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Margie B. Gillis and Louisa Moats, Theme Editors

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on Language and Literacy

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The Role of Phonology and Language in Learning to Read

International DYSLEXIA Association®

Summer Edition 2020

PERSPECTIVES

ON LANGUAGE AND LITERACY

A Quarterly Publication of the International Dyslexia Association *Volume 46, No. 3*

MISSION

The International Dyslexia Association (IDA) is committed to creating a future for all individuals who struggle with dyslexia and other related reading differences so that they may have richer, more robust lives and access to the tools and resources they need.

The Role of Phonology and Language in Learning to Read

ON THE COVER: "Untitled" by Spencer Haas.

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IDA members include people with dyslexia and their families, educators, diagnosticians, physicians, and other professionals in the field. IDA's home office, 43 branches in the United States and Canada, and 12 Global Partners provide educator training, publications, information, and support to help struggling readers around the world. IDA's Annual Conference attracts thousands of outstanding researchers, clinicians, parents, teachers, psychologists, educational therapists, and people with dyslexia.

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Recognizing and Removing Roadblocks for Beginning Readers

For most people, becoming a competent reader requires considerable effort. The beginning reader must come to understand the relationship between his or her spoken language and the new system of representing it in print. Beginning readers are asked to map a visual symbolic system onto their spoken language. The less complicated the map the easier it is to learn to read. The English Writing System has a fairly challenging map. Children who become efficient readers are able to use their knowledge of the relationship between sound and print to develop a growing reservoir of words that they can read effortlessly.

"Untitled" by Spencer Haas

Evidence indicates that strengthening phonemic skills beyond awareness is necessary. Being able to rapidly engage in phonemic skills in real time during reading is more challenging than the awareness of phonemes. Reading requires phonemic proficiency. For children who are poor readers or who have dyslexia, phonemic awareness is challenging, making proficiency even more so. Some students who speak nonmainstream forms of English also face challenges when mapping their spoken language onto the English Writing System, even at the phonological level. These children are learning to map their dialect language on a writing system that does not represent what they hear and speak very clearly in everyday life.

Sensitivity to the challenges these students face will help them to become competent readers. For all students, teaching reading and spelling in tandem rather than separately can help build reading skills. A complete knowledge of the English Writing System occurs when it is used not only to decode but also to encode or write. Teaching spelling and reading together strengthens the connection between sound and print.

Fortunately, many of the issues that poor readers face when learning to read can be identified very early in a child's academic career, even as early as preschool. Those include potential language comprehension issues in addition to the precursors to difficulties with decoding and word recognition. Identification leads to the possibility of early intervention strategies to help develop these skills prior to learning to read. For both mainstream and nonmainstream English speakers who are at risk of reading failure, early identification can help set the stage for competent reading. These issues are not trivial as access to appropriate education is a hallmark of our educational system and begins the process of entrance into social systems that lead to financial stability.

David P. Hurford

David P. Hurford, Ph.D.
Co-Editor-in-Chief

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The Role of Phonology and Language in Learning to Read

by Margie B. Gillis and Louisa Moats

We, the editors of this issue of *Perspectives*, were each fortunate to have been mentored by eminent language and reading researchers early in our careers. Many of the researchers and scholars who shaped our thinking were associated with the Haskins Laboratories at Yale University, where seminal work in understanding reading was taking place. Isabelle Liberman, her husband Alvin Liberman, their colleague Donald Shankweiler, and many of their associates and graduate students, formulated the phonological core-deficit hypothesis now considered to be central to explaining both typical reading development and reading difficulties.

But how did they arrive at their novel and profound insights about the relationship of speech to reading? Up until the 1970s (and even today), many psychologists and educators believed that reading was primarily dependent on visual perceptual abilities, visual short-term memory, and/or general cognitive characteristics such as mental processing speed. Proposing that printed word recognition depended primarily on specific linguistic processes, especially at the phonological level of language, was a revolutionary idea. Explaining why phoneme awareness was elusive, that phonemes were obscured by the characteristics of speech, and that humans were not "wired" for the level of linguistic awareness demanded by reading, were pivotal discoveries. These discoveries, however, evolved gradually, through a series of painstaking experiments that began with the goal of developing a reading machine for the blind.

A short history of the Haskins work follows here, as it places the articles in this issue in historial perspective.

The Evolution of Speech Research at Haskins Laboratories

Work on a reading machine for the blind. Haskins Laboratories was founded in 1935 by Dr. Caryl Haskins, a biophysicist and a pioneer in radiation biology who was joined by Dr. Frank Cooper, an electrical engineer. The lab's history of being a multidisciplinary community of researchers "was created for basic research and research training in certain pioneer areas which involve several scientific disciplines" (Shankweiler & Fowler, 2015, p. 80). In 1944, to prepare for the consequences of World War ll, the Office of Scientific Research and Development suggested that Haskins join the Committee on Sensory Devices to help conduct research on the development of a reading machine for the blind. Dr. Alvin Liberman, a psychologist, joined the Haskins team in 1944 and collaborated with Cooper to design a reading machine that would convert optical patterns in print (orthographic symbols) to acoustic signals.

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This reading machine would potentially improve the Optophone, a device invented in 1912 that scanned text and generated a series of tones which could be used by a blind person to identify letters. The hope was to develop a more efficient machine that could increase the speed of the existing device.

A failed experiment. Researchers from Haskins were unsuccessful at creating accurate sound alphabets, because at the time, Cooper and Liberman believed that speech comprised "discrete alphabet-like acoustic segments for phonemes" (Shankweiler & Fowler, 2015, p. 82). In the course of their experimentations, they discovered "that the letter sounds merged auditorily; they did not maintain their discrete identities" (Shankweiler & Fowler, 2015, p. 83). As Shankweiler and Fowler's article describes in detail, the researchers' failed experiments "revealed large regions of ignorance of human perceptual capabilities and had broad repercussions for cognitive science" (Shankweiler & Fowler, 2015, p. 79). Though the term coarticulation wasn't used at the time, Cooper and Liberman were discovering the fact that speech is very different than other codes. In their own words, "the acoustic signals for words provide many fewer 'distinct elements' than do words in Morse code" (Shankweiler & Fowler, 2015, p. 83). Cooper's and Liberman's final report for the Committee on Sensory Devices included their principal conclusion that "a successful reading machine must present its information in word-like units, not letter-by-letter" (Shankweiler & Fowler, 2015, p. 84).

New ideas to explore. Although these early Haskins researchers didn't determine that the output of a reading machine had to be speech, they did consider the idea that speech has "a special *kind* of complex acoustic structure" (Shankweiler & Fowler, 2015, p. 84) and began to explore a new tool that made speech visible—the sound spectrograph. This instrument provided a visual record of the auditory signal that shows the frequency composition and acoustic structure of speech. These new explorations led to the development of a complementary device that reconverted the visible pattern of a spectrograph into a sequence of speech sounds. Invented by Cooper, the Pattern Playback machine tested "their hypotheses about how the acoustic signal specifies the phonetic segments of syllables, words, and sentences" (Galantucci et al, 2006, p. 3). According to Shankweiler's historic account, "this line of research proved pivotal, serving indeed to shift the direction of Haskins research toward the investigation of speech as a special kind of acoustic signal reflecting in critical ways how it is produced" (Shankweiler & Fowler, 2015, pp. 87-88).

Studying speech for its own sake and the motor theory of speech perception. Shankweiler and Fowler describe another important discovery in the history of speech research—"that the speech signal is nothing like an acoustic alphabet, but rather is an 'encoded' signal as a result of coarticulatory overlap of gestures…and appears to put speech perception in a category of its own" (Shankweiler & Fowler, 2015, p. 89). Hence, these findings related to speech's acoustic signals and how sounds are coarticulated supported the need to study speech—both perception and production—for its own sake. As the research on speech evolved, the connections between perception and production were studied, which led Liberman and his colleagues to develop a motor theory of speech perception. This theory "claimed that listeners use highly context-dependent acoustic speech cues to recover speech motor invariants that they proposed mapped more directly to phonetic segments than did the acoustic cues" (Shankweiler & Fowler, 2015, p. 94). In subsequent years, the motor theory was developed further by several Haskins' researchers, including Ignatius Mattingly, a linguist, who suggested that speech *perception* depends on the brain's ability to *produce* speech.

Connecting speech and reading research. Dr. Donald Shankweiler, a neuroscientist, joined the Haskins team, continuing the research on speech and the hemispheric lateralization and the biological specialization for language. This line of research led Shankweiler to partner with Dr. Isabelle Liberman, a cognitive psychologist, to answer questions about reading development and reading disability. Their first research together, exploring the types of errors children made when they read aloud, led them to discover that these errors were linguistic rather than visual—that is, words were misread when they had overlapping phonetic features. Further exploration on their part prompted Isabelle Liberman's seminal paper published in the *Bulletin of the Orton Society* in 1971. In it she states that "the sounds of speech are (instead) a very complex code. In this complex code, information about successive phonemic segments is transmitted simultaneously, not successively in strings as it is in the written language" (Liberman, 1971, p. 59). She concludes the paper making the following points: 1) "We cannot have language without speech but we can and do have language without a written form that can be read… 2) we need something more in the way of a conscious, cognitive analysis of the phoneme structure of language if we are to read" (Liberman, 1971, p. 64).

These ideas developed into the concept of phonemic awareness as a metalinguistic skill that underlies the ability to decode words—a finding that Dr. Reid Lyon, director of the reading research program at the National Institute of Child Health and Human Development, considered one of the most important scientific discoveries of the 20th century. As Isabelle Liberman and Shankweiler continued their research on the role that phonemic awareness plays in learning to read, they proposed the phonological core deficit hypothesis to explain why some children have difficulty learning to read. They explained that learning to read requires the individual to map the written word to the spoken word and as such, is a linguistic process. This finding provided the motivation for decades of research that led to more recent research on neurocognitive processing.

Shankweiler and Fowler conclude their historical account saying, "Today, 70 years after the faltering beginnings of the reading machine project, Haskins Laboratories is best known for its pioneering research on speech and reading, but it also deserves to be known for the pioneering work on the reading machine that stimulated these developments" (Shankweiler & Fowler, 2015, p. 95).

Progress in Understanding Speech and Reading: The Articles in This Issue

Each of the articles to follow builds on the Haskins researchers' foundational insights into the nature of reading. That reading is "parasitic on speech," as Al Liberman often remarked, is the unifying theme of this issue.

In the first article, David A. Kilpatrick argues that phonemic proficiency, not simply phoneme awareness, underlies the development of fast, accurate, recognition of words in print. He emphasizes that advanced phonemic manipulation skills, performed without undue mental effort, are what enable automatic word recognition. Phoneme proficiency also underlies our ability to decipher and remember new printed words, and, together with letter-sound proficiency, allows the self-teaching required for independent word learning. He suggests that assessments have more explanatory and predictive value if phonemic proficiency is directly measured, and that explicit instruction in advanced phonemic skills should continue until students are fluent readers.

Jeannine Herron and Margie B. Gillis review evidence that the encoding process—translating speech into print—is an often overlooked but essential strand in foundational literacy instruction. The authors contrast a speech-to-print instructional approach with more traditional and common print-to-speech instruction. They summarize evidence, including a study of their own, that a spelling component in decoding programs increases the lessons' effectiveness, and argue that speech-to-print instruction strengthens neural connections between phonological, orthographic, and semantic processing systems more effectively than instruction that focuses first and primarily on print decoding. A helpful table is used to contrast the sometimes subtle differences in approaches.

