Dyslexia and Read Naturally

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Read Naturally's mission is to facilitate the learning necessary for every child to become a confident, proficient reader. Dyslexia is a reading disability that impacts millions of Americans. To support learners with dyslexia, educators must understand:

- what dyslexia is and what it is not
- how the dyslexic brain differs from that of a typical reader
- how and why recommended reading interventions help

To these ends, this paper supports educators to deepen their understanding of the instructional needs of dyslexic readers and to confidently select and use Read Naturally intervention programs, as appropriate.

Part I: What Is Dyslexia?

Dyslexia is a genetic condition of the brain that affects the functioning of the reading network.[1] This network comprises a set of specialized areas and the connections among them that enable the brain to store, process, and transmit information central to the act of reading:

- analysis of visual inputs of written language
- sounds of individual letters and groups of letters
- pronunciations of words and syllables
- spellings of words and common spelling patterns
- meanings of words and word parts
- conceptual and content knowledge
- grammar and syntax

Figure 1 on the next page illustrates some of the identified areas of the reading network that comprise the "diverse constellations of related and integrated processes" used to read words.[2]

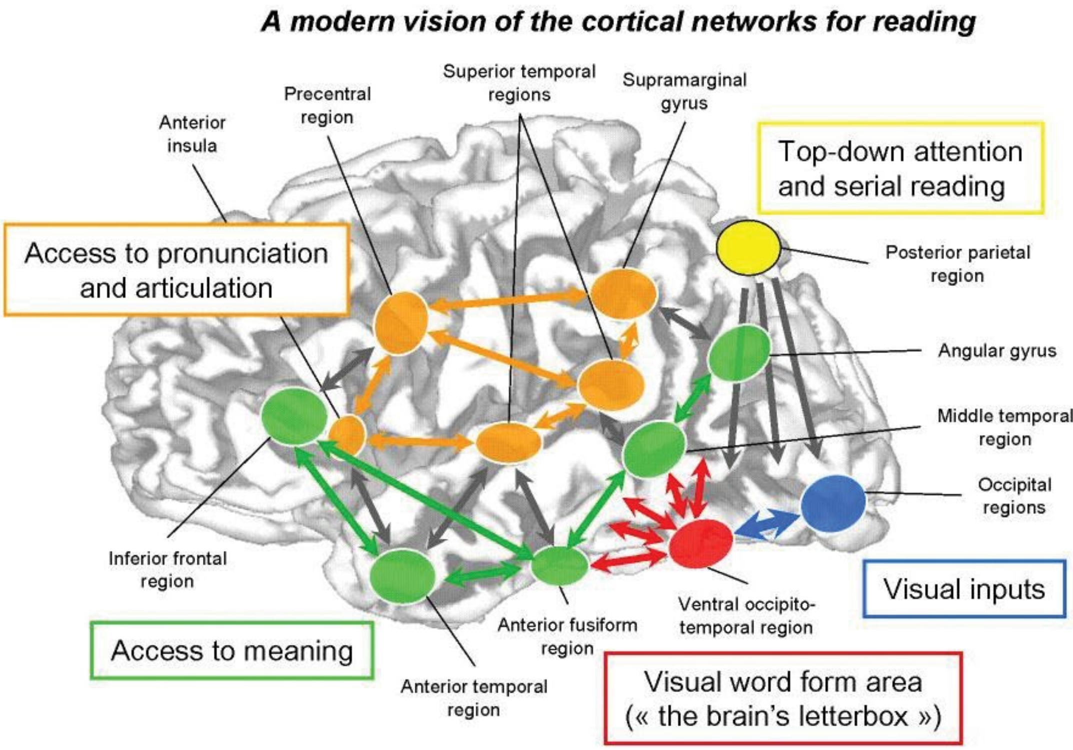

Figure 1. Illustration of the brain's left hemisphere, highlighting areas used for reading and the complex connections between areas. From *Reading in the Brain: The New Science of How We Read* (p. 63) by S. Dehaene. Copyright 2009 by Penguin Books. Used with permission. For a list of resources for further reading about reading and the brain, see Appendix A.

Dyslexia may occur alongside additional conditions, such as attention deficit disorder, dyscalculia (a math disability), or dysgraphia (a writing disability). Dyslexia is unique from other causes of poor reading, such as sensory disabilities, cognitive disabilities, other language disorders, or environmental factors. It has been shown to be independent of general intelligence.[3]

In addition to the medical classification of dyslexia as a "neurodevelopmental disorder with a biological origin," dyslexia may be classified educationally as a *specific learning disability* (SLD) in reading.[4] It is important to note, however, that not all learners with dyslexia will need or qualify for special services, nor does every struggling reader have dyslexia. Specific learning disabilities like dyslexia selectively affect areas of the brain used for storage, processing, and retrieval of information essential to tasks such as reading, writing, speaking, mathematics, or reasoning. It is estimated that roughly 80% of students who qualify under SLD criteria in the United States have a reading disability.[5]

Because dyslexia is highly complex and affects people along a continuum of severity, estimates of its prevalence vary widely and should be viewed as rough approximations. These estimates are influenced by many factors, including differing definitions of dyslexia, the assessment measures and instruments used, analysis methods, qualification thresholds, the language of assessment, and more. Studies commonly report that 3–5% of individuals are severely impacted by dyslexia while 9–17% of individuals may be impacted to some degree.[6]

The brain differences for learners with dyslexia make learning to read and write more difficult. Specifically, these differences may affect the ease with which individuals:

- notice, identify, and manipulate the sounds of spoken language *(phonemic awareness)*
- learn to map those language sounds onto individual letters and groups of letters *(grapheme-phoneme correspondence)*
- read unknown words *(decoding)* or known words *(word recognition)*
- spell words *(encoding)*
- organize spoken and written language *(syntax* and *semantics)*

The added challenges that individuals with dyslexia face when applying the above skills have practical impacts on their learning. Learners with dyslexia typically:

- require more explicit instruction, more modeling and practice, and greater feedback and support to master phonemic awareness and basic phonics
- exhibit slower overall reading speed with less accuracy, making comprehension more difficult
- have difficulty with spelling and written expression

Due to its complex nature, dyslexia affects individuals differently, and the severity of symptoms varies along a continuum from mild to severe. Longitudinal studies show that dyslexia is a lifelong condition; it is not something a person outgrows. However, with early and appropriate intervention, it is possible to prevent dyslexia from ever being a factor in a reader's life.[7]

What Causes Dyslexia?

There are two broad types of dyslexia. *Acquired dyslexia* occurs when a person who has learned to read suffers loss or impairment of reading ability due to brain damage, such as from a stroke, disease, or traumatic brain injury. *Developmental dyslexia*, as the name implies, is caused by abnormal brain development; it is a congenital disorder, which means it is something people are born with. This paper focuses on developmental dyslexia (hereafter, simply referred to as dyslexia) and its educational implications.

Like reading itself, the construct of dyslexia is highly complex; it is a multi-faceted syndrome whose symptoms likely originate from many diverse causes. While science has identified several factors thought to contribute to dyslexia, the root causes of these differences are still unknown.[8] In addition, it is unclear which factors cause reading difficulty, which may simply occur at the same time, and which may be a byproduct of impaired reading. Current evidence does, however, support findings that dyslexia is (a) genetic in origin, (b) hereditary by nature, and (c) impairment of the brain's reading network—the areas used for reading and the connections among them.

Genetics and Brain Development

Neurobiologists have identified many brain differences between individuals with dyslexia and typical readers. These differences affect both the formation[9] and connectivity[10] of the brain, notably leading to abnormalities in a variety of key areas used for language processing and reading. Most of these areas are located on the left side of the brain.

Modern brain-imaging technologies (e.g., PET, MEG, and fMRI scanning) allow researchers to map brain activation during specific reading tasks. Studies have found a variety of differences in the activation of the reading network between dyslexic and non-dyslexic readers.[11] Abnormalities in *neuronal migration*, an important process of early brain development, are suspected to be a genetic root cause of some developmental differences.[12]

Heredity

It was observed over a century ago that dyslexia runs in families.[13] Longitudinal studies of identical and fraternal twins have since provided evidence that dyslexia is indeed hereditary and at least partly due to genetic factors. While all struggling readers are affected by environmental factors such as the quality of their education, it is estimated that about half of dyslexia differences are due to heritable genetic factors.[14] Studies estimate a 30–50% chance that a child of a dyslexic parent will have dyslexia.[15] In addition, if a student has dyslexia, it is likely that half of his or her siblings will also be dyslexic.[16] For this reason, children with a parent or sibling who is dyslexic are considered to have family risk for dyslexia. Family history is a critical component of any assessment system for early identification of those at risk for dyslexia.

In support of these findings, scientists have identified several genes thought to contribute to dyslexia.[17] These susceptibility genes are found in higher prevalence in individuals with dyslexia than in those without. Several of these genes are known to relate to neuronal migration, while others affect the "hard-wiring" of connections (myelinization). Although neurobiologists and geneticists continue to shed light on possible causes within the human genome—that is, the chromosomes and genes that make up each person's DNA and that can be passed on to future generations—the exact genetic causes of dyslexia are still unknown and under exploration.

Dyslexia and Vision

While there are still active questions about possible contributions to dyslexia of visual connection speeds and visual processing within the reading network (e.g., magnocellular pathway delays), students with dyslexia do not fail to see the letters or words on the page. Through the mid-1900s, dyslexia was thought to be primarily a problem of vision; however, researchers today generally agree that dyslexia is not caused by vision problems. Word reading and visual memory tasks (that is, the identification of objects) have been shown, first observationally[18] and more recently through neurological imaging,[19] to be separate processes that utilize different parts of the brain. Researchers have thus been able to show that general visual input is not the underlying cause of impairments to the reading network.

Letter Reversals

Mirror errors, or letter reversals, are naturally occurring errors made by children learning to read. Because learners with dyslexia have historically tended to languish in the early developmental stages of reading, especially without adequate instruction and support, it was once thought that reversal of letters was an underlying condition of dyslexia.[20] However, this naturally occurring error made by students prior to completing the mapping of letters to sounds is merely a symptom of their developing reading. More importantly, these errors are not the result of poor vision but instead a byproduct of the absence of automatic and accurate letter identification.

Type Fonts

Proficient readers have an uncanny ability to strip away all of the irrelevant features of a word—like the style (differences in the possible shapes, weight, and incline of each letter),[21] size,[22] and case[23]—in order to retrieve what remains constant in each experience with a word: the letters and their order. Figure 2 illustrates some of the differences encountered in written words. Proficient readers have the remarkable capacity to read words automatically and accurately, regardless of variation in words' visual representations.

Size	Case	Letter Shape	Weight and Inclination
Size Size Size Size	lower case UPPER CASE MiXeD cAsE	Type font Type font *Type font* **Type font**	Normal Type **Bold Type** *Italic type*

Figure 2. Chart illustrating some of the characteristics that may vary in written words.

Recent claims have been made that certain fonts, including those specifically aimed at learners with dyslexia (for example, Dyslexie, OpenDyslexic, and Read Regular), make learning to read easier or improve reading proficiency for those with dyslexia. Yet research studies reject these claims[24] or find that any benefits equally affect readers with and without dyslexia.[25] In short, there has been no font found that specifically helps learners with dyslexia to read.

Convergence Insufficiency

Visual disorders like convergence insufficiency may produce negative symptoms during reading, such as eye strain or headache. However, a joint technical report on learning disabilities, dyslexia, and vision from the American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, and American Association of Certified Orthoptists (2011) found that individuals with convergence insufficiency neither learn to read at a slower rate nor achieve at reduced rates of proficiency.[26] So, while visual disorders such as convergence insufficiency may co-occur in individuals with dyslexia or general reading difficulty, it is not considered an underlying or contributing cause to specific characteristics of dyslexia.

Note: While vision issues are neither a symptom nor a cause of dyslexia, uncorrected visual problems can adversely affect any child's reading and should be addressed accordingly.

Part II: How Do Proficient Readers Read Words?

To appreciate the differences in the reading experience for individuals with dyslexia, it is important to first understand how reading occurs for typically functioning readers.

The Simple View of Reading

One framework used frequently to describe the process of learning to read is called the Simple View of Reading.[27] When beginning readers learn the foundations of reading, they create new storehouses and pathways in the brain to connect printed words with knowledge already developed through the acquisition of spoken language (word meanings, pronunciations, grammar, and syntax). The Simple View of Reading expresses this idea as an equation:

Reading Comprehension = Decoding x Linguistic Comprehension

That is to say, beginning reading involves learning to identify the pronunciation of written words (decoding) to allow access to a child's knowledge of those words in their verbal vocabulary (linguistic comprehension). Dr. David Kilpatrick summarizes this idea plainly:

> The simple view says that if a student can quickly and effortlessly read the words in a given passage *and* if that student can understand that same passage when it is read to her, it follows that the student should be able to comprehend that passage when she reads it herself.[28]

However, this is more complicated than it sounds because the areas used by the brain to do this work first need to be wired or—in one important case—rewired.

Building the Brain's Letterbox

The reading of a word begins in an area in the back, lower left side of the brain.[29] This area, which neuroscientist Stanislas Dehaene calls the "brain's letterbox," is not set up from birth for the "unnatural" act of reading.[30] In a person's earliest years, this area is used for object identification, such as recognizing faces. However, over the course of years of reading instruction and practice, the area is slowly rewired to specialize for reading. Several astonishing events happen during this remodeling of the brain. The object identification functions that naturally occur there move out to live in a different neighborhood of the brain, and the area is rebuilt to process letters and words. The letterbox becomes a hub of communication with other areas of the reading network that house pronunciations, spellings, and meanings.[31] This is true for all human beings who learn to read, regardless of the language they use.

> **Note:** In a similar manner, a natural visual mirror effect between the left brain and right brain must be overridden to discriminate letter pairs like *b* and *d* or *p* and *q*. As with the remodeling of the letterbox, this rewiring can take several years to solidify; it explains a developmental phase during which children may "mirror write," or write words backwards. For most students, this behavior disappears by the intermediate grades as the result of

ongoing reading and writing experience. However, there are rare cases in which this unlearning of the mirror effect does not occur and causes severe impairment of letter learning.[32]

The remodeling of the letterbox starts when emerging readers begin to learn the alphabetic principle. But before discussing how new readers learn to read print, it is important to consider the knowledge of spoken sounds that most typical pre-readers bring to reading instruction and what new knowledge of sounds develops while they are learning to read.

Understanding Phonemic Awareness

Several ancient civilizations developed writing systems without lasting success. Notably, these systems only used pictures to represent objects or symbols to represent abstract ideas. It wasn't until humans innovated writing systems to represent the *sounds* of spoken words as well as convey meaning that the systems began to take root. While all languages communicate some information about pronunciation, an alphabetic language like English relies on the correspondence between its arbitrary symbols and its spoken sounds.

Phonological awareness is the conceptual understanding of the units of oral language: individual sounds, onsets and rimes, syllables, and words. Many children enter school with an understanding of these components already in place, gained through the typical developmental acquisition of oral language and through environmental interactions with songs, nursery rhymes, stories read to them, or educational programs like *Sesame Street*.

The smallest units of sound in a language are called *phonemes*. Phonemic awareness is a critical component of phonological awareness and represents understanding that spoken words are made up of these individual sounds. Unlike the understanding of rhyme or alliteration, which is often acquired through exposure to spoken language and early word play, the discovery of phonemes may not be learned prior to formal reading instruction. This is one of the primary reasons that reading is considered an "unnatural act." A study of illiterate adults found that they were able to discriminate speech sounds, play with syllables and rhymes, and recognize words as having the same endings. However, they did not perceive and could not identify or manipulate the smallest units of sound because they had never been taught.[33] Unlike letters, which are discrete and reveal clear boundaries, the sounds of spoken language are delivered in a seamless fashion in which phonemes blend and overlap with each other. Discovering these isolated sounds is the key to unlocking the alphabetic code.

Because understanding phonemes is necessary to becoming a proficient reader, phonemic awareness has been identified as an essential component of reading instruction. Phonemic awareness is auditory. Instructional practices designed solely to build a learner's awareness of phonemes may be conducted without print of any kind—no letters, words, or connected text. They teach a child to notice, consider, and manipulate the sounds that make up spoken words. Indeed, a learner first needs to understand that the spoken word cat has three sounds before being able to connect those sounds to its letters. The findings of the National Reading Panel (2000) suggest that all kindergarten students will likely benefit from explicit instruction in phonemic awareness; however, the duration and intensity should be differentiated according to the needs of individuals and/or small groups.[34]

Because of the critical importance of phonemic awareness to reading acquisition, assessments of phoneme segmentation have been shown to be particularly strong predictors of future reading achievement. These tests are often administered as part of early screening to identify children at risk of reading difficulty and are another important part of screening for early risk factors of dyslexia.[35]

The Alphabetic Principle and Its Relationship to Phonemic Awareness

In addition to developing phonemic awareness in isolation through oral activities, learners also cultivate this awareness as they are taught the symbols of the language. The *alphabetic principle* is the understanding that both individual letters and groups of letters (together known as *graphemes*) are used to represent the smallest sounds in written language. The study of phonemes and graphemes is mutually beneficial: analyzing speech sounds clarifies the function of letters, and learning letters draws attention to the sounds of speech.

Consider why this might be true in each direction. In order to establish a connection between a letter and a sound, a learner must first have a clear understanding of each. A strong awareness of the spoken sounds in a language anchors newly learned letters to this previous knowledge. For this reason, students with phonemic awareness and basic phonological skills have been shown to learn letter-sound correspondence more quickly than those who do not.[36] In the other direction, students must learn that every different iteration of the letter a (for example, a *a* a **A** A) is actually the same letter. Having a name for the category of symbols that represent the grapheme a allows each new example of the letter to fit into the learner's existing knowledge of the letter. In addition, many letter names include a corresponding sound that the letter represents; learners utilize embedded sounds within letter names when developing grapheme-sound correspondences. For these reasons, learners who know letter names tend to learn letter-sound correspondences more quickly.[37] In fact, letter naming has been found to be another strong predictor of future reading success.[38] Timed letter-naming assessments are used to evaluate a learner's confidence and automaticity with the letters being identified.

Learning the abstract concepts of phonemic awareness and the alphabetic principle is complicated in English by the fact that these associations are inconsistent; there are many exceptions and partially regular pronunciations and spellings (*orthography*).[39] Because of this, it takes children learning English 2 to 3 years longer to master highly accurate word reading than it does for children learning alphabetic languages with more regular spellings.[40] For at-risk and dyslexic learners with possible phonological core deficits, effective instruction and intervention are thus even more critical.

Phonics Instruction and Decoding

Research has consistently shown that readers learn to read most efficiently when provided with *phonics instruction*—that is, the explicit, systematic teaching of the grapheme-phoneme correspondences of a language.[41] It is especially imperative that dyslexic learners receive high-quality phonics instruction and access to additional phonics intervention until these concepts have been mastered.[42] Some evidence suggests that dyslexic readers may struggle to generalize word learning when encountering new words. These students may need to learn correspondence or spelling rules multiple times,[43] and they may not master these concepts and skills without ongoing, intensive intervention in phonemic awareness and phonics.

While phonics begins with letter-sound correspondences, it should quickly move to the applied skill of *decoding*, or using knowledge of letter-sound relationships and letter patterns to correctly pronounce written words. Because the ability to identify and blend sounds together is essential to successfully decoding words, phonological assessments of phonemic awareness may reveal a possible underlying cause of poor decoding. If a student has not mastered phonological skills, such as blending, segmenting, and manipulating sounds, phonemic awareness instruction is a necessary part of intervention to remediate poor decoding.

Recall that decoding is paired with linguistic comprehension as one of the two core components of the Simple View of Reading. Use of letter-sound knowledge to decode is one of two ways readers identify words. It is called the *phonological route* and is used to read the following types of words:

- words in a reader's oral vocabulary that have never been encountered in print
- unknown words
- pseudowords (also called nonsense words or non-words)

Phonics assessments that include pseudowords, such as the *Quick Phonics Screener*, evaluate another important risk factor for reading disability and should be part of any assessment plan.[44] When students read non-words, it isolates their ability to apply letter-sound knowledge and blending by removing all other information readers normally utilize to identify words, such as word meaning, context, and grammar. The reader must rely solely on decoding skills.

Sight Words and Orthographic Mapping

While decoding is used to read unknown words and pseudowords, proficient readers have a second method for recognizing words called the *lexical route* (or sometimes, the *direct route*). Unlike the phonological route, by which readers move from visual input to word pronunciation in order to retrieve meaning, the lexical route moves from visual input directly to the meaning of a familiar word. To understand this second path, it is important to know how readers store sight words.

A *sight word* is a word with either regular or irregular spelling that is recognized automatically and immediately "on sight" without the need to decode it. Research has shown that there are tremendously fast processes occurring in the brain during word recognition of known words. The reason these words are identified so quickly is because of how they are stored. Known words are believed to be learned through a process called *orthographic mapping*, "the formation of letter-sound connections to bond the spellings, pronunciations, and meanings of specific words in memory."[45]

Orthographic mapping occurs when a reader breaks down the pronunciation of a word into its separate sounds (*phoneme segmentation*) and then maps the corresponding graphemes and patterns of its written form, or spelling, to its pronunciation and meaning.[46] The mapping process allows the word recall necessary for reading and writing a word and creates a direct shortcut to recognizing the word in the future without decoding it. While studies have shown that orthographic mapping can occur in as few as one to four encounters with a word, learners with reading impairment may require many more experiences before a word becomes recognized on sight.

Important! Although the label *sight word* implies that words are identified as whole units, they are not. The brain utilizes a word's constituent parts (graphemes, syllables, the order and relative positions of letters within the word, and word parts) to identify the correct word from the tens of thousands of other words in its mental dictionaries. Readers recognize orthographically mapped words with such speed that it just seems that they are identified "by sight."

Spelling inventories and Oral Reading Fluency assessments (using word lists or connected texts) provide information for evaluating a reader's ability to learn sight words. Spelling knowledge of real, developmentally appropriate words demonstrates the extent to which a student has learned words and spelling patterns. Orthographically mapped sight words are necessary for automatic and effortless oral reading as measured through Oral Reading Fluency assessments.

Fluency

Fluency is the ability to read with accuracy, