Development, Assessment, and Promotion of Preliteracy Skills

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Version of record first published: 08 Jun 2010.

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A large body of research evidence highlights the required conditions for children to become skilled readers. Within the past decade, research also has uncovered the fact that the origins of skilled reading begin to develop even before children start school. The intent of this article is to provide a brief summary of what is known about the development of skilled reading in early elementary grades, to highlight the key findings concerning the developmental precursors to the successful acquisition of skilled reading, and to review recent advances in tools that can be used by early childhood professionals to identify children who may be at risk for reading difficulties before these children experience the negative consequences of reading failure. Use of these tools can provide the means for teachers and other early childhood professionals to provide the focused experiences and activities that will help children succeed in becoming skilled readers.

Learning to read and write is a key developmental milestone in a literate society. Children who learn to read earlier and without experiencing significant problems tend to be more avid readers than children who experience difficulties in learning to read. For instance, Nagy and Anderson (1984) estimated that the number of words read in a year by a middle school child who is an avid reader might approach 10,000,000, compared to 100,000 for the least motivated middle school reader. Children who are avid readers experience more exposure to print, both solidifying and expanding their skills in reading and writing. Such large differences in exposure to print may lead to what Stanovich (1986) termed a *Matthew effect* (i.e., the rich get richer whereas the poor get poorer), such that those children with poor reading skills fall further and further behind their more literate peers in reading as well as in other academic areas (Chall, Jacobs, & Baldwin, 1990).

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Well-developed reading skills serve as the cornerstone to acquiring content knowledge in other domains both in school and throughout life. Significantly, a relatively large degree of children's exposure to and acquisition of vocabulary and other language skills is through reading. In contrast to those children who acquire reading skills early and without much difficulty, children who are poor readers tend to continue to struggle with reading and writing, read less than their peers who are more skilled in reading, and receive less exposure to content knowledge, vocabulary, and other language skills (Cunningham & Stanovich, 1998; Echols, West, Stanovich, & Zehr, 1996; Morrison, Smith, & Dow-Ehrensberger, 1995).

Whereas many children learn to read without significant difficulty, a sizable proportion of children experience at least some difficulty, and a significant number of children experience substantial difficulties. Recent results of the National Association of Educational Progress (NAEP; National Center for Educational Statistics, 2003) indicated that among fourth-grade children in the United States, only 31% performed at or above the proficient level in reading and 37% performed below the basic level in reading. It is tempting to conclude from these statistics on reading proficiency that schools are increasingly doing a poor job of teaching children to read. However, examination of results of the NAEP across years reveals that the percentage of children performing at proficient levels has remained constant. The problem is not that schools are increasingly failing to teach children literacy skills. The problem is that the societal demands for literacy are increasing.

Knowledge about the causes, correlates, and predictors of children's reading success and reading failure in the early elementary grades has expanded greatly in the past three decades. Much of the research that has contributed to this knowledge base has been funded by the National Institute of Child Health and Human Development (NICHD) and has been summarized in two influential documents, the report of the National Research Council, Preventing Reading Difficulties in Young Children (Snow, Burns, & Griffin, 1998), and the report of the National Reading Panel (NRP), Teaching Children to Read (NICHD, 2000). This knowledge has been incorporated into many current reading curricula with the intent that children exposed to this pedagogy have a greater chance of learning to read successfully. In addition, methods of identifying, monitoring, and helping struggling readers in kindergarten through Grade 3 have been developed. Most recently, this knowledge of the development of skilled reading, assessment, and effective instruction has been incorporated into federal education policy as a part of the No Child Left Behind (NCLB) legislation.

The National Research Council's report (Snow et al., 1998) identified three basic problems that represent early impediments to developing into a skilled reader: (a) problems in understanding and using the alphabetic principle to acquire fluent and accurate word reading skills, (b) a failure to acquire verbal knowledge and strategies that are needed for the comprehension of written material, and (c) the absence or loss of the initial motivation to read or a failure to develop a mature appre-

ciation of the rewards of reading. Based on the NRP's findings, Reading First, the component of NCLB that focuses on improving reading outcomes for children, requires that reading instruction include a focus in five domains: phonemic awareness, phonics, fluency, vocabulary, and comprehension strategies. These five areas represent a developmental hierarchy of skills that children need to be able to engage in to accomplish the ultimate purpose of learning to read, to be able to understand, learn from, use, and enjoy written language.

The research evidence on the consequences of falling seriously behind in the development of these skills is sobering. Longitudinal studies indicate that children who remain poor readers by the end of the first grade almost never acquire average-level reading skills by the end of elementary school (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Juel, 1988 Torgesen & Burgess, 1998; Torgesen, Rashotte, & Alexander, 2001). There are two key components to successful reading. One is the ability to accurately and fluently identify individual words in print (i.e., decoding), and the second is good general language comprehension skills (Torgesen, 2002a). Although learning and using specific comprehension strategies can increase reading comprehension to a degree, evidence suggests that the majority of reading skill in children and adults can be explained by these two components (i.e., decoding and language comprehension skills; Hoover & Gough, 1990).

In terms of understanding reading difficulties in alphabetic languages like English, there is a general scientific consensus that there is a core phonological processing deficit (i.e., the ability to detect, manipulate, and use the sound structure of spoken language independent of meaning) in nearly all poor readers, and there are deficits in other reading-related skills (e.g., vocabulary) in some poor readers depending on the degree to which their level of reading is discrepant from their level of general cognitive and academic functioning (Stanovich, 1988; Stanovich & Siegel, 1994). Children with poor phonological processing skills have difficulty cracking the alphabetic code that connects the graphemes in written language to the phonemes in spoken language. Children with phonological processing deficits do not have an effective strategy for decoding unfamiliar words when they are encountered in print. These children tend to rely too heavily on contextual cues to guess the unfamiliar word rather than using knowledge of phonics to decode it. As a consequence of using an ineffective strategy, attempts to decode unfamiliar words result in many word-reading errors. Reading grade-level material is difficult for these children and many of them begin to develop negative attitudes about reading, resulting in reduced opportunities to practice reading (Oka & Paris, 1986).

