in test formats and task difficulty. Correlational analyses found that the PALS-PreK phonological awareness subtests were related to other emergent literacy and general outcome measures and were predictive of later performance (particularly Nursery Rhyme Awareness). Although the PALS-PreK was more advantageous than the IGDIs in terms of providing meaningful data, the length of administration makes it less practical as a progress-monitoring tool. Given that rates of non-zero scores on the IGDIs were higher for older children, the IGDIs may be better suited for developmentally advanced preschoolers. For the children who could complete at least one item on the IGDIs, Rhyming was superior to Alliteration in terms of concurrent and predictive relationships. There remains a critical need for assessments of emergent literacy that are appropriate for use with preschool children, especially at-risk and diverse populations, in terms of test format and task difficulty.

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