Brandy Gatlin-Nash, Lakeisha Johnson, and Ryan Lee-James describe and discuss the challenges of language and reading faced by nonmainstream dialect speakers of English. Referring to a growing research base that illuminates the associations between dialect use, oral language development, and poverty, the authors summarize major theoretical frameworks for understanding the influence of dialect on learning to read, especially with regard to phonological differences in this population. Citing concrete examples of how dialect may interfere with academic language learning, the authors offer helpful guidance on how to support and instruct dialect speakers in the classroom. The article includes citations of several innovative curricula developed for language-minority children, and emphasizes the importance of teachers understanding language processes and language differences so that they can address these differences constructively.

Finally, Rouzana Komesidou and Tiffany P. Hogan describe the ways in which early manifestations of potential reading difficulties can be observed in preschoolers. The authors point out that precursors of both aspects of the Simple View of Reading—word recognition and language comprehension—can be measured and observed before students encounter formal reading instruction, and can be deliberately nurtured in therapeutic and educational settings designed for early intervention. Warning signs of delayed or problematic language in preschoolers are described and illustrated, as well as the longitudinal, predictable consequences that early phonological, semantic, or syntactic language delays have on later word recognition or reading comprehension problems.

In retrospect, Haskins Laboratories' profound discoveries about the connections between speech, language, reading, and literacy have shaped everything about the way we currently describe, identify, classify, and treat reading development and disorders. The articles in this issue of *Perspectives,* while proposing refinements in current assessment and instruction practices, reflect and honor that enduring legacy.

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How the Phonology of Speech Is Foundational for Instant Word Recognition

by David A. Kilpatrick

For those of us blessed with proficient reading abilities, word-level reading is smooth and effortless and only presents difficulties in unusual circumstances. We often take these fluid skills for granted. Yet how is it that we can move so effortlessly through text, barely giving much conscious thought to the individual words, yet taking in the flow of meaning as we go along?

The most obvious answer is that we have *word-reading fluency*. Fair enough, but how does one become fluent? It may seem a bit surprising that there is good reason to believe that phoneme-level processing skills are at the root of word-level reading fluency. Before dismissing such a nonintuitive notion (i.e., "How does an *auditory* skill influence *visual* word recognition?"), consider the fact that individuals with dyslexia, and individuals who are deaf, lack word reading fluency. Both of these groups of individuals struggle with the phonemic properties of spoken language (for information about *phonemes*, see "What Are Phonemes"). To understand the connection between phonemic processing skills and word-level reading fluency, let's consider a little known but research-supported perspective on fluency.

What Are Phonemes?

Phonemes are the smallest detectable sound units in spoken language. They allow us to distinguish one syllable (or word) from another. For example, we can distinguish the spoken words *sat* from *sad* because they differ by a single phoneme, even though two of their phonemes (/s/ & /a/) are the same. *Box* and *see* are easy to tell apart because they share no phonemes. In alphabetic writing systems, letters are designed to represent individual phonemes. English, due to its long, rich history and many words borrowed from other languages, has the most deviations from this letter-phoneme idea behind alphabetic writing. For example, many two-letter groups represent a single phoneme (*ch*, *sh*, *th*, *ee*, *oa*), or even more than two letters (*igh*, *ough*). As a result, the spoken words *ax*, *cat*, *thin*, *sheep*, and *thought* all have three phonemes, but their written forms have between two and seven letters (notice that *ax* has three phonemes because the letter *x* at the end of syllables represents two phonemes, /k/ /s/). With this said, phonemes in spoken language are routinely represented in writing by a single letter.

The Nature of Word-Reading Fluency

The National Reading Panel (NICHD, 2000) devoted an entire section of its research review to fluency. They defined fluency as reading with speed, accuracy, and proper expression (prosody), and they indicated that fluency was important because it freed up cognitive resources to focus on comprehension. However, they did not discuss the nature of the skills that underlie word-reading fluency or how someone becomes fluent. They also did not say too much about why some children are dysfluent.

Not long after the National Reading Panel review came out, series of papers were published by Joseph Torgesen and colleagues (Torgesen; 2004, Torgesen & Hudson, 2006; Torgesen, Rashotte, Alexander, 2001; Torgesen, Rashotte, Alexander, Alexander, & MacPhee, 2003), that provide important insights into the nature and "causes" of reading fluency. They described word-reading fluency as primarily—but not exclusively—a byproduct of the size of the databank of familiar words that readers have stored in long-term memory. This databank of familiar written words is referred to as a *sight word vocabulary* or an *orthographic lexicon*. Words in the orthographic lexicon are instantly and effortlessly recognized as familiar because they have been previously encountered and are now well established in memory. "It is the necessity of slowing down to phonemically decode or guess at words that is the most critical factor in limiting the reading fluency of children with severe reading difficulties," said Torgesen and colleagues. "The most important key to fluent reading of any text is the ability to automatically recognize almost all of the words in the text" (Torgesen et al., 2003, p. 293). Thus, a reader with a large sight vocabulary moves quickly and accurately through text while a reader with a limited sight vocabulary does not.

You may be asking, "what about rapid automatized naming (RAN) and reading experience, aren't they associated with reading fluency?" You would be correct (Torgesen & Hudson, 2006). However, RAN and reading experience are also associated with the size of the orthographic lexicon. So, we cannot separate these out and speak of them in a simple, additive manner. Educators cannot directly influence RAN, nor can they ultimately control the amount of reading experience a student has. But, there are ways to build word-reading skills and reading fluency. Before discussing that, let's explore the validity of the notion of fluency proposed by Torgesen and colleagues.

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Abbreviation

RAN: Rapid automatized naming

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Research That Provides Insight into Word-Reading Fluency

Research support exists for the idea that reading fluency is largely the result of the size of the sight vocabulary. First, studies show that the speed with which students can read words from a list (i.e., without context) correlates very strongly with the speed of their paragraph reading fluency (Jenkins et al., 2003; Kim et al., 2012; Torgesen, Rashotte, & Alexander, 2001). Timed word list reading appears to function as "a direct measure of both the size of a child's sight word vocabulary and the speed with which individual words can be recognized" (Torgesen & Hudson, 2006). This statement is based on the assumption that children with a large orthographic lexicon can read many words from a list under timed conditions while children with a limited orthographic lexicon will read fewer words during that same time limit. The fact that timed list reading correlates so strongly with paragraph reading fluency supports the view that reading fluency is a byproduct of the size of the sight vocabulary.

Educators cannot directly influence RAN, nor can they ultimately control the amount of reading experience a student has. But, there are ways to build word-reading skills and reading fluency.

Second, Torgesen and Hudson (2006) note that among older students in intervention studies conducted by Torgesen and colleagues, such students may be fluent on a second-grade level passage, but dysfluent on a fifth-grade level passage. Consider the implication of this. If fluency were its own reading-related subskill—independent of the size of the sight vocabulary—those older students should also be dysfluent reading the second-grade passage (e.g., if fluency had to do with the speed of the activation of known words). Those older students would be more familiar with all or most of the high-frequency words in a second-grade passage than they would with the many lower-frequency words in the fifth-grade passage. Thus, the size of their existing databank of familiar words appears to best explain the fluency disparity between their reading of second- vs. fifth-grade passages.

Researcher Linnea Ehri, who has spent her career studying sight-word memory, independently came to a similar conclusion as Torgesen and colleagues:

> If readers know words by sight and can recognize them automatically as they read text, then word reading operates unconsciously. In contrast, each of the other ways of reading words requires conscious attention. If readers attempt to [phonically] decode words, to analogize, or to predict words, their attention is shifted from the text to the word itself to identify it . . . It is clear that being able to read words automatically from memory is the most efficient, unobtrusive way to read words in text. Hence, building a sight vocabulary is essential for achieving text-reading skill. (Ehri, 2005, p. 170)

If the size of the orthographic lexicon is central to reading fluency, how can it be efficiently built? Why are those with dyslexia so poor at remembering words, and thus lack fluency? Findings related to this question have emerged in the niche area of the reading research that examines orthographic learning. Orthographic learning research is designed to understand how we remember the words we read. Two of the most strongly supported theories of orthographic learning are David Share's *self-teaching hypothesis* (Share, 1995, 2011) and Ehri's *orthographic mapping theory* (Ehri, 2005, 2014; Miles & Ehri, 2019). Both of these theories place a heavy emphasis on the phonological properties of spoken language.

The Self-Teaching Hypothesis

How many of the tens of thousands of words in our databank of familiar words did our teachers or parents teach us? Very few. Perhaps only several hundred. This means that we taught ourselves the rest of them. The self-teaching hypothesis (Share, 1995, 2011) explains how we add new words to our orthographic lexicons after encountering them in print and successfully sounding them out. As a result of this process of *phonological recoding* (a term used by some researchers as an equivalent term for *phonic decoding*), connections between a word's pronunciation and its letter sequence are made. However, if the word is not sounded out, its likelihood of being remembered in the future decreases dramatically (Share, 1999). This indicates that the ability to sound out an unfamiliar word forms the foundation of remembering words. The self-teaching process is supported by many direct studies.

An Issue That Science Must Explain

The self-teaching model prompts a very interesting question. Ask yourself: of the tens of thousands of words that are familiar to you, what percentage of them did you—upon first encounter—put any conscious effort into remembering for the next time? If you are like most skilled readers, you would say very few, perhaps 1–2%, if even that. This means that words are remembered implicitly, and that requires a scientific explanation. How is it that we can remember tens of thousands of words that we have encountered over the years, and we have no conscious awareness of doing anything to remember them? Compare that to when you had to remember your math facts, or state capitals, or terms for a biology test. That's because orthographic learning seems to happen unconsciously, automatically, and in the background. When we encounter a new word in a text, we figure it out it and move on. We do not run to get flashcards. Our goal is comprehending what we read, and the simple determination of the word via sounding it out is enough to serve that purpose. Yet in the background, our orthographic memory is "logging" some kind of connection between that spoken word and that printed word so that on future encounters, it is a familiar word and easily recognized.

Ehri's theory of orthographic mapping takes us a big step in the direction of understanding this amazing process.

If students can distinguish between the different phonemes within a spoken pronunciation in long-term phonological memory, they have the necessary anchoring points to attach the word's spelling to that pronunciation.

Orthographic Mapping

Orthographic mapping is the cognitive process we use to store words for later, instant, and effortless retrieval. It is basically how we add each "entry" into our orthographic lexicon/sight vocabulary. "Letter sound knowledge and phonemic awareness are central to the orthographic mapping process" (Miles & Ehri, 2019, p. 63). It involves connecting something we already know (the word's pronunciation) to something we are trying to learn (the printed form of the word). This connection forming process occurs at the level of phonemes, given the alphabetic nature of our writing system. If students can distinguish between the different phonemes within a spoken pronunciation in long-term phonological memory, they have the necessary anchoring points to attach the word's spelling to that pronunciation. Studies show that from second grade on, typically developing readers require only 1–4 exposures to a new word before it is firmly (and permanently) established in long-term orthographic memory (e.g., Share, 2004), such that the word becomes effortlessly recognized thereafter. However, for students who don't have access to the phonemic structure of the oral pronunciation (i.e., weak phoneme awareness), they do not have adequate anchoring points in their long-term memory to efficiently "store" the letter orders that represent spoken words. A word's letter order represents that word's orthography. *Orthography* comes from two Greek words meaning "correct" and "written characters" (Liddell et al., 1968). Orthographic memory for a written word means that the word's letter order is familiar and thus instantly recalled.

Most people find this orthographic mapping concept quite abstract when they first hear about it. Don't feel bad if you do not "get it" the first time through. I certainly didn't! But when people have the "aha moment" about orthographic mapping, many things they see about reading instruction and intervention with children fall into place.

At this point, it is important to distinguish orthographic mapping from phonic decoding. Phonic decoding is a process used with unfamiliar written words that goes from graphemes to phonemes, then from phonemes to the activation of a word's pronunciation. Orthographic mapping cannot occur unless the person already knows what the word is that he or she is looking at and needs to map. Once the word is known, the phonemes in the spoken word are connected to the letters/graphemes in the written word. The string of letters (i.e., the written word) is thus anchored to the word's pronunciation. From then on, that letter sequence is now familiar and as a unit, and it activates the word's pronunciation. Phonic decoding is no longer needed for that particular word because the printed word is now highly familiar and thus instantly recognized.

Recall that with the self-teaching hypothesis, while we are reading for meaning we encounter new words, determine them through phonic decoding (with context as a backup to address ambiguity and irregularities) and move on. We do not typically participate in conscious word study when we encounter new words. That means that we have barely a "split second" to make the kind of connections that Ehri is talking about. This parallels our own experience that we don't even recall making such connections. How does that happen so quickly and unconsciously?

The Phonemic Proficiency Hypothesis

To do what Ehri says we are doing in the time-limited scenario that Share says we are doing it, the required letter-sound skills and phonemic skills *must* be automatic. Consider the following logic: If the process of storing words for later retrieval is automatic, unconscious, and goes on "behind the scenes," that means that any skills required to bring about that process must also be automatic, unconscious, and occur "behind the scenes." This logic seems inescapable. That means that letter-sound *knowledge* and phonemic *awareness* are not enough—perhaps they are enough for phonic decoding—but not for efficiently remembering words during real world reading. Instead, the skills required for efficient orthographic learning are letter-sound *proficiency* and phonemic *proficiency*. Proficiency here refers to automatic, unconscious access to the sounds associated with specific graphemes (letter-sound proficiency) and automatic, unconscious access to the phonemic structure of the spoken language (phonemic proficiency). Thus, the phonemic proficiency hypothesis naturally emerges as a necessary way to characterize what happens in efficient orthographic learning.

To illustrate letter-sound proficiency, consider the fact that by late first grade, typically developing readers can respond instantly to CVC pseudowords like *bim* or *vup*. To do that, they have to retrieve the sounds of all three letters and blend them together. This suggests automatic access to those sounds. Students who accurately but more slowly look at such words and say "/v/ - /u/ - /p/, *vup*!" are already a few months behind (Harn et al., 2008). They demonstrate blending and letter-sound *knowledge*, yet despite these skills, they are progressing more slowly than they should be. They lack proficiency.

Similarly, from about third grade on, typical readers can respond to complex phonemic manipulation tasks instantly. For example, they can change the /l/ in *flute* to an /r/ to result in *fruit,* all in one second. To accomplish this, they need to do four classic phonemic awareness tasks in that one-second time frame: 1) phonemic segmentation, 2) phonemic isolation (i.e., determine *where* in the word the change needs to be made), 3) phonemic manipulation (i.e., substitute the /r/ for the /l/), and finally 4) phonemic blending. This strongly suggests that the first of these—parsing the word into its individual phonemes—was instant and automatic, and did not require any conscious

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effort. This illustrates phonemic proficiency—instant access to the phonemic structure of the spoken word without conscious effort. By contrast, phoneme awareness implies conscious access to phonemes (the word *awareness* implies *consciousness*).

Having both letter-sound proficiency and phonemic proficiency provides a workable explanation for how we can make the kind of orthographic mapping connections under such time-limited conditions. It helps explain how we automatically stored the tens of thousands of words we know without even thinking about it. The automatic process of remembering words is presumably driven by automatic access to letter sounds combined with the automatic access to the phonemic structure of spoken words. With these skills in place, a word's pronunciation can be implicitly mapped onto its letter order automatically, unconsciously, and "behind the scenes" while we focus on comprehending what we read.

For those with difficulty accessing the phonemic structure of the spoken language, learning a phoneme-based writing system is very difficult. Indeed, that is the case for those with dyslexia, who experience the phonological-core deficit, as well as those who are deaf.

Independent Support for the Phonemic Proficiency Hypothesis

Given what Share's and Ehri's theories tell us about how we remember words, there is compelling logic that phonemic skills and letter-sound skills *must* be automatic. But there is empirical support independent of the logical deduction described above. First, there have been a few direct tests of whether timed phoneme manipulation tasks (i.e., an assessment of phonemic proficiency) are better associated with reading than untimed tasks (i.e., conventional phonemic *awareness*). Although few in number, these studies involved large samples of students (ranging from 162 to 1,423 participants) across a wide range of ages and ability levels (first grade to college students, skilled readers and dyslexics). This association was dramatically displayed via the *Phonemic Proficiency* subtest from the new WIAT-4, with hundreds of students at each age level from age 4 to adulthood (Pearson, 2020). These studies' results, along with the nationally stratified sample from the WIAT-4 norms, suggest that timed manipulation tasks tell us something about word learning beyond pseudoword reading tasks, RAN, and most importantly, untimed phonemic tasks (e.g., Vaessen & Blomert, 2010). While the relationship between reading and conventional phonemic awareness tasks declines over time, these studies and the WIAT-4 norms indicate that timed manipulation tasks maintain a substantial relationship with reading over time.

A second source of support comes from the word reading intervention literature. Studies that involved phonemic manipulation tasks, which allow for an assessment and training of phonemic proficiency, consistently demonstrate substantially higher standard score point gains in intervention studies (Kilpatrick, 2015; Kilpatrick & O'Brien, 2019). Third, support comes from the research literature on dyslexia. Studies show that those with dyslexia do not develop letter-sound proficiency (Yap & van der Leij, 1993) nor phonemic proficiency (Caravolas et al., 2005; de Jong & van der Leij, 2003; Snowling et al., 1997). Finally, indirect support comes from numerous studies that indicate that there is an automatic, unconscious activation of phonology during skilled, silent reading (e.g., Halderman et al., 2012).

Putting Phonemic Skills in Perspective

The notion that phonemic skills lie at the center of proficient word reading should come as no surprise given the alphabetic nature of the English writing system. In traditional Chinese writing, which is not alphabetic, written characters represent words. However, in alphabetic languages, we do not write characters that represent words. Aside from the three words *a, I,* and the archaic *O* (replaced by *oh*), there are no words in English where a single character represents a whole word. Characters represent phonemes (or at most, morphemes) in the spoken language. So, for those with difficulty accessing the phonemic structure of the spoken language, learning a phoneme-based writing system is very difficult. Indeed, that is the case for those with dyslexia, who experience the phonological-core deficit, as well as those who are deaf. Learning to read proficiently is an ongoing challenge for those who are deaf (Lederberg et al., 2013). Because the nature of alphabetic writing is to capture the phonemic sequences in the speech stream, it should be no surprise that phonemic skills are so central to word-level reading.

Perhaps why this may initially surprise us is that our intuition strongly suggests that because written words are visual, we must be using some kind of visual memory process to read. However, for several reasons, researchers know this intuition is not accurate. I have covered this more extensively elsewhere (Kilpatrick, 2015; Kilpatrick & O'Brien, 2019), but briefly summarize here.

First, there is a moderate to strong correlation between phonemic skills and reading, but a low correlation between visual memory and word reading. Second, related to the first, is that those with dyslexia, as a group, do not have poor visual memories. Third, we can easily recognize a written word we know, even if it looks very different from our original exposure to that word. For example, *BAG* and *bag* look nothing alike (or even bag; note the different visual presentations of the letter g/g, neither of which looks like G). It is the *sequence of letters* that is familiar, not the visual look of the word. Fourth, as mentioned, those who are deaf struggle learning to read. Their visual memory is as good as hearing individuals. If reading were based upon visual memory, we would not expect them to struggle.

Fifth, we have lapses in visual-phonological memory when we forget people's names or the names of objects we are looking at ("Hand me that uh . . . that thingy over there"). But we never have such failures with familiar written words. Finally, neuroimaging studies show different activation patterns in the brain between visual memory tasks and word recognition tasks.

Visual memory is not how we remember words for later retrieval. We remember words via orthographic memory. That is, we recognize letter sequences in written words as familiar, regardless of the visual presentation of the word—whether uppercase, lowercase, or in differing fonts or people's handwriting, as long as the word is legible.

Conclusion

Contrary to our intuitions, phonemic skills are foundational for fluent, word-level reading in alphabetic writing systems. They not only assist in sounding out new words, but they are central to remembering words. The more efficiently we remember words, coupled with wide reading experience, the more quickly we build our pool of known words. And the larger that pool of known words, the more easily we move through text quickly and accurately. We thus see there is a relationship, a couple of steps removed, between phonemic skills and reading fluency. But it must be understood that not all studies show this because they typically assess phonemic *awareness*—that is, conscious access to phonemes—in untimed phonemic tasks. However, efficient orthographic mapping happens under an extremely limited time frame while reading, so the phonemic skills needed to connect pronunciations with spellings of words must be lightning fast. Struggling readers taught via phonics may not develop this level of phonemic proficiency, so while their pseudoword reading skills develop (indicating the phonics instruction did its job), their real-word reading skills may show more limited gains. We can conclude that letter-sound proficiency and phonemic proficiency are both needed for skilled word-level reading. These two skills we find in typically developing readers, but not in struggling readers. We must thus "upgrade" our recommendations from letter-sound knowledge and phonemic awareness to letter-sound proficiency and phonemic proficiency.

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Encoding as a Route to Phoneme Awareness and Phonics: A Shift in Literacy Instruction

by Jeannine Herron and Margie B. Gillis

The early organization of literacy in the brain, where neural maps and highways are first laid down, connects vital components needed for reading and writing. These new circuits, established synapse by synapse over a relatively short time, will provide the navigation (efficiently or not) for reading and writing for a lifetime. In this article, we build evidence to encourage a comprehensive approach that includes an equal emphasis on decoding and encoding. Decoding requires turning written symbols into speech; encoding is the process of turning speech into print.

Encoding is not simply a first step to writing; it is a vital but underappreciated route to reading. It requires a deeper and more consistent practice of identifying the individual speech sounds in words and linking those sounds to letters. It engages children from the beginning with meaningful words, not isolated skills. The segmentation and construction of spoken words build essential neural networks and provide a meaningful route to phoneme awareness and phonics, as children learn to master the ingenious code of letters that makes spoken words visible. We will discuss how children's brains respond to instruction, cite the evidence from research about the effectiveness of encoding instruction, and suggest some encoding strategies.

How Children's Brains Respond to Instruction

Learning to Speak and Understand Speech

A newborn's brain is flooded with new sights and sounds. Voices and faces swim into recognition. Day after day, hour after hour, a familiar face appears and talks. She says "MAMA." The baby watches her lips and face, and imitates, experimenting with his or her own voice. One day a tiny voice produces "MA" and the mother smiles, offers hugs, and an affirmation: "Yes! MAMA!" Eventually the baby learns to repeat the sounds and understand their meaning.

Strings of mouth movements (articulatory gestures), and the sounds they produce are stored away in the brain as words. Words are a code to stand for a real thing in the world. The word MAMA is learned as a *string* of speech-bits, not *individual* speech-bits. And thus the young child learns to say many words, remembering each one as a string of sounds, and linking each string to the word's meaning. The brain is prewired to learn language, word by meaningful word. The baby names the concrete things in its world by producing a sequence of sounds. It is this sequence linked to its meaning that the brain stores away. The individual speech sounds are not consciously stored with these word-memories.

Learning to Read

At the age of 4 or 5, the brain has to learn another code—a code on top of a code—a visual group of shapes that were invented to stand for the speech-bits that are strung together as remembered words. This is a new task that the brain is not wired for like speech, because humans have not been reading and writing very long. Suddenly new synapses and neural pathways are required. The brain has to become conscious of each of these speech-bits. And this task is challenging for many would-be readers. Alvin Liberman titled a paper written in 1989, *Reading Is Hard Just Because Listening Is Easy*. Liberman writes: "… speaking a word does not require knowing how it is spelled or even that it has a spelling. Given that the speaker has thought of the word, the phonetic module takes care of the rest, automatically selecting and regulating the string of consonants and vowels the word comprises." Liberman concludes his paper saying that "reading and writing present a cognitive hurdle that speaking and listening do not."

Letters stand for speech sounds; now the 4- or 5-year-old has to bring these speech-sounds (phonemes) to consciousness. Words have to be segmented into their individual phonemes, in order to link them to letters. This is the hardest task for new readers—becoming phonemically aware and automatically linking these phonemes to the letters that stand for them (phonics). *And it is this skill of phonemic awareness that is seriously weak in students who struggle to read.*

> *While decoding words requires turning written symbols into speech (print-to-speech); encoding involves transposing speech into writing (speech-to-print). They are synergistic. Each reinforces the other.*

Traditional instruction often presents the skills needed for good reading as isolated skills. First comes letter names and shapes, then phoneme awareness, then phonics, then decoding, comprehension, and fluency. However the brain needs to link new learning to something it already knows. It already knows how to say and understand words. New learning about visual words needs to be linked to that speech foundation

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Abbreviation

NICHD = National Institute of Child Health and Human Development

because the new code was invented to make speech visible. As the alphabet is introduced, the brain is asked to link a visual shape to a speech-bit in a word used in everyday speech. It is the act of speech production that is accessed to make these links, not just the sounds it produces. This rewiring in the brain prepares efficient pathways that become instantaneous routes for word recognition. There is now a preponderance of evidence from both behavioral and neuroimaging investigations that phonological processing is essential for the development of the network of systems that support skilled reading (Pugh et al., 2010).

For most children, this rewiring requires explicit and systematic instruction. An important way to provide this is through *encoding* (speech-to-print) as well as *decoding* instruction. To become aware of phonemes, the *production* of speech needs to be emphasized as well as the *perception* of speech. As children say a word, they must learn to pay attention to what they are doing with their mouth as well as what they are hearing with their ears. Both the motor-kinesthetic system and the auditory system are essential to phoneme awareness. While decoding words requires turning written symbols into speech (print-to-speech); encoding involves transposing speech into writing (speech-to-print). They are synergistic. Each reinforces the other.

How the Brain Learns to Read and Write

Brain imaging research with functional magnetic resonance imaging and magnetoencephalography techniques has shed some light on how instruction may affect the organization of reading in the brain. Cornelissen has shown that speech areas are activated even before a sight word is recognized (Cornelissen, 2010). Boets (2011) and Vandermosten (2012) confirmed that the contribution of speech is essential in phonological tasks like segmentation, and demonstrated that the critical connections between speech and auditory areas are weaker in dyslexics. Several neuroscientists have shown that dyslexic readers tend to activate areas of the right hemisphere, while skilled readers activate areas in the left hemisphere (Simos et al., 2002; Aylward et al., 2003; Shaywitz, 2003; Shaywitz et al., 2003; Sandak et al., 2004; Richards & Berninger, 2008). Storing information about visual words in the right side of the brain creates inefficient neural pathways to connect with what is already known about words in the left side of the brain. Intensive phonologically based intervention with the dyslexics in the Simos and Shaywitz studies improved reading and where reading was improved, the brain activity had moved from the right to the left (Simos et al., 2002; Shaywitz et al., 2003). The human brain is flexible and can change in response to instruction and practice.

Early instruction may influence habitual pathways as reading skills develop. Clearly it is important to engage the left hemisphere in early reading instruction. Speech production and analysis automatically activate left hemisphere processing. Traditional decoding often includes lists of "sight words" to be visually memorized, many of which are not "irregular" and should be decoded rather than memorized. (This visual memorization may call upon contour, configuration, and pattern analysis best handled by the right hemisphere.) Decoding starts with visual analysis of an unknown word; encoding starts with speech and a known word (activating left hemisphere speech and comprehension mechanisms). For skilled reading, new pathways will be most efficient if they are laid down on the previously organized substrate of speech and comprehension in the left hemisphere where the brain has already stored the pronunciations and meanings of words (Dehaene, 2004, Dehaene et al., 2005).

These neuropsychological studies demonstrate that a child's experiences with letters and words influence how his or her brain establishes preferred processing strategies and neural networks for reading. In instruction, the *production* of speech needs to be emphasized as well as the *perception* of speech. ("What did your mouth do when you said that word?" Not simply "What did you hear when you said that word.") Both the motor-kinesthetic system and the auditory system are essential to phoneme awareness.

Evidence of the Effectiveness of Speech-to-Print Instruction

Considerable research has shown that phonologically based instruction that includes encoding results in better reading skills (Moats, 2005; Castiglione-Spalten & Ehri, 2003; Uhry & Shepherd, 1993). A "best-ever synthesis" of studies using encoding instruction, conducted by Weiser and Mathes (2011) found that effect sizes (i.e., a measure of how important the differences are) favoring treatment groups were found for phonemic awareness, spelling, decoding, fluency, comprehension, and writing. Important factors were early identification of students in need of intervention, explicit and direct instruction in phoneme-grapheme relationships, word study, and guided practice of manipulating and writing specifically taught sounds and word patterns. Weiser (2013) has concluded that integrating encoding and decoding instruction in early reading programs may be the missing ingredient for successfully turning around America's reading scores.

Tangel and Blachman (1992) provided an intervention for kindergartners that included instruction in three foundational skills: 1) phonemic awareness, 2) letter recognition, and 3) letter-sound correspondences. They concluded their paper stating: "Children who have repeated opportunities to invent spellings will enhance their phonemic awareness in the process. That is, children who are in an environment that provides numerous opportunities to interact with print (e.g., connecting printed and spoken words when being read to, representing spoken words with letters) may discover the internal structure of words through these and other activities." In a follow-up study a year later when the students were in first grade (Tangel & Blachman, 1995), they noted: "This awareness (of the internal structure of words) translates into significantly greater sophistication in terms of both standard spelling and invented spelling."

A study by Ouellette and Sénéchal (2008) also conducted with kindergartners, concluded that "invented spelling refines phonemic and orthographic awareness, and promotes an analytical approach." (Invented spelling refers to young children's attempts to spell words phonetically—that is, based on their phonological awareness.) Sénéchal and colleagues (Sénéchal et al., 2012) found that "invented spelling is an exploratory process that involves the integration of phoneme and orthographic representations. With guidance and developmentally appropriate feedback, invented spelling provides a milieu for children to explore the relation between oral language and written symbols that can facilitate their entry in reading." Moats (1998) writes, "One of the most fundamental flaws found in almost all phonics programs, including traditional ones, is that they teach the code backwards. That is, they go from letter-to-sound instead of from sound to letter. The print-to-sound approach (conventional phonics) leaves gaps, invites confusion and creates inefficiencies."

Morais (1988) showed that illiterate adults (who have never had reading instruction) are not able to hear the phonemes in words, suggesting that there is a critical period for this fine-grained analysis. His work also suggested that phoneme analysis is best learned as real words are encoded, not as skills isolated from spelling. A number of leading educators have advocated an encoding approach, including Maria Montessori (1948), Carol Chomsky (1979), Pat Lindamood (1998), and Romalda Spalding (1986).

The alphabet is a tool for coding speech into visible shapes. The easiest way to learn this code is to use it as it was invented—to make spoken words visible.

Studies of speech-to-print software have also reported positive results. After eight weeks of intervention with *Phonographix* (largely encoding software), first-grade students with severe reading disabilities improved scores significantly on word attack, word identification, sight word fluency decoding, comprehension, and spelling, including significant gains in fluency (Denton et al., 2007). Torgesen conducted an independent study using *Read, Write & Type* (National Institute of Child Health and Human Development (NICHD)-funded speech-to-print software curriculum) with at-risk first graders (Torgesen et al., 2010). The study compared *Read, Write & Type* with the *Lindamood LIPS* program that emphasized drawing students' attention to articulatory gestures. There was no significant difference between the two groups. Students in both groups made significant gains in phoneme awareness, phonemic decoding, reading accuracy, rapid automatized naming, and reading comprehension compared to those of a control group.

What Is Needed for Encoding Instruction

There are two ways to learn a code—by sending and by receiving it. Novices are taught to send Morse code as they learn to receive it. Youngsters learning about computer codes learn to use code to move robots around, rather than learning to read code. The alphabet is a tool for coding speech into visible shapes. The easiest way to learn this code is to use it as it was invented—to make spoken words visible (Herron, 2011).

If there is a benefit to including encoding with early reading instruction, teachers need materials that provide a systematic sequence to introduce all 44/45 speech sounds of English and the 26 letters that represent them. For example, children could start with a few at a time, the way they learned to say words. If the teacher starts with a simple rime like AT on the white board, or in a pocket chart, she can play with different sounds to start the word—"What letter would you add at the beginning to make this word AT say CAT?" (FAT, HAT, or SAT)? "Say AT. Now say CAT. Your mouth made the sound /k/ at the beginning. What letter stands for /k/? Let's write it." In a few lessons her students have learned to segment four words, identify six speech sounds, and link the appropriate shapes (letters) to the sounds. This encoding process integrates all the essential reading skills, linking them meaningfully together to form efficient pathways in the brain.

There are two important concepts for beginning readers to learn—that spoken words are strings of speech sounds and that letters can stand for those sounds. These concepts don't require that children memorize the entire alphabet all at once. Four-year-olds can start with just a few letters and build words with them.

The authors of this paper were interested in exploring the effects of providing this kind of instruction for pre-K and K students. Herron received a Small Business Innovation Research grant from the NICHD to develop seven apps and an online software curriculum, *Talking Shapes*, and Gillis carried out research using the apps and accompanying movable alphabet materials with pre-K students. Their report is in preparation for publication.

Some Encoding Strategies

Encoding is a very different neural process than decoding. If children have memorized letter-sound pairs in order to decode, the letters are telling them what the sounds are. They do not have to reprogram their speech processor to bring to consciousness the individual sounds in words. They simply have to blend the sounds together, sound by sound, and check to see if they recognize the blended sound as a familiar word.

Adding systematic encoding instruction to the language arts instruction seems to generate deeper and more automatic links between the speech sounds and the letters that represent them. Each time children sound out and spell a word, they are segmenting the word into its speech sounds. They are practicing phoneme awareness and phonics over and over. They have to search their brains to identify the speech-bit and make that link to the visual shape (by accessing the motor memory and feel of *producing* the sound, and by *hearing* the sound when they say the word). They are building automatic pathways, not through the drill-and-practice of isolated skills (counting phonemes, underlining blends, etc.) but through the fun of constructing real, meaningful words. Competence results in pleasure: "I can write!"

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It's easier to decode a word that has previously been encoded. The pathways have been established to connect the essential elements of the spoken words, the meaning of those words and the new visual representations of the words. These are the pathways for the orthographic maps that result in the instant recognition of written words. Now children can find the pleasure of reading. They can decode new words on their own without having to depend on someone else to identify the word. "I can read!"

Everybody dedicated to teaching children to read cares deeply about the best way to accomplish this goal. It's admirable that professionals in the reading field who previously dismissed phonics as irrelevant are recently patching phonics into their instructional packages. But early reading instruction still needs new thinking. We need a shift in our instructional practices in order to change the discouraging statistics that two-thirds of our students are still not learning to read proficiently (NCES, 2019). Phoneme awareness and phonics instruction need to change as well—the teaching of phonics needs to involve working more with meaningful words. Adding systematic and explicit encoding will enrich the process.

One important instructional implication is that we must alter how we approach phonics instruction. This change requires teachers to shift attention from a decoding-focused approach to one that not only places an emphasis on encoding, but that begins there.

Support for Teachers

As we return to where we began this article, one important instructional implication is that we must alter how we approach phonics instruction. This change requires teachers to shift attention from a decoding-focused approach to one that not only places an emphasis on encoding, but that *begins* there. A speech-to-print approach is based on the premise that the learning-to-read process *begins* with children saying a word that they know the meaning of and then taking the word apart sound by sound. This *phonological analysis* supports their understanding that they are stringing sounds together to say a word and that they can spell words by using letters that stand for each sound they say. The teacher focuses students' attention on the sound by asking, *What sound do you hear? What is your mouth doing when you make that sound?*

In contrast to an emphasis on the phonological structure of words, a print-to-speech approach has children analyzing words visually. They learn that they can identify words by memorizing letter-sound associations, looking at each letter in a word and blending those sounds together. This process *ends* with the child reading a word that they know the meaning of.

Figure 1 compares the two approaches by contrasting several key features of instruction for each: use of a scope and sequence, decoding instruction, encoding/spelling instruction, use of key words/pictures, use of word/sound walls, sight word instruction, and text types. The problems that are listed in the print-to-speech column are there to alert teachers to the potential pitfalls of using a phonics patch in lieu of evidence-based speech-to-print instruction.

To be fair, there are challenges associated with each approach that must be acknowledged. In order to use a speech-to-print approach and get optimum results, teachers must have good phonological awareness themselves. They must also dedicate time to learning about the structure of the English language, including the consonant and vowel phoneme systems, and practice applying that knowledge and teach foundational skills. This takes in-depth study and practice. Finally, they must be able to identify students who have difficulties with phonological and orthographic processing and know how to address those difficulties by selecting appropriate strategies, scaffolding instruction, and monitoring students' progress to determine if skills are being acquired.

If a teacher chooses to use a print-focused approach, in addition to the potential problems listed in the chart, there are a few other challenges. There are sounds that don't have a unique letter associated with them (e.g., /ng/, /zh/, /sh/; /aw/, /oi/, /oo/ as in *book*) so they are often omitted from instruction and/or not explicitly taught. Students are then left feeling confused and are not able to appreciate the logic of English. Another common instructional challenge is ensuring that phonics instruction is differentiated—that is, it is taught in small groups based on diagnostic phonics assessment data (both decoding and spelling). While many teachers understand that phonics instruction is important, whole class instruction in foundational skills only works for a select few students.

The research on how the brain learns to read and write provides compelling evidence for how children should be taught these fundamental but critical skills. The methods teachers *choose* and are *trained* to use can make or break a child's success in school and in life.

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	Speech-to-Print	Print-to-Speech
Use of a Scope and Sequence	• Scope and sequence includes a major spelling (grapheme) for almost all phonemes, introduced in K. • Instruction begins with salient speech sounds. For example, the continuant sound /s/ is easier to stretch out so the student can feel what their mouth is doing. • Confusable phonemes, such as /p/ and /b/, are taught in contrast to one another.	• "Vowels" and "consonants" are treated primarily as letter groups, not phonemes (e.g., a, e, i, o, u are vowels). **Potential Problems:** • A common sequence used to teach letter sound correspondence is alphabetical order which ignores how sounds are produced. • Order of instruction may be determined by presumed visual confusability of letters and frequency of letters in print.
Decoding – the process of turning written symbols into speech.	• Teacher focuses students' attention on all the letters in the word, not just the first letter, systematically blending the sounds through the whole word. • Children practice blending sounds to read the same consistent and transparent pattern (i.e., closed syllable with short vowel sounds) • Use of sound-letter (phoneme-grapheme) cues for corrective feedback when sounds are not recalled during word reading.	• Teacher focuses students' attention on the letter. *What letter do you see? What sound does the letter make?* **Potential Problems:** • Context cues are often used to support word recognition: Children get their mouths ready to say a word and look at the first letter after they've used a picture or context clue. • Corrective feedback may reference visual aspects of the printed word, such as its length or configuration. • Decoding (word recognition) practice may not be connected to encoding or spelling.
Encoding – the process of turning speech into written words.	• Children say words, segment the sounds, and build words from grapheme tiles. • Corrective feedback involves attending to what the mouth is doing as speech sounds are articulated and sequenced. • Sound-letter cue cards are used for encoding practice.	• Phonetic spelling may be encouraged, but not supported with explicit teaching of the phoneme system. **Potential Problems:** • Visual memorization techniques are emphasized—copying, tracing words, reciting letters in words during repeated writing. • Children learn to spell words related to a theme. This encourages them to memorize the words.
Key Words/ Pictures	• Children learn key words from pictures that represent each sound; the cards represent the phonemes, then show the letters used to represent them. • Key words are carefully chosen and are used as a mnemonic to support students' ability to identify the proper sounds.	• Cue cards show a grapheme (letter or letter combination), and a key word that begins with a sound it represents. **Potential Problems:** • Key words for sounds may include incorrect or atypical sound-letter correspondences. • For example, **x** often has a *xylophone* as its key picture and **o** often has an *orange* as its key picture.
Sound/Word Walls	• Teachers display *sound walls* in their classrooms. • Each sound (44 in all) has a number of ways to spell the sound with the most common correspondences listed first. • For example, the sound /f/ might include the words *fish*, *five,* and *off*. The next level would add *phone* and *rough*. • Color coding is used to highlight the position of the sounds and the regularity of those sounds.	• Teachers display *word walls* in their classrooms. **Potential Problems:** • Under each letter are several words that begin with the specified letter, without regard for the sound it represents. • The list often includes students' names. • For example, words below the letter **O** might include *on, one, only, out, Oliver* and *Owen.*
Sight Word Recognition	• A *sight word* is one that is instantly recognized. • Children learn to recognize words by sight when they orthographically map the word—that is, they associate the sounds they hear with the letter(s) that represent those sounds. • A *sight word* can be phonetically regular or phonetically irregular. Students may use a different mapping process depending on their regularity. • Spelling pronunciations, predictable correspondences, and/or word meaning and origin might be used to explain the word's spelling.	• The *sight word* lists that students learn are high frequency words that include both phonetically regular and phonetically irregular words. **Potential Problems:** • Children are encouraged to memorize words *by sight.* • They are often encouraged to look at the visual configuration of the word to support this memorization process. • Flash card memorization without word analysis is emphasized.
Text Types	• In order to build their sight word vocabulary, students read decodable text. This practice, along with advanced phonemic awareness and explicit phonics instruction, reinforces orthographic mapping and reading fluency.	• Students read a variety of texts to build sight word vocabulary including predictable text and leveled text. **Potential Problems:** • Since many of the words in these texts are too difficult to decode, students are encouraged to guess the words based on the pictures, syntactic structure, and/or the visual cues found in the word (i.e., the first letter they see).

Figure 1. A Comparison of Speech-to-Print and Print-to-Speech

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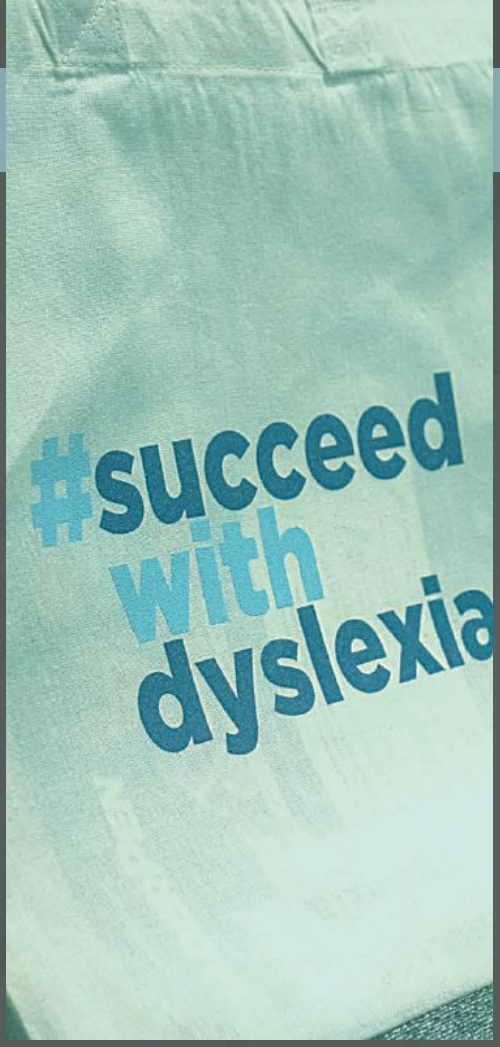

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Linguistic Differences and Learning to Read for Nonmainstream Dialect Speakers

by Brandy Gatlin-Nash, Lakeisha Johnson, and Ryan Lee-James

In relation to Mainstream American English (MAE), nonmainstream dialects of English are characterized by differences in phonology, morphology, syntax, vocabulary, and prosody (Wolfram & Schilling, 2016). Nonmainstream American English (NMAE) refers to a variety of dialects including African American English, Appalachian English, Caribbean English Creoles, Chicano/Latino English, Hawaiian Creole English, and Southern American English. NMAE is spoken by children and adults in various regions of the U.S. across racial, ethnic, and socioeconomic status (SES) backgrounds. However, dialect density, the rate of dialect produced in spoken language, is highest among Black children, the majority of whom are African American (AA), and/or from low income homes (e.g., Washington & Craig, 1998). Largely fueled by achievement gaps in reading between AA students and students from lower SES backgrounds and their White, higher income peers (McFarland et al., 2019), recent research has addressed differences between NMAE and MAE in relation to language and reading outcomes among children. This research demonstrates that in general, children who use a high frequency of NMAE dialect tend to have lower literacy scores than their peers who use no or very little NMAE dialect (see Gatlin & Wanzek, 2015 for a review).

If we consider how economic disadvantage and NMAE each influence growth of literacy, SES is closely related to vocabulary, background knowledge, and overall language comprehension (e.g., Pace et al., 2017), whereas NMAE is more closely tied to structural aspects of language (phonology, morphology, and syntax). Thus, the combined impact of SES and NMAE will contribute to children's development of reading as oral language skills form foundations upon which literacy skills develop. The study of NMAE has traditionally focused on word- and sentence-level differences, commonly referred to as morphosyntactic—a combination of morphological and syntactic—dialect features. For example, the MAE phrase *We went to Sam's house* may be stated as *We went to Sam house* in NMAE dialect. *They were hungry* in MAE may be stated as *They was hungry* in NMAE. This research, largely conducted in the field of communication disorders, has targeted morphosyntactic features for two reasons primarily: 1) to identify developmental profiles of language within the context of dialect and SES differences and 2) to evidence similarities and differences among clinical indicators of language impairment for NMAE and MAE speakers (who traditionally have been the target sample in much of the existing research; Oetting & McDonald, 2001). Recently, however, the focus of research has been dedicated to understanding phonological differences of NMAE and associations with general language skills and reading outcomes.

The combined impact of SES and NMAE will contribute to children's development of reading as oral language skills form foundations upon which literacy skills develop.

Connections Between Learning to Read and NMAE Use

Three major theories have been proposed regarding relations between NMAE use and reading acquisition, mainly focusing on explanations of reading difficulties. The first is the linguistic bias hypothesis, which suggests that teachers perceive students who use NMAE as less capable than their peers who do not use NMAE (Goodman & Buck, 1973). Teachers' preconceived notions towards NMAE, and in particular, lower prestige dialects such as African American English (AAE), may lead to setting lower expectations for academic success. This bias, which potentially occurs regardless of teacher race (Gupta, 2010), may then result in lower expectations regarding academic performance, resulting in fewer opportunities for successful learning. The second theory suggests that there is a mismatch between the structures of NMAE and MAE, which leads to an increased difficulty in learning to read (Cecil, 1988). The structural differences of NMAE and the texts used in classrooms often do not align. This theory is supported by studies that have found negative associations between NMAE usage and literacy skills (e.g., Craig & Washington, 2004).

The third theory on the relation between NMAE and difficulties in learning to read is the linguistic flexibility hypothesis (Terry & Scarborough, 2011). This theory suggests that NMAE speakers who have strong metalinguistic awareness are able to switch between NMAE and MAE easily. Metalinguistic awareness is the ability to decontextualize language by thinking, manipulating, and talking about it. Children with limited linguistic flexibility may have difficulty switching between NMAE and MAE. Importantly, this theory posits that dialect use alone is not predictive of literacy skills. Rather, the ability to dialect

Abbreviations

AA: African American
AAE: African American English
MAE: Mainstream American English
NMAE: Nonmainstream American English
SES: Socioeconomic status

shift in various contexts that presuppose MAE use, such as speaking in formal settings or when writing, is indicative of metalinguistic awareness, which is in turn related to reading outcomes. This theory also proposes that the relation between dialect, language, and reading is complex, with bidirectional relationships among the factors. Whether one predicts the other is important, but it is imperative to consider the challenges that children who speak with dialects may face when learning to read, specifically in the areas of oral language and phonological skills.

Malcolm: Linguistic Barriers in the Classroom

Envision the following scenario in a first-grade classroom during Language Arts instruction. Just over 20 students are in their orange seats in groups of four with their individual desks touching one another, making a larger square-shaped formation of desks. During whole group instruction, the teacher walks around the classroom, priming the children for background knowledge before reading a story. In doing so, she asks a general question to the class. An AA male student, Malcolm, who is seated at a desk by himself in the corner, enthusiastically raises his hand to answer the question:

Teacher: *Who knows what the word 'strain' means?*
Malcolm: *Ooh, ooh me, I know.*
Teacher: *Go ahead.*
Malcolm: *It's like a rope except smaller.*
Teacher (with a puzzled look): *No, that's not it. Does anyone else think they know the answer?*

The teacher calls on another student who raises her hand. That student gives a close definition of *strain*, making a hand gesture signifying a squeezing motion. The teacher then praises the second student for her attempt, gives the definition of the word, and then uses *strain* in a sentence. Malcolm begins playing with pencils inside of his desk as the teacher begins reading the story.

Oral language is often conceptualized as vocabulary knowledge, but a more comprehensive and accurate view includes phonology, morphology, syntax, semantics, listening comprehension, and narrative skills.

Two common phonological dialect features of both AAE and Southern American English are 'g' dropping (e.g., *runnin'*) and vowel shifting (e.g., *think* becomes *thank*). In this particular instance, Malcolm likely misunderstood the teacher and perceived the word *strain* as *string*. If this was indeed the case in this particular instance, Malcolm gave an accurate description according to his own conceptualization of the word *string*, demonstrating how he might pronounce the word using his own dialect ("I tied my *shoestrain*"). Thus for Malcolm, the words *strain* and *string* are presumably indistinguishable.

Imagine this or similar situations occurring daily for students like Malcolm whose dialect may be significantly different from that of their teachers. Further imagine the cumulative consequences of such events for students for whom these types of interactions are regular occurrences. This particular sequence of events did in fact take place in a classroom in the southeastern portion of the U.S. and was captured as part of a research project involving video observations of first-grade instructional practices.

NMAE Dialect, Oral Language, and Phonological Awareness

Tremendous effort has gone into identifying the components of reading skills in order to inform instruction. For example, the Simple View of Reading (Gough & Tunmer, 1986), which posits that reading comprehension consists of two separate but equally important parts (decoding and linguistic comprehension), has guided research and practice for several years. More recently, the Componential Model of Reading (Aaron et al., 2008) was developed to account for the elements of the Simple View of Reading (the *cognitive domain*) and the *psychological* and *ecological domains*, which are also important for reading development. Linguistic skills are an integral component of any model of reading development, and research has demonstrated the importance of language in the acquisition of reading skills (e.g., Dickinson et al., 2012). Oral language is often conceptualized as vocabulary knowledge, but a more comprehensive and accurate view includes phonology, morphology, syntax, semantics, listening comprehension, and narrative skills (Language and Reading Research Consortium, 2015).

Phonological awareness is the knowledge that spoken language consists of smaller units (Wagner & Torgesen, 1987), including rhymes, syllables, and individual sounds (phonemes). The ability to focus on and manipulate phonemes in spoken words is referred to as phonemic awareness. Children whose first language is English and who are learning to read the English Writing System are tasked with discriminating individual sounds in words, many of which are already a part of their vocabulary. For a child whose first language is English, but uses a nonmainstream dialect of English, identifying and manipulating individual phonemes in words may be more difficult. For instance, a common phonological feature of AAE is the reduction of final consonant clusters. A child may be shown a picture of a "hand" and asked to segment the sounds of the word. That child may respond /h/ /a/ /n/ because in the child's dialect, the final sound /d/ is variably produced. In fact, researchers have found that there is a tendency for children who use a greater amount of dialect in their speech to have lower scores on standardized measures of phonological awareness (e.g., Mitri & Terry, 2014).

Phonemic awareness is a prerequisite for letter-sound identification and decoding skills (e.g., Liberman, 1973). In transparent orthographies (e.g., Spanish), sounds and letters map onto one another with nearly a one-to-one correspondence. In more opaque orthographies (e.g., English), correspondence between sounds and letters is not always consistent. Thus, for

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children who speak English and are learning to read words in English, mapping sounds and letters may already be a challenge. For NMAE dialect speakers, learning the alphabetic principle, the notion that written symbols or graphemes (letters) represent phonemes that signal the pronunciation of words, is perhaps even more challenging. Often, NMAE dialect differences do not map well onto the English Writing System's orthography (Wolfram & Schilling, 2016). For instance, in AAE, /f/ and /v/ are often used in the place of the /th/ sound in words ending in -th (e.g., the word *smooth* is pronounced as *smoov*). Thus, when children encounter written words such as *bath*, they may not realize that the graphemes blend together to refer to a concept with which they are familiar, they just pronounce it differently—*baf*. Charity and colleagues (2004) found that for dialect speakers, greater use of phonological features of MAE, and by implication increased knowledge of MAE, on a sentence imitation task was positively associated with decoding and word identification.

Once word reading skills are mastered, higher order language skills are essential for reading comprehension (Storch & Whitehurst, 2002). For NMAE dialect speakers, differences in morphology and syntax, coupled with phonological differences, could make comprehension more difficult. As an example, two common features of both AAE and Southern American English are variance in subject-verb agreement and the zero modal auxiliary (the deletion of helping verbs such as *has* and *have*) as demonstrated in the sentence, *Zion need to change clothes because he been outside*. In this one sentence, the variation from MAE may not appear extreme. However, when multiple sentences become paragraphs and paragraphs become full text, then dialect differences could potentially have an impact on the comprehension of the text. Moreover, for children who speak with a dialect, who are more likely to come from low SES backgrounds, deficits in vocabulary and background knowledge likely exacerbate the differences. Strong decoding skills, in the absence of sufficient vocabulary and background knowledge, will yield difficulties with reading comprehension (Gough & Tunmer, 1986).

Componential Model of Reading

In the Componential Model of Reading (Aaron et al., 2008), ecological and psychological domains are important to children's reading outcomes, in addition to the cognitive domains focusing on decoding and linguistic comprehension. The ecological domain includes factors such as NMAE dialect differences, the home environment, the class environment, parental involvement, and peer influences. An important consideration of the ecological domain is the linguistic diversity that students bring with them to school that is reflective of the language of their home and neighborhood environments. Dialects that are deemed as informal are often referred to as "home language." MAE is usually considered more formal and is typically referred to as standard, academic, or "school language." Although several aspects of the ecological domain are beyond the control of educational agencies, being aware of these factors that potentially play a role in the development of reading is important in the consideration of assessment and instruction of children who are at risk of reading difficulties, particularly children from traditionally marginalized backgrounds.

Although several aspects of the ecological domain are beyond the control of educational agencies, being aware of factors that potentially play a role in the development of reading is important in the consideration of assessment and instruction of children who are at risk of reading difficulties.

The psychological domain of the Componential Model of Reading consists of teacher knowledge and expectations, and student motivation. Knowledge of the language constructs necessary for teaching literacy skills is very important (e.g., Moats, 2009), but unfortunately, teachers may not always receive sufficient training in this area. Without explicit knowledge and training, teachers may lack understanding of NMAE dialects and the potential role of dialect in the acquisition of reading skills. As we saw in the aforementioned classroom scenario, the teacher appeared unaware of dialectal differences that were likely responsible for Malcolm's misinterpretation of the word *strain*. If she had been familiar with phonological features of dialect, she might surmise that he had interpreted the word as *string* and actually gave an accurate (and clever) response, and thus would have been able to acknowledge Malcolm's attempt and address his misunderstanding. The observer is also left to ponder the roles of teacher expectations in relation to the use of NMAE and student motivation in the exchange. It is plausible that this interaction had a negative effect on Malcolm's motivation and desire to engage. He resorted to off-task behavior after his answer was not recognized. The seemingly well-intended teacher may have simply lacked knowledge of dialect differences, resulting in a missed learning opportunity for Malcolm.

Implications and Future Directions

As previously stated, prior research has generally found negative relations between dialect use and language and reading skills. However, the nature of the relationship is not entirely clear. That is, research has not determined whether NMAE dialect use itself is a cause of reading difficulties or if ability or inability to vary dialect use is instead an indicator, or marker, of overall language and reading skills. As the linguistic flexibility hypothesis suggests, using a nonmainstream dialect is not necessarily a risk factor for children who are learning to read. In fact, varying dialect use in different contexts may actually signal strong language skills among children (Connor & Craig,

2006). The relationship between NMAE dialect and literacy is even more ambiguous when studied among children from low-income homes because of potential confounding of dialect and language and literacy skills with SES. Therefore, without longitudinal evidence and intervention research examining dialect use and phonological awareness, language, and reading outcomes among children in various SES contexts, causal relations cannot be determined. More research is needed in the area in order to garner more conclusive results.

The linguistic differences that children bring with them to school should be viewed positively in classrooms and used as strengths to leverage performance in literacy. Many speakers of NMAE are able to speak more than one dialect of English. The metalinguistic awareness required to vary dialect use in different contexts or environments can be used as a strength in regard to reading instruction, similar to the way that bilingualism is often viewed as a language strength (Terry et al., 2018). We recommend that teachers talk explicitly with students about how most of us speak differently depending upon the context (e.g., home language versus school language) and with whom we are speaking. Doing so, in a positive light without criticism or invalidation of the students' home language, we believe, will help to decrease the stigmas often associated with being a speaker of NMAE. Programs like *DAWS* (Johnson et al., 2017), *ToggleTalk* (Craig, 2018), and *Codeswitching Lessons* (Wheeler & Swords, 2010) focus on helping students become what is referred to as bidialectal (Wolfram & Schilling, 2016), by explicitly contrasting MAE and AAE (see Table 1 for more information on these programs and Figure 1 for sample *DAWS* lessons). Adding contrastive analysis to existing evidence-based language and literacy programs is one potentially effective approach to instruction among dialect speakers (Gatlin-Nash & Terry, in press; Washington et al., 2018).

In addition to speakers of dialects receiving instruction and intervention, teachers should also receive professional development geared toward increasing their knowledge of the structures of dialects and the potential role of linguistic differences in learning to read. As part of their preparation and development, teachers usually receive training focused on best practices for students who are English learners. However, they are typically unaware of language structures of NMAE (Diehm & Hendricks, in press; Gupta, 2010). Equipped with knowledge of dialect and the features that might be evident in children's language, educators can assist children by explicitly addressing potential sources of confusion when error patterns emerge in literacy instruction. For instance, dialect variation should be taken into consideration for instruction and assessment in phonemic awareness (e.g., *hand* as /h/ /a/ /n/). Additionally, by carefully analyzing dialect speakers' written language, educators can gauge the role that NMAE may play in students' understanding of the alphabetic principle. For example, if a student repeatedly misspells words with /th/ digraphs (e.g., *them* as *dem*, *with* as *wif*), that student may not be attending to differences in the pronunciation of /th/ in MAE and in his or her dialect. Similarly, knowledge of word and sentence level differences is important for teachers as several dialect features are traditionally criticized and/or marked as grammatical errors. For instance, common NMAE dialectal features include the absence of the past tense marker *-ed* (e.g., *The boy jump around his room yesterday*.) and the absence of the plural marker *-s* (e.g., *The candy costs 50 cent*.). When occurrences such as these happen, explicit instruction that still respects the child's home language can draw students' attention to the differences between informal dialect and more standard or mainstream forms of English.

Finally, standardized measures of language skills often assess students' knowledge of MAE and may not accurately assess the language abilities of students who speak NMAE. For instance, traditional measures of phonological awareness tap into children's knowledge of MAE phonology, and it is important to note that NMAE dialects speakers do not necessarily lack phonological knowledge. Indeed, Terry (2014) found that NMAE speakers demonstrated phonological knowledge of NMAE as evidenced by their performance on a phonological judgment task. Children were asked to judge pronunciations of words, some of which were consistent with NMAE dialect patterns (e.g., *breakfast* in MAE realized as *breakfas'* or *breffis* in NMAE). Both the low and high frequency dialect groups judged MAE pronunciations as acceptable. However, children in the high dialect group, who used dialect frequently in their speech, were more likely to judge NMAE dialect pronunciations as acceptable than their peers who used NMAE infrequently in their speech (i.e., the low dialect group). These findings underscore that NMAE dialect speakers have phonological knowledge in their primary dialect as well as MAE. From a strengths-based perspective, it is important to recognize that typically developing children who speak NMAE often have a strong grasp of their primary dialect; however, our assessment approaches and the reasons for which we often embark upon assessment do not always allow for this fact to be realized. In addition, oral narrative skills are often a linguistic strength for AA children (Gardner-Neblett et al., 2012), potentially stemming from cultural practices of storytelling to enrich

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TABLE 1. Programs Available to Encourage Bidialectism

Program	Website	Grade Level
DAWS	*https://www.ventrislearning.com/dialect-awareness-daws/*	Grades 2–4
ToggleTalk	*https://www.ventrislearning.com/toggletalk/*	Grades K–1
Codeswitching Lessons	*https://www.ventrislearning.com/code-switching-lessons/*	Grades 2–6

Week 1: Day 1

TEACHER INSTRUCTIONS

Objectives:
To contrast home and school language and to learn about using past tense and plurals.

Materials needed:
- Pictures of formal and informal clothing
- *Don't Say Ain't* by Irene Smalls

Teacher:

Clothing can be divided into two categories, formal and informal. What do you think is the difference between formal and informal clothing? Can you think of some times where you would wear formal clothing? How about when you would wear informal or casual clothing?

Scaffolding tip:

If students are having difficulty, ask them to think about different places they go where they have to wear specific clothes (i.e. church, playing with friends).

Teacher:

I'm going to show you several different pictures. Think about whether they are wearing formal or informal clothing.

Present pictures.

Just like there are different times when we have to wear different types of clothing, there are also times when we have to use different types of language. We all speak differently at home than we do at school. So you can think of how you talk at home as your "informal clothing," while how you talk at school is your "formal clothing." There's nothing wrong with the way you talk at home, there is just a different expectation for what is appropriate when you come to school. When you come to talk to me, we are going to talk about the differences between home and school language and when they should be used.

This week we are going to talk about two grammatical features that we should use all the time in our school language. We do not always use these in our home language. The first feature is using *plurals. Plural* is a concept of quality, representing "more than one." In English, the *plural* is typically formed by adding –s or –es to the end of a word. For example, "There are three kids sitting at the table." In school language, we have to add -s to *kid* because it shows that there is more than one.

The other feature we will also talk about using in school language is *past tense.* This is a verb tense that expresses an action that has happened in the past. Verbs are usually made *past tense* by adding –d or –ed to the end of a word. For example, "I walked home from school yesterday." What word gives us a clue that this was done in the past? (Scaffold if necessary.) The word *yesterday* gives us a clue that this is something that was done in the past. We have to add –ed to *walk* to make it *past tense.* When we have a *past tense* sentence we also have to be sure to include the correct linking verb. "Was" and "were" should be used in sentences that are *past tense* because they represent an action that has already occurred.

Teacher:

Now I'm going to show you a book where the characters use both home and school language to help you tell the difference between the two. The book is called *Don't Say Ain't.* It is a story about a little girl who is trying to fit in at a new school because she talks differently, but also does not want to lose her friends back home.

Read pages with sticky notes attached. Ask students whether each passage is in home or school language. Draw their attention to home language appearing in quotations.

Figure 1. Sample DAWS Lessons on Discussing Language Differences and Teaching Contrastive Analysis
Note: From Ventris Learning Dialect Awareness (DAWS™). Printed with permission from publisher.

Week 2: Day 1

TEACHER INSTRUCTIONS

Objectives:
To contrast home and school language and to understand subject–verb agreement and the copula.

Materials needed:
- Copula Sentence Sorts

Teacher:
Let's review the differences between home and school language again. What do you remember about each? In which types of situations is home language appropriate? How about school language?

This week we are going to focus on two grammatical features that we should use all the time in our school language: the *copula* and *subject-verb agreement.* We do not always use these in our home language.

Teacher:
The *copula* is a verb, but it does not express action. The *copula* is the word that serves as a connecting link between the subject of the verb and additional information about the subject. Some forms of the *copula* that we use often include: *is, are, was, were,* and *am.* For example, "Pam is a doctor." Who is the subject of this sentence? Which form of the *copula* did you hear that connected the subject to the word "doctor?"

The other feature we will talk about this week is closely related to the *copula. Subject-verb agreement* occurs when the subject and verb of a sentence agree in number. Singular subjects need singular verbs while plural subjects need plural verbs. What is the subject in the sentence "My sisters are teachers"? What form of the *copula* is used as a verb to link the subject to the word "teacher"? *Are* and *were* are used if the subject is plural, as with this example. *Is, was,* and *am* are used if the subject is singular. Can someone come up with a sentence that has a singular subject and uses *is* or *was?*

Teacher:
For our activity today, we are going to focus on the copula. I am going to give each of you a pile of cards. Separate them into two stacks based on the pattern you see.

Pass out Sentence Sorts and give students time to complete the activity.

Scaffolding tips:
- If students are having difficulty, tell them to separate the cards into school language and home language. If still struggling, allow students to work together.
- Remind students that sentences that include "was" or "were" are past tense and the action verb should have –d or –ed at the end in school language.

Teacher:
What pattern did you find in your two stacks? You should have one group of cards that is in home language and another group that is in school language. In the school language stack, a *copula* was used in each sentence. Which words are used as a form of the *copula*?

Go over each sentence to ensure that students understand the rule and have them in the accurate pile.

Now I would like for you to rewrite the sentences from the home language pile into school language using the Writing Sheet in your folder.

Ask students to place the Writing Sheet at the back of their folder after they are finished.

interpersonal interactions. Unfortunately, however, standard assessment and instructional practices often result in children's linguistic strengths being overlooked.

Dialects of English are complex and rule-governed systems of English, no different than MAE, and they need not be perceived as a cause of reading difficulties or a weakness among students.

Appreciating Linguistic Diversity

Perhaps now more than ever, reading is considered a foundational skill. It opens the doors to opportunities for competing in an increasingly technologically advanced and global world. Unlike reading, language develops in context through implicit adult-child interactions with very little direct support. Development of reading, on the other hand, requires explicit, systematic instruction and without it, children will not learn to read proficiently. Learning to read for NMAE dialect speakers can be an arduous task, especially in the face of insufficient general oral language skills. Dialects of English are complex and rule-governed systems of English, no different than MAE, and they need not be perceived as a cause of reading difficulties or a weakness among students. Indeed some of the greatest authors of recent times, such as Paul Laurence Dunbar, Langston Hughes, and Zora Neale Hurston, used NMAE dialect as a literary device in their poetry and novels. By appreciating and leveraging the unique linguistic characteristics present in NMAE speakers and providing high-quality language and literacy instruction, we hope to see gains in the literacy outcomes of linguistically diverse children.

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Preschool Language Precursors to Later Reading Problems

by Rouzana Komesidou and Tiffany P. Hogan

Language forms the basis of learning to read. The Simple View of Reading (Gough & Tunmer, 1986; Hoover & Gough, 1990) captures the contributions of language by defining reading comprehension as the product of word recognition, the ability to decode letter strings into pronounceable words, and listening comprehension, the ability to understand spoken language.

Word recognition is supported by code-related skills—phonological awareness, print and letter knowledge, and rapid naming (also referred to as rapid automatized naming or RAN) (Bishop & League, 2006; Georgiou et al., 2006). Listening comprehension is supported by oral language skills—vocabulary, grammar, inferencing, and background knowledge (Hogan et al., 2014). Word recognition contributes more to reading comprehension in the early grades when children develop their code-related skills, and listening comprehension begins to contribute more to reading comprehension around third or fourth grade, as text demands increase in content areas such as mathematics, science, and social studies (Catts et al., 2005; LARRC, 2015; Tilstra et al., 2009). Despite these differential contributions, evidence shows that word recognition and listening comprehension are interrelated and preschool is an important time for fostering children's abilities in both components to guarantee successful reading development (LARRC & Chiu, 2018).

Early Language Factors that Indicate Risk for Later Reading Problems

The Simple View of Reading has been used to categorize reading disabilities into three main types (Catts et al., 2003): 1) dyslexia, or difficulties with code-related skills that contribute to word recognition, 2) developmental language disorder, or difficulties with oral language, and 3) co-morbid dyslexia + developmental language disorder, or difficulties with both word recognition and language comprehension. This classification highlights that deficits in early phonological awareness, print and letter knowledge, and rapid naming are primary risk factors of poor word recognition associated with dyslexia (see Figure 1) (Hulme et al., 2015), and early deficits in oral language (i.e., vocabulary, grammar, inferencing, and background knowledge) are primary risk factors of poor listening comprehension associated with developmental language disorder (see Figure 1) (Catts et al., 2008).

Poor phonological awareness affects children's ability to appreciate the sound structure of the language to read words accurately (Hulme et al., 2015; Torgesen et al., 1997). Difficulty with phonological awareness can be obvious in preschool when children begin learning how to manipulate sounds in spoken syllables and words. Educators and caregivers might

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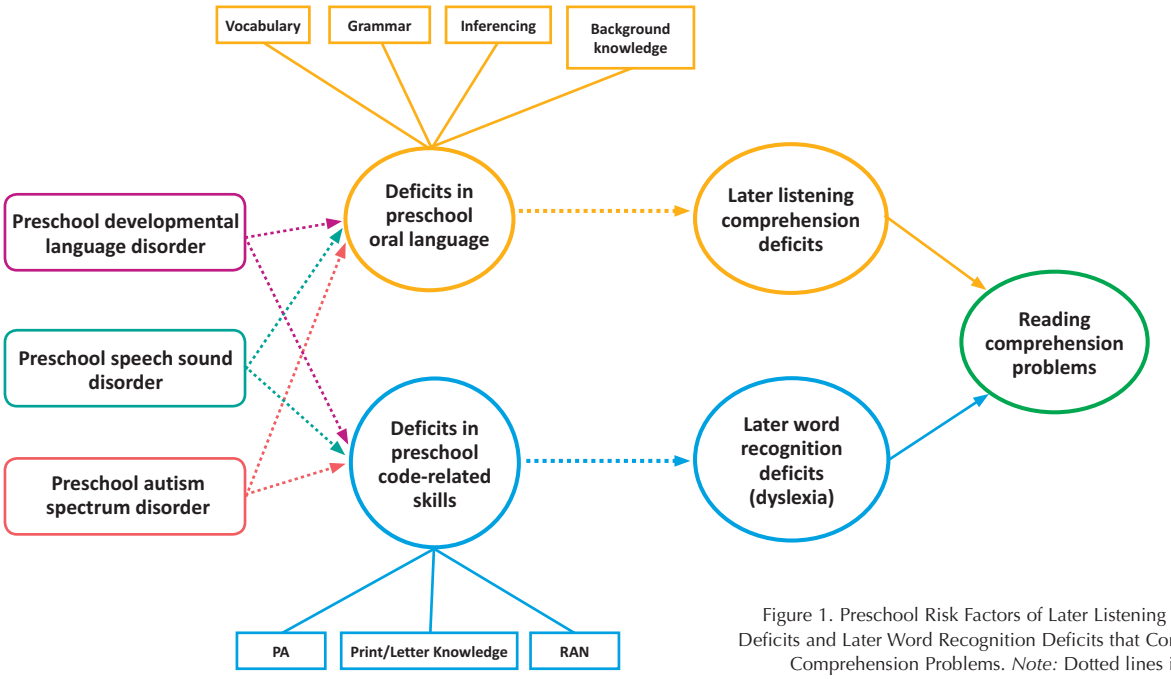

Figure 1. Preschool Risk Factors of Later Listening Comprehension Deficits and Later Word Recognition Deficits that Contribute to Reading Comprehension Problems. *Note:* Dotted lines indicate risk.

Abbreviations

PA = Phonological awareness

RAN: Rapid automatized naming

notice that some children struggle with blending (e.g., put together the sounds /p/, /e/, /t/ to make the word *pet*), phoneme substitution (e.g., if you replace the /k/ sound in *cat* with the /b/ sound, you get *bat*), or rhyming (e.g., *cat* rhymes with *hat*). Difficulty in learning and remembering print conventions and names of letters is also an early indicator of word reading problems (Hulme et al., 2015). Young children who exhibit code-related difficulties might also be slower in naming aloud a series of familiar items, like letters or numbers. Rapid naming is seen as a measure of the quality of children's phonological representations with slower rates implying incomplete representations and/or access to those representations (Norton & Wolf, 2012).

Difficulty with phonological awareness can be obvious in preschool when children begin learning how to manipulate sounds in spoken syllables and words.

Difficulties in oral language can also be obvious during preschool. Educators and caregivers should look for warning signs that may be attributed to children's failure to use and understand spoken language. Some examples are use of shorter and ungrammatical sentences (e.g., her playing), difficulty naming objects (e.g., the child says "thing"' instead of the actual word), difficulty understanding the relationships between words (e.g., elephant and giraffe are both animals), difficulty finding the right words to express one's thoughts, difficulty following directions, and difficulty understanding what is being said during storytime or regular conversations (LARRC & Chiu, 2018; Leonard, 2014; Rudolph & Leonard, 2016).

Early Language Disorders that Indicate Risk for Later Reading Problems

Having a language disorder prior to or during early reading instruction puts a child at high risk for reading problems in the future (see Figure 1). One type of language disorder is speech sound disorder, an umbrella term referring to varied deficits in speech production, such as persistent sound deletion, substitution, and/or distortion (Carroll & Snowling, 2004; Farquharson et al., 2018; Hearnshaw et al., 2018; Shriberg et al., 1997). Said another way, a child with a speech sound disorder has difficulty producing speech sounds that would be expected by his or her age. For example, a 4-year-old may say "fider" for "spider" even though the majority of his or her same-aged peers have learned how to correctly produce the /sp/ in "spider." There is considerable evidence suggesting that children with speech sound disorder are at increased risk for word reading problems (Anthony et al., 2011; Cabbage et al., 2018; Carroll & Snowling, 2004; Hayiou-Thomas et al., 2017; Rvachew, 2007). Those most at risk have a speech sound disorder with additional deficits in code-related skills (i.e., phonological awareness, print and letter knowledge, and/or rapid naming) or oral language (Bishop & Adams, 1990; Larrivee & Catts, 1999; Pennington & Bishop, 2009; Snowling et al., 2000). For example, if a child has speech sound disorder and shows deficits in phonological awareness, then he or she is more likely to have later word recognition problems. Similarly, if a child has speech sound disorder and shows deficits in oral language, then he or she is more likely to have delays in language comprehension.

Unlike speech sound disorder, the presence of preschool developmental language disorder alone puts children at clear risk for later reading problems. Children with developmental language disorder have difficulties understanding and/or using spoken language (Bishop et al., 2017; Leonard, 2014; Tomblin et al., 2017). They show deficits across multiple domains of language, that is, phonology, vocabulary, morphology, syntax, and pragmatics, which will impact their ability to construct meaning from written text (Catts et al., 2006; Nation et al., 2004). In addition, approximately half of children with developmental language disorder have dyslexia. When both domains of the Simple View of Reading are affected, more severe reading comprehension problems are likely to ensue (McArthur et al., 2000).

Finally, reading comprehension difficulties are frequent in children with autism spectrum disorder. Often, children with autism spectrum disorder have difficulties learning to read words and comprehend text (Nation et al., 2006; Ricketts et al., 2013). Moreover, social impairments typically seen in these children contribute to reading comprehension problems, beyond the influence of word recognition and language comprehension (Ricketts et al., 2013). Due to deficits in social cognition, children with autism spectrum disorder are often unable to decipher social and communicative norms from written text or understand the mental states and intentions of story characters.

Formal assessments are available to measure risk, though, importantly, most only include a few risk factors, none are 100% accurate, and all only measure risk.

Screening for Reading Problems in Preschool

The risk for later reading problems can be assessed in preschool by taking into account all of the risk factors shown in Figure 1. Formal assessments are available to measure risk (some resources are listed in Table 1), though, importantly, most only include a few risk factors, none are 100% accurate, and all only measure risk. Catts & Petscher (2020) propose the *Cumulative Risk and Protection Model*. In their model, risk factors add up to cumulative risk, and, importantly, protection factors may reduce a child's risk. Taken together, risk *and* protection factors are both considered when determining risk for

TABLE 1. Resources for Early Literacy Screeners
List of early literacy screeners prepared by the Gaab lab *https://docs.google.com/spreadsheets/d/16m40o49LZ_9wZI9VPAxhHFlATvhSM1mm-0oGr48jFfo/edit#gid=427370037*
List of language screeners prepared by Bao and Hogan *https://docs.google.com/spreadsheets/d/1o5U6QSztiJb0qE_a0wjzPeWg7_816GmquEagQi0XPpo/edit#gid=1925966314*
National Center on Intensive Intervention Academic Screening Tools Chart *https://charts.intensiveintervention.org/chart/academic-screening*

future reading problems. For example, if a preschool child has poor phonological awareness and RAN (i.e., risk factors) but has good oral language skills and preschool literacy instruction with an explicit focus on both early word reading and oral language (i.e., protection factors), then the risk for that child would be cumulatively lower than a child who has those risk factors and additionally, poor language and no formal preschool literacy instruction. Risk in preschool should be assessed continually until the start of formal education to best inform early education literacy instruction for each child, in preparation for enrollment in kindergarten. Ideally, knowing a child's cumulative risk will help ensure he or she is receiving the early intervention needed to stave off later reading failure, or to mitigate its negative effects. Newer screening assessments listed in Table 1, not yet published but in production, take into account a child's risk and protective factors for improved screening accuracy.

Ideally, knowing a child's cumulative risk will help ensure he or she is receiving the early intervention needed to stave off later reading failure, or to mitigate its negative effects.

Stimulating Oral Language Skills in Preschool

Educators and caregivers can stimulate both early word recognition and early language comprehension skills. To stimulate early word recognition, a focus should be on sounds, letters, and how the two are connected. Because other articles in this issue review the evidence base for early word reading instruction, we will focus on stimulation of oral language skills that set the foundation for later reading comprehension.

Educators and caregivers can foster children's language development by targeting foundational language skills and higher-level language skills within the context of shared book reading. Foundational language skills include vocabulary and grammar and set the foundation for higher level language skills (Hogan et al., 2011; LARRC et al., 2019). Higher level language skills include inferencing, comprehension monitoring, and text structure knowledge (Hogan et al., 2011; LARRC et al., 2019).

To improve *vocabulary*, educators and caregivers can select new words during storybook reading (e.g., different), provide child-friendly definitions (e.g., *different* means not the same), use them in various contexts (e.g., dogs and whales are *different* animals; red and green are *different* colors), and explain how new words are related to known words (e.g., *different* is the opposite of *same*) (Beck et al., 2013). It is important to provide repeated exposures to new words either through multiple occurrences in a single storybook or repeated readings of a storybook to facilitate learning (Justice et al., 2005; Storkel et al., 2017). Storybook reading is also a good way to stimulate children's grammar because written language involves more complex grammatical structures (e.g., clauses) than spoken language (Horowitz & Samuels, 1987). In addition, educators and caregivers can use well-structured conversations to expose children to correct grammatical structures (Fey et al., 2003).

Educators and caregivers can address *inferencing* by embedding questions during book reading to prompt children to fill gaps in the story using information from the text and their background knowledge (Hogan et al., 2011; LARRC, 2016). For example, after reading a story about a girl getting a bike for her birthday, an adult can ask, "How do you think Anne is feeling?" (Anne is feeling happy), "Why?" (Because she always wanted a bike), and "What do you think will happen next?" (Anne will ride her bike). *Comprehension monitoring* can be improved by identifying parts of a story that are difficult to understand and by using strategies to fix breakdowns (Hogan et al., 2011; LARRC, 2016). Strategies include using pictures and context cues, asking open-ended questions, rereading a sentence, finding the meaning of an unknown word, and using graphic organizers to organize content and ideas. Finally, educators and caregivers can promote *text structure knowledge* by asking questions about important elements of a story (e.g., characters, setting, problem, resolution), by using graphic organizers to represent the relationships between story components, and by exposing children to informational texts (Hogan et al., 2011; LARRC, 2016).

The Language and Reading Research Consortium (LARRC) developed *Let's Know!* (download from *https://larrc.ehe.osu.edu/)*, a language-focused curriculum for preschool through grade 3 (LARRC, 2016; LARRC et al., 2019). The curriculum is free and is designed to promote foundational language skills (i.e., vocabulary, grammar) and higher level language skills (i.e., inferencing, comprehension monitoring, text structure knowledge) through shared book reading. Children participate in structured lessons across four unit themes (i.e., fiction, animals, earth materials, and folktales) that incorporate language-rich text and strategies to ameliorate reading comprehension.

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Evidence-based and systematic instruction that focuses on early word reading, foundational language skills, and higher-level language skills can mitigate the effects of language-based risk factors and support children's reading development.

Taking a Proactive Position

Knowing the language-based risk factors for later reading problems and cumulative risk including protective factors, will help educators and caregivers to accurately identify children who need early language and literacy stimulation to prevent poor outcomes. Deficits in code-related (i.e., phonological awareness, print and letter knowledge, and/or rapid naming) and oral language skills are clearly linked to later reading failure. In addition, having a diagnosed language disorder in preschool, such as speech sound disorder, developmental language disorder, and autism spectrum disorder, puts a child more at risk for having deficits in code-related skills and deficits in oral language skills compared to preschool children without these disorders. Identifying early risk using age-appropriate, psychometrically sound universal screeners can pave the way for young children to receive the support they need. Moreover, evidence-based and systematic instruction that focuses on early word reading, foundational language skills (i.e., vocabulary, grammar), and higher-level language skills (i.e., inferencing, comprehension monitoring, text structure knowledge) can mitigate the effects of language-based risk factors and support children's reading development.

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