Fluent decoding appears to depend heavily on a well-developed sight-word repertoire (i.e., words that are processed quickly based on stored spelling patterns, rather than a decoding of the individual sound patterns represented by letters), which is built through repeated accurate readings of a word (Ehri, 1998; Torgesen, Rashotte, & Alexander, 2001). Consequently, children with poor phonological

processing skills have difficulty developing the large body of sight-words required to become a fluent reader both because of inaccurate readings of words and because of reduced exposure to print associated with low motivation.

Results of several large-scale intervention studies over the past decade suggest that highly intensive systematic instruction can reduce the rate of severe reading failure (defined as scoring at or below the 30th percentile on measures of word reading) to about 4% to 6% of the population (Torgesen, 2002b). It is not clear, however, that even with these most effective interventions, children will maintain their gains in reading, that gains in reading accuracy will translate into fluency, or that reading comprehension will be within the average range. Many of these children have already experienced significant reading difficulties, and the consequences of those early failure experiences may resonate in unknown ways throughout school. Even with the advances in understanding, assessing, and providing interventions for reading difficulties in the early school period, it makes sense to ask whether children who are at risk for reading difficulties can be identified before they fail and whether early interventions can eliminate or reduce this risk.

DEVELOPMENT OF EARLY LITERACY SKILLS IN PREREADERS

Whereas knowledge of the development of reading in school-age children has been building over the past three decades, it is only within the past 10 years that substantial efforts have been directed systematically toward understanding the development and contribution of reading-related skills prior to school entry. This growing body of research evidence highlights the significance of the preschool period for the development of critically important early literacy skills (e.g., see Snow et al., 1998; Whitehurst & Lonigan, 1998). This area of study is often referred to as emergent literacy (Sulzby, 1989; Sulzby & Teale, 1991; Teale & Sulzby, 1986; Whitehurst & Lonigan, 1998). Emergent literacy skills represent the developmental precursors to conventional reading and writing skills. Whereas traditional approaches to the study of reading often take as their starting point children's entry to the formal school environment, an emergent literacy approach conceptualizes the acquisition of literacy as a developmental continuum with its origins early in the life of a child, rather than an all-or-none phenomenon that begins when children start school. The emergent literacy approach departs from other perspectives on reading acquisition in suggesting there is no clear boundary between prereading and reading.

Whitehurst and Lonigan (1998) proposed that emergent and conventional literacy consisted of two interdependent sets of skills and processes, outside-in and inside-out. Outside-in skills represent children's understanding of the context in which the target text occurs (e.g., knowledge of the world, semantic knowledge,

and knowledge of the written context in which a particular sentence occurs). Inside-out skills represent children's knowledge of the rules for translating the particular writing they are trying to read into meaningful sounds (e.g., letter knowledge, phonological processing skills, and perhaps vocabulary). Inside-out skills reflect code-related components of reading that are mostly specific to reading, whereas outside-in skills reflect more general abilities, like language and general knowledge that support comprehension. Whitehurst and Lonigan hypothesized that inside-out (code-related) skills would be most important early in the sequence of learning to read when the primary task is the development of accurate and fluent decoding skills, whereas outside-in (language) skills would become more important later in the sequence of learning to read when the task shifted to comprehension. Skilled reading is a complex task that requires the coordination and interaction of many skills. Although these processes may be difficult to separate in a mature, skilled reader, it is unlikely that they are well integrated in the early stages of learning to read.

Empirical Links Between Early Skills and Later Reading

The National Early Literacy Panel (2005) conducted a meta-analysis of studies published in peer-reviewed English-language journals through 2004 that included data concerning the predictive relation between a skill measured in preschool or kindergarten and reading outcomes for children learning to read in an alphabetic language. A subset of the results of this meta-analysis is shown in Table 1. The data reported in the table include the average zero-order correlation for decoding and reading comprehension across all retrieved studies, the number of studies contributing to each average correlation, and the number of children contributing data to the correlation across studies.

Not surprisingly, early measures of actual reading (i.e., decoding nonwords and words) are the best predictors of later reading. In terms of potential component skills involved in developing reading skills, what is apparent from the results summarized in Table 1 is that measures of both alphabet knowledge and phonological awareness (i.e., measures of detection or manipulation of rhyme, syllables, onset-rime, phonemes) have sizable relations with both decoding skills and reading comprehension. Concepts of print, name writing, and invented spelling (using letters to partially represent phonological aspects of words) measures have moderate to strong relations with both decoding skills and reading comprehension. Other predictor variables like Rapid Automatized Naming (RAN) Letters-Digits (rapid naming of letters or digits) and RAN Objects-Colors (rapid naming of objects or colors), both phonological processing skills, also have moderate relations with decoding skills and comprehension, whereas phonological short-term memory (phonological STM in the table) has a relatively weak relation with decoding skills and a moderate relation with reading comprehension. Measures in the global

TABLE 1
Average Correlations Between Predictor Variables Measured in Preschool
or Kindergarten and Reading Outcomes Measured in Kindergarten
or Later Based on Meta-Analysis of National Early Literacy Panel

| | Reading Outcome | | | | | |
| | Decoding | | | Comprehension | | |
Predictor Variable	Average r	N Studies	N Children	Average r	N Studies	N Children
Decoding nonwords	.72	8	763	.41	3	282
Invented spelling	.53	9	625	—[a]		
Decoding words	.52	21	4,006	.40	6	1,091
Alphabet knowledge	.50	52	7,455	.48	17	2,038
Writing name	.49	10	1,650	.33	4	565
Verbal IQ	.43	3	1,735	.42	3	347
RAN graphological	.40	12	2,081	.43	3	333
Phonological awareness	.39	69	7,874	.40	20	1,946
Concepts about print	.34	12	2,604	.54	3	535
Oral language	.29	51	7,152	.26	22	2,607
RAN nongraphological	.29	15	2,527	.36	5	573
Phonological STM	.27	31	4,660	.39	13	1,911

Note.   RAN = Rapid Automatized Naming (lexical access), STM = Short-Term Memory.
[a]Fewer than three studies were retrieved from a search of literature.

category of oral language have relatively weak relations with both decoding and
reading comprehension.

Additional analyses revealed that with only a few exceptions, whether these
skills were measured in preschool or in kindergarten did not influence the size of
the correlations. To the extent that it was possible to examine different aspects of
oral language and their relations with decoding skills and reading comprehension
in these studies, the results suggested that more complex aspects of oral language,
such as listening comprehension, understanding syntax, and definitional vocabu-
lary had stronger associations with decoding and comprehension than did expres-
sive or receptive vocabulary. Although the average correlations among oral lan-
guage and decoding skills and reading comprehension were only moderate, the
strength of the correlation was similar for decoding skills and reading com-
prehension, a finding not consistent with the distinction between the relative tem-
poral contribution of inside-out and outside-in skills proposed by Whitehurst and
Lonigan (1998).

Multivariate studies in which the longitudinal predictive influences of multiple
emergent literacy skills are examined simultaneously provide some clarification of
the findings from these zero-order correlations. Lonigan, Burgess, and Anthony
(2000) studied the relations between phonological awareness, letter knowledge,
and oral language to decoding skills in a group of preschool children followed lon-

gitudinally for 1 year and found that only phonological awareness and letter knowledge contributed unique variance to the prediction of decoding skills, accounting for 54% of the variance in decoding. Although oral language was correlated with the code-related skills and decoding, it was not related to decoding once phonological awareness and letter knowledge were in the model. Sénéchal and LeFevre (2002) also failed to show an independent relation between oral language and reading in the first and second grades. In one of the most comprehensive studies to date, Storch and Whitehurst (2002) followed 626 children from preschool through fourth grade. They measured code-related skills (i.e., print knowledge, print concepts, phonological awareness), and oral language in preschool and kindergarten, and they measured decoding skills and reading comprehension in the first through fourth grades. The results of this study revealed a strong connection between code-related skills and oral language during preschool, that reading skill during the early elementary period was determined primarily by children's code-related skills, and that reading comprehension in later elementary school was significantly influenced by children's oral language skills.

Taken together these findings indicate that, similar to evidence concerning the development of reading skills in school-age children, phonological processing skills, particularly phonological awareness, as well as print knowledge (alphabet knowledge, concepts of print) are important determinants of early reading acquisition for children when measured in preschool and kindergarten. Multivariate studies (Lonigan et al., 2000; Sénéchal & LeFevre, 2002; Shatil & Share; 2003; Storch & Whitehurst, 2002) indicate that early in development, code-related skills and oral language skills are interrelated. However, these studies also reveal that the code-related skills are relatively more important for the acquisition of decoding than are oral language skills, whereas both code-related skills and oral language are important for developing good reading comprehension (i.e., each contributes unique predictive variance to reading comprehension).

Another significant finding from the longitudinal studies concerns the striking continuity between the levels of reading-related skills displayed by preschool children and the levels of reading-related skills displayed by these children when they are in kindergarten (e.g., Lonigan et al., 2000; Storch & Whitehurst, 2002). This degree of consistency across time in reading-related skills is similar to what is found with grade-school children (Wagner, Torgesen, & Rashotte, 1994). This high degree of longitudinal continuity indicates that the developmental and environmental antecedents of the skills that underlie the acquisition of reading are found early and prior to the onset of formal schooling.

Key Emergent Literacy Skills

The collective findings across this growing body of empirical evidence indicate that oral language, phonological processing skills, and print knowledge are strong-

ly predictive of how well and how easily children will learn to read and write once they are exposed to formal reading instruction from kindergarten through the third grade.

Oral language refers to the corpus of words in a child's vocabulary as well as his or her ability to use those words to understand and convey meaning (i.e., syntactic and narrative skills). Phonological processing skills refer to children's developing sensitivity to the sound structure of his or her language (e.g., that words are made up of smaller sounds like syllables or phonemes) and the ability to use that information in cognitive processes like memory. Print knowledge refers to a developing understanding about the nature and purpose of books and print (e.g., letters, the sounds letters represent, directionality of print).

A significant number of children leave the preschool years with substantial oral language skills, a lot of knowledge about print and the alphabet, and well-developed phonological processing skills. These children are poised to "crack" the alphabetic code and become skilled readers when provided with effective reading instruction. In contrast, many children arrive at kindergarten with low levels of these emergent literacy skills, making it less likely that they will benefit from the instruction they will receive in the early elementary grades (e.g., see Lonigan, 2003). For these children, early reading instruction must first build the key emergent literacy skills that will allow them to break the code needed to become a fluent and skilled reader. A central problem in effective reading instruction arises, not from the absolute level of children's preparation for learning to read, but from the diversity in their levels of preparation (or a mismatch between children's current skills and the level of skills assumed by the reading instruction they receive).

EARLY IDENTIFICATION OF CHILDREN WHO ARE AT RISK FOR READING DIFFICULTIES

Data from a variety of sources indicate that the prevention of reading difficulties is likely more efficacious and cost effective than the remediation of reading difficulties (Berninger et al., 2002; Coyne, Kame'enui, Simmons, & Harn, 2004; Torgesen, 2000). As noted previously, children who have difficulty acquiring the alphabetic principle and who continue to experience problems with decoding lose the opportunity to develop the fluency required to become a skilled reader, tend to experience decreased motivation to read, and miss out on opportunities to acquire vocabulary and other content knowledge. Early identification of areas in which children may need targeted intervention is essential if the cycle of failure is to be broken. Accurate assessment of the emergent literacy skills involved in the causal chain of learning to read and write is important because early identification can lead to focused early intervention efforts to help children develop the skills needed

to benefit maximally from the instruction they will receive in the early elementary grades.

Key questions asked by early childhood educators involve how best to provide for the educational needs of their children. The use of assessments that provide information on children's developmental achievements in key areas of emergent literacy can provide teachers with the information they need to provide optimal learning experiences for children. Of course, assessment is not an end in and of itself. It is one part of an identification, intervention, and evaluation sequence. Whereas accurate assessment can be a powerful tool for acquiring information, its value can only be realized in the context of a well-developed intervention program that translates the information obtained into curriculum modifications and specific instructional tactics and goals. That is, these assessments can more clearly focus educational activities on building key emergent literacy skills, enabling the targeting of skill areas in which a child needs the most help, and provide a means for determining whether program goals have been achieved.

As knowledge concerning the development of emergent literacy skills has increased, there has been a corresponding increase in the availability of psychometrically sound and developmentally appropriate methods to measure these skills. There are at least three main forms of assessment that can be used to identify children with specific education needs or to develop education goals. These forms of assessment include informal assessment, diagnostic assessment, and screening. The latter two forms of assessment typically involve the use of standardized measures.

Informal Assessment

Traditional methods of determining the skills of preschool children often involve observation of the child in either general or specific contexts. These informal assessments of children's skills can be informative and may be useful for teachers as they teach new skills or they may provide valuable information to be used in scaffolding interactions with a child (e.g., using a child's immediate responses to instructional interactions to increase or decrease the difficulty level of the interaction is making use of informal assessment). Informal assessments typically are neither standardized nor highly structured in nature. They most often provide no comparison or equivalent scores and may be difficult to use in determining whether a child has made or is making adequate progress in key skill areas. Such assessments can include teacher-created checklists, other checklists, observation of children with anecdotal notes, or portfolios of children's work products. Because of their informality, these assessments are relatively easy to create and use. In terms of identifying weaknesses in key skill domains, informal assessments may not be optimal. Because informal assessments typically do not utilize a standardized procedure, the conditions of elicitation of children's skills are not uniform across children.

Therefore, whether a child exhibits a particular skill may be due to the child's skill, the eliciting context, or both. Moreover, the meaning of skills observed is typically unknown with respect to reliability or validity of the observation.

Standardized Assessments

A standardized measure is one in which a common set of stimulus materials and questions, a consistent set of administration procedures, and conventional scoring procedures, are used, and the scores are often based on a norming sample. Standardized measures have a number of significant strengths. Standardized measures allow meaningful comparisons among children (or between assessments of a single child over time) because (a) they have clear and consistent administration and scoring criteria (i.e., the measure is always given and scored in the same manner), (b) they have generally good reliability and validity, and (c) raw scores are converted into scores that reflect a child's performance relative to the performance of a normative group. Because the assessment is the same for each child administered the measure, resultant scores have consistent meaning across children, examiners, and assessment sites. Standardized measures are usually normed within relatively large and representative samples. In such normative samples, the distribution of scores approximates the normal curve with 66% of those taking the test scoring between −1 and +1 standard deviations from the mean.

Diagnostic Assessment

In general, diagnostic measures are those standardized measures that provide highly detailed information about an individual skill area. Multiple items within the measure are intended to probe and explore different levels of competence or achievement of the skill. Some diagnostic assessments include multiple subtests, each intended to provide an index of strengths or weaknesses in a particular skill domain. Diagnostic measures tend to have very proscribed administration procedures, multiple items tapping a single construct, and basal and ceiling rules that allow optimal usage of assessment time in the region of a child's developmental level.

The key advantages of using standardized diagnostic assessments include in-depth examination of specific skill areas or facets of a skill area, generally high reliability (consistency of measurement), established validity of the measure (scores on the measure are related to measures of theoretically relevant constructs and unrelated to theoretically irrelevant constructs), and they allow comparisons of children's skills to a normative context. Hence, standardized diagnostic measures can allow a meaningful, accurate, and in-depth determination of the emergent liter-

acy skill areas in which a child has strengths or weaknesses relative to a developmental norm.

There are now a number of diagnostic measures that provide reliable and valid information about children's skills in each of the three core domains of emergent literacy (oral language, phonological processing, print knowledge). Table 2 provides a brief summary of some of the measures in each of these domains and information concerning administration, psychometrics, and ages for which the test is appropriate. As noted in the table, availability of preschool measures with strong psychometric characteristics is most evident for oral language, particularly for vocabulary; however, there are currently available, or soon to be available, measures of phonological processing skills, like the Woodcock–Johnson, 3rd Edition (Woodcock, McGrew, & Mather, 2001) or the Preschool Comprehensive Test of Phonological Processing (Lonigan, Wagner, Torgesen, & Rashotte, in press a), and measures of print knowledge, like the Test of Early Reading Achievement, 3rd Edition (Reid, Hresko, & Hammill, 2001) or the Test of Preschool Early Literacy (Lonigan, Wagner, Torgesen, & Rashotte, in press b). A more detailed summary and psychometric characteristics, content domains, and administration procedures of a larger number of available measures can be found in Lonigan, McDowell, and Phillips (2004).

The key disadvantages of using standardized diagnostic assessments are their costs—both in terms of the financial investment of purchasing the measure and in terms of the time required to administer the measure to individual children—and the level of training or expertise required to administer the measure and interpret the results. Hence, there should be a plan for the use of the specific information derived from the assessments to justify the cost of this more complete and refined assessment procedure. For instance, there should be a plan to use an appropriate validated intervention with a child who demonstrates an area of weakness in development of emergent literacy skills (e.g., providing specific vocabulary instruction to a child with a measured weakness in vocabulary skills).

Screening Assessments

It is unlikely that every child in an early childhood program needs to be administered an extensive battery of standardized diagnostic assessments. One mechanism for selecting children who may be in need of more extensive assessment is the use of a screening measure. Screening measures are generally brief, easy to administer assessments that provide a global picture of skill development in an area (e.g., literacy-related skills). Screening measures are not intended to provide the type of in-depth information about the various facets of a skill like that obtained with a diagnostic assessment. Screening measures are often used to identify children who may require a more in-depth assessment of skills or to provide a quick "snapshot"

TABLE 2
Summary Information for Examples of Standardized Measures
in Three Early Literacy Domains

Domain and Measure	Skill Area Assessed	Age or Grade Range for Use	Time (Minutes)	Reliability	Validity
Oral language					
Peabody Picture Vocabulary Test–III[1]	Receptive vocabulary	21/2 to 90 years	10–20	.90–.95	.63–.92
Expressive One-Word Picture Vocabulary Tests–III[2]	Expressive vocabulary	2 to 18 years	10–15	.88–.95	.64–.71
Test of Preschool Early Literacy[3]	Expressive and definitional vocabulary	3 to 5 years	10–20	.98	.71–.77
Preschool Language Scales–IV[4]	Auditory comprehension, expressive communication	2 weeks to 7 years	15–40	.82–.94	.66–.88
Clinical Evaluation of Language Fundamentals–Preschool[5]	Expressive vocabulary and syntax, receptive vocabulary and syntax	3 to 7 years	30–45	.49–.97	.31–.93
Oral and Written Language Scales[6]	Listening comprehension, oral expression	3 to 21 years	40–60	.80–.91	.46–.91
Phonological processing					
Preschool-Comprehensive Test of Phonological Processing[7]	Phonological awareness, phonological memory, phonological access	3 to 5 years	20–30	.74–.88	.43–.62 .29–.42 .57–.60
Woodcock–Johnson III Tests of Cognitive Abilities and Achievement[8]	Phonological awareness, phonological memory, phonological access	2 to 90 years	2–10 per subtest	.57–.98	.46–.49
Phonological Awareness and Literacy Screenings–PreK[9]	Phonological awareness	4 to 5 years	10–30	.77–.94	.62–.74
Developing Skills Checklist[10]	Phonological awareness, phonological memory, letter knowledge	Pre-K to K	20–30	.81–.92	.41–.57
Print knowledge					
Test of Early Reading Achievement–3[11]	Alphabet knowledge, print conventions, print meaning	3 to 9 years	15–45	.82–.99	.34–.98
Test of Preschool Early Literacy[3]	Alphabet knowledge, print conventions	3 to 5 years	5–10	.92–.97	.46–.88
Developing Skills Checklist[10]	Print conventions, writing	Pre-K to K	20–30	—	—
Phonological Awareness and Literacy Screenings–PreK[9]	Alphabet knowledge, print conventions, writing	4 to 5 years	10–20	.75	.67

Note. Reliability can be internal consistency or test–retest. Validity can be concurrent or predictive.
Pre-K = prekindergarten; K = kindergarten.
[1]Dunn and Dunn (1997), [2]Gardner (2000), [3]Lonigan, Wagner, Torgesen, and Rashotte (in press b), [4]Zimmerman, Steiner, and Pond (2002), [5]Wiig, Secord, and Semel (1992), [6]Carrow-Woolfolk (1995), [7]Lonigan, Wagner, Torgesen, and Rashotte (in press a), [8]Woodcock, McGrew, and Mather (2001), [9]Invernizzi, Meier, Juel, and Swank (1997), [10]CTB/McGraw-Hill (1990), [11]Reid, Hresko, and Hammill (2001).

of how children are developing in a skill area. Screening measures are often standardized, and they are typically validated by the degree of "false positives" (children identified as delayed in a skill who have no actual delay) and "false negatives" (children identified as developing a skill at average or above levels who have a true delay in the area) they produce. At present, there are no validated screening measures for preschool children's emergent literacy skills. That is, there is no measure that has been established as a valid screen of the need for more in-depth assessment by comparison of the false positives and false negatives when compared to an in-depth diagnostic assessment.

There are a few brief measures that may be used to provide the type of "snapshot" assessment typical of a screening measure. One such measure is the Get Ready to Read! Screening Tool (GRTR!; National Center for Learning Disabilities, 2001), a 20-item measure for 4-year-olds that is available in both English- and Spanish-language versions. Items on the GRTR! require children to point to one of four pictures in response to a question (e.g., "Find the picture that has letters in it"), and it includes content assessing print knowledge (understanding of books, printed letters and words, letter sounds) and phonological awareness (rhyming, segmenting words). Another brief assessment is the Get It! Got It! Go! Individual Growth and Development Indicators (IGDIs; McConnell, 2002). Within the early literacy domain, IGDIs consist of three brief timed tests that assess vocabulary and phonological awareness. Vocabulary is assessed with a picture naming task that requires children to name as many pictures as they can in 1 min. Two tasks assess phonological awareness, rhyme and alliteration, and require children to identify as many odd words from a set (i.e., cat, mat, sun for rhyme; cup, car, dog for alliteration) as they can in 1 min.

The English-language GRTR! has adequate internal consistency reliability ($\alpha = .78$), and it has good concurrent validity as measured by its correlations with a diagnostic measure of early literacy, the Developing Skills Checklist (CTB/McGraw-Hill, 1990; $r = .69$), the Peabody Picture Vocabulary Test ($r = .58$), a measure of letter knowledge ($r = .66$), and a measure of phonological awareness ($r = .58$). Likewise, the Spanish-language GRTR! has adequate internal consistency reliability ($\alpha = .76$), and it has good concurrent validity as measured by its correlations with diagnostic measures of early Spanish literacy skills, the Test of Preschool Spanish Early Literacy (Lonigan, Farver, Eppe, et al., 2005) in both the domains of print knowledge ($r = .68$) and phonological awareness (rs = .37 to .48), and with a measure of Spanish oral language skill ($r = .31$).

Two additional studies provide information concerning the validity and utility of the GRTR!. Molfese, Molfese, Modglin, Walker, and Neamon (2004) reported that scores on the GRTR! were moderately and significantly correlated with measures of general cognitive ability, expressive and receptive vocabulary, rhyming, and blending for 3- and 4-year-olds. Phillips, Lonigan, and Wyatt (2005) examined longitudinal predictive relations between scores on the GRTR! and scores on mea-

sures of vocabulary, phonological awareness, print knowledge, and decoding. The mean intervals between administration of the GRTR! and the follow-up testing was 20, 28, or 35 months, depending on the subsample of children examined. Significant predictive relations were obtained at each of the follow-up intervals. Of particular interest were the predictive relations at the longest follow-up interval. Using age-standardized scores (a conservative test of cross-time correlations), scores on the GRTR! administered when children were between 3 and 5 years of age were significantly and strongly correlated with scores on the Word Identification ($r = .51$) and Word Attack ($r = .46$) subtests of the Woodcock Reading Mastery Test–Revised, and with the Gray Oral Reading Test ($r = .56$). administered when children were 7 years of age or older.

Evidence concerning the psychometric characteristics of IGDIs is not as well developed as psychometric data for the GRTR!. McConnell and colleagues (e.g., McConnell, Priest, Davis, & McEvoy, 2002; Missall & McConnell, 2004) reported the results of several smaller studies (i.e., ns = 39–90) examining the reliability and validity of IGDIs. Overall, these data indicate that the picture naming IGDI has relatively good reliability (i.e., 1-month test–retest reliability = .44–.78) and concurrent validity (e.g., correlations of .47–.69 with Peabody Picture Vocabulary Test–III [Dunn & Dunn, 1997] and Preschool Language Scales–IV [Zimmerman, Steiner, & Pond, 2002]). Reliability for the rhyme and alliteration IGDIs are somewhat lower. Concurrent validity correlations with the other measures of phonological awareness are in the .60 to .72 range; however, rhyme and alliteration scores correlate almost as much with measures of letter knowledge and vocabulary.

The data from these studies provide evidence that even relatively brief, easy to administer assessments in preschool can reliably identify key reading-related skills. That scores on an assessment like the GRTR! administered in preschool relate strongly to scores on reading measures administered when most children were in second grade provides substantial evidence of the importance and ability to identify which preschool children may be at risk of having problems learning to read. Both measures were designed so that they could be administered and interpreted by individuals with minimal training in assessment. Hence, both measures are well-suited to be used by preschool teachers and others to provide a global estimate of children's emergent literacy skills.

Although there is currently no established cutpoint on the GRTR! or IGDIs to identify children most likely to benefit from a more extensive diagnostic assessment (i.e., children who are likely to show clear and consistent deficits on more detailed assessment instruments), children identified as exhibiting below average skills on these measures could be administered a battery of standardized diagnostic assessments to determine the exact nature of their strengths and weaknesses in emergent literacy skill development. Children with below average skill development could then be exposed to focused educational activities designed to promote development of these key skills.

VALIDATED EARLY INTERVENTION FOR CHILDREN WHO ARE AT RISK FOR READING DIFFICULTIES

Ultimately, the promise of early identification through reliable and valid assessments requires evidence that children identified as needing assistance to promote the development of emergent literacy skills have less difficulty learning to read than they would have if no assessment had been conducted. To date, there are no studies that demonstrate this clinical utility of assessment. In part, such promise requires the development and evaluation of effective preschool intervention models and intervention activities to promote emergent literacy skills. Emerging research supports the effectiveness of some interventions for increasing emergent literacy skills (see Lonigan, 2003). Within the three key domains of emergent literacy outlined earlier (i.e., oral language, phonological processing, print knowledge), there have been studies of the efficacy of interventions and intervention components to promote the development of these emergent literacy skills.

Enhancing Children's Oral Language Skills

A number of interventions have been developed to enhance children's oral language skills through shared reading. The most widely researched and validated of these interventions is called dialogic reading (Whitehurst & Lonigan, 1998). Dialogic reading involves several changes in the way adults typically read books to children. Central to these changes is a shift in roles. During typical shared-reading the adult reads and the child listens, but in dialogic reading the child learns to become the storyteller. The adult assumes the role of an active listener, asking questions, adding information, and prompting the child to increase the sophistication of descriptions of the material in the picture book. A child's responses to the book are encouraged through praise and repetition, and more sophisticated responses are encouraged by expansions of the child's utterances and by more challenging questions from the adult reading partner. The focus of the intervention changes dependent on the developmental level of the children.

Younger children and children with poorly developed vocabularies are asked to describe objects, actions, and events on the page, whereas older children or children with more well-developed language skills are asked to focus on the narrative as a whole or on relations between the book and the children's lives. Videotapes to train parents and teachers of preschoolers to engage in dialogic reading are available (Pearson Early Learning, 2003; Washington Research Institute, 1998).

Dialogic reading has been shown to produce larger effects on the oral language skills of children from middle to upper income families than a similar amount of typical picture book reading (Arnold, Lonigan, Whitehurst, & Epstein, 1994; Whitehurst et al., 1988). Studies conducted with children from low income families attending child care demonstrate that child care teachers, parents, or commu-

nity volunteers using a 6-week, small-group, center-based or home dialogic reading intervention can produce substantial positive changes in the development of children's language as measured by standardized and naturalistic measures (Lonigan, Anthony, Bloomfield, Dyer, & Samwel, 1999; Lonigan & Whitehurst, 1998; Valdez-Menchaca & Whitehurst, 1992; Whitehurst, Arnold, et al., 1994) that are maintained 6 months following the intervention (Whitehurst, Arnold, et al., 1994). A large-scale longitudinal study of the use of dialogic reading over a year of a Head Start program for 4-year-olds showed large effects on emergent literacy skills at the end of Head Start that were maintained through the end of kindergarten. Notably, however, these positive effects on vocabulary did not generalize to reading scores at the end of second grade (Whitehurst, Epstein, et al., 1994, Whitehurst et al., 1999), highlighting the modularity of emergent literacy skills (i.e., promoting oral language does not result in improved phonological awareness or print knowledge).

Enhancing Children's Phonological Awareness Skills

Experimental studies of programs designed to teach children phonological awareness show positive effects on children's reading and spelling skills (e.g., Ball & Blachman, 1988; Bradley & Bryant, 1985; Lundberg, Frost, & Petersen, 1988; Torgesen, Morgan, & Davis, 1992; Uhry & Shepherd, 1993). Phonological awareness training programs that have included letter knowledge training tend to produce larger gains than phonological awareness training alone (e.g., Ball & Blachman, 1988; Bradley & Bryant, 1985). The majority of these programs teach children how to categorize objects on the basis of certain sounds (e.g., initial phonemes). Other programs explicitly teach children phonemic analysis and synthesis skills. For example, Torgesen et al. (1992) found that a small-group training program that taught children both analysis (e.g., identify initial, final, or middle sounds in words) and synthesis skills (e.g., say words after hearing their phonemes in isolation) resulted in larger gains in both phonological awareness and a reading analogue task than training in synthesis skills alone. Both training groups performed better on these tasks than a group of control children who had listened to stories, engaged in discussions about the stories, and answered comprehension questions for an equivalent period.

The majority of phonological awareness intervention studies have been conducted with children at the beginning stages of learning to read (i.e., kindergarten or first grade); however, a small number of studies conducted with preschool children have been published. Byrne and Fielding-Barnsley (1991a) found that preschool children (mean age = 55 months) exposed to 12 weeks of their "Sound Foundations" program (Byrne & Fielding-Barnsely, 1991b) demonstrated greater increases in phonological awareness than a group of control children exposed to storybook reading and a semantic categorization program. What is most notable

about this research program is that some of the gains were maintained through the first and second grades (Byrne & Fielding-Barnsley, 1993, 1995). This intervention program consisted of teaching children six phonemes in the initial and final positions of words by drawing attention to the sound in words, discussing how the sound is made by the mouth, reciting rhymes with the phoneme in the appropriate position, and encouraging children to find objects in a poster that had the sound in the initial (or final) position. Worksheets in which children identified and colored items with the phoneme in the correct position were used, and the letter for the phoneme was displayed. A final stage of training introduced children to two card games that required matching objects on the basis of initial or final phonemes.

Despite the success of this phonological awareness intervention program, many early childhood educators would find some of the activities used outside the range of developmentally appropriate practice for preschool children. Moreover, when the program was evaluated as a teacher-implemented rather than a researcher-implemented program, the gains observed were significantly smaller. Computer technology might be a promising method for dealing with these limitations and effectively teaching phonological awareness skills in preschool. Well-designed software allows children to learn through active exploration and interaction. Computerized instruction is able to provide immediate feedback regarding correct responses, reinforcement where appropriate, and modeling when needed. Using computerized instruction, instructional tasks can be divided into small steps, and children can control the instructional pace.

There have been a small number of studies that examined the efficacy of computer-assisted instruction for promoting phonological awareness in preschool and kindergarten children (e.g., Barker & Torgesen, 1995; Foster, Erickson, Foster, Brinkman, & Torgesen, 1994). Lonigan et al. (2003) found that 4-year-old children who attended Head Start who were exposed to 10 weeks of computer-assisted instruction phonological awareness training for 10 to 15 min per day made significantly more gains in phonological awareness than children who were exposed to the Head Start curriculum only. Despite these positive gains, our experience suggested that preschool children who are at risk for later reading problems need significant assistance navigating the software. Consequently, whereas instructional activities can be ordered in an optimal sequence, the demand for teacher time is high, making such interventions impractical in many early childhood settings.

Several more recently developed phonological awareness training programs include activities that are better keyed to the developmental level of preschool children and make use of recent advancements in understanding the developmental continuum of phonological awareness (e.g., Anthony & Lonigan, 2004; Anthony, Lonigan, Driscoll, Phillips, & Burgess, 2003). For example, Lonigan and Torgesen (1999) designed a comprehensive preschool pull-out program that included small-group phonological awareness training. Preschool children (mean age = 54 months) participating in the small-group phonological awareness activities en-

gaged in tasks designed to teach them how to blend and segment increasingly smaller units of words. For example, early in training, children were taught to blend or elide the components of compound words (e.g., "water" … "melon" = "watermelon," "hotdog" = "hot" … "dog"). Then, children were taught to blend and elide syllables (e.g., "mon" … "key" = "monkey," "el" … "e" … "phant" = "elephant") and ultimately onsets and rimes (e.g., /b/ … "at" = "bat," "cat" = /k/ … "at"). The abstract elements of parts of words were made more concrete by using puzzles of pictures of the words to correspond with putting sounds together or taking sounds apart. Children participated in these activities for 4 months for approximately 10 min per day. When compared to children who participated in small-group print activities or only the regular preschool classroom activities, children exposed to the small-group phonological awareness intervention experienced significantly more growth in their phonological awareness skills (see Lonigan, 2003).

Comprehensive Teacher-Directed Interventions

Recently, there have been evaluations of preschool curricula that incorporate activities designed to promote multiple aspects of emergent literacy. Given the evidence that emergent literacy skills are relatively modular, that interventions in one domain (e.g., oral language) may enhance skills in that domain without improving children's reading outcomes (e.g., Whitehurst et al., 1999), and that many children at risk of reading difficulties show weaknesses in multiple emergent literacy domains, it may be advantageous to use preschool curricula that target all emergent literacy skills. As noted earlier, Lonigan and Torgesen (1999) designed a comprehensive program to impact oral language, phonological awareness, and print knowledge skills. This program formed the basis for an emergent literacy curriculum, Literacy Express (Lonigan, Menchetti, Phillips, McDowell, & Farver, 2005), that we have recently evaluated in a randomized trial in Head Start centers (Lonigan, Farver, Menchetti, Phillips, & Eppe, 2005).

In this study, Head Start centers in Los Angeles, California, and Tallahassee, Florida were randomly assigned to either a business as usual control condition or the Literacy Express curriculum condition. The 485 children (mean age = 50 months) attending these centers were pretested at the beginning of the Head Start year and posttested at the end of the Head Start year on standardized measures of oral language, phonological processing skills, and print knowledge. The teachers and aides of the Head Start centers implemented the curriculum. Figure 1 shows the results from the first wave of this evaluation study (Lonigan, Farver, Menchetti, et al., 2005). These data suggest that children in Literacy Express classrooms made greater gains in phonological awareness (blending and elision) and print knowledge than children in the control classrooms. There was also a trend for greater growth in oral language skills.
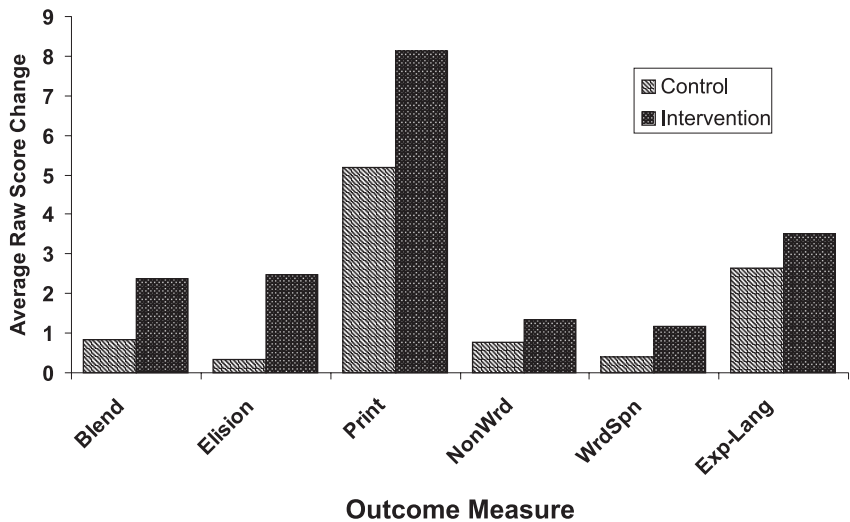
FIGURE 1   Average raw score change in phonological processing, print knowledge, and oral language domains for Literacy Express ("Intervention") and Control groups for children attending Head Start centers in Los Angeles, California, and Tallahassee, Florida.

Overall, these results imply that a teacher-implemented emergent literacy curriculum can produce substantial impacts on children's emergent literacy skills that are above those obtained by a traditional early childhood program alone. In the context of the findings of the recently released report of the first year of the Head Start Impact Study (U.S. Department of Health and Human Services, 2005), which found that Head Start effects were limited to the print knowledge domain in the area of emergent literacy skills, the initial results of this study indicate that Head Start teachers can be provided with and effectively use validated educational tools to promote children's skills in multiple areas of emergent literacy (i.e., focused curricula can provide added value).

SUMMARY AND CONCLUSIONS

Research evidence concerning school-age children has converged on a view of the acquisition of complex reading skills that requires skills in five key areas: phonemic awareness, phonics, fluency, vocabulary, and comprehension strategies. Most children with reading difficulties have weak phonological processing skills, which result in a failure to crack the alphabetic code and a failure to develop accurate and fluent word decoding skills. More recent research has identified the developmental precursors to these early reading skills. Emergent literacy skills that include pho-

nological awareness, print knowledge, and oral language provide the foundation for early reading success. There is strong developmental continuity between these emergent literacy skills during the preschool period and later reading skills. The linkage between emergent literacy skills and later reading skills indicates that children who are at risk of developing reading problems can be identified before school entry and prior to the emergence of actual problems in learning to read.

An increasing selection of reliable and valid assessment measures are available to assess children's strengths and weaknesses in emergent literacy skills. Some of these measures are diagnostic assessments that provide a rich report of children's skills in specific domains. However, these measures are often costly in terms of purchasing the measure, time to complete the assessment, and the required qualifications of the individual conducting the assessment. There are also some briefer screening-like measures that provide more global information about children's development of key emergent literacy skills. These screening measures are less expensive and easier to use than diagnostic assessments. Such screening measures can be used to identify children who may benefit from a more comprehensive examination of skills, using a diagnostic measure, or to identify children who, relative to their same-age peers, are not developing emergent literacy skills at a typical rate and need exposure to more systematic instruction in emergent literacy and expanded opportunities to develop these skills. Information obtained from these valid assessment can allow early childhood educators to provide children with the activities and experiences that may prevent later reading difficulties and that help children to be successful in school and later life.

Ultimately, the promise of early identification through valid assessments requires evidence that children identified as needing assistance to promote the development of emergent literacy skills have less difficulty learning to read than they would have had no assessment been conducted. Such promise requires the development and evaluation of effective preschool intervention models and activities to promote emergent literacy skills. Research supports the effectiveness of some interventions for increasing emergent literacy skills, and existing studies indicate that systematic instruction in phonological processing and print knowledge translates into better reading skills. Emerging research evidence supports the positive impact of emergent literacy curricula that can be implemented by typical preschool teachers. These curricula, coupled with assessment that allows the identification and monitoring of children who are at risk of reading difficulty, hold promise for eliminating or reducing the risk that these children will experience serious reading problems and the consequent negative sequelae associated with them.

ACKNOWLEDGMENTS

ment (HD38880, HD36067, HD36509, HD30988); the Administration for Children, Youth, and Families (90YF0023); the National Science Foundation (REC-0128970); the Institute of Education Sciences (R305J030093, R305B04074); and the National Institute for Literacy. Views expressed herein are mine solely and have not been cleared by the grantors.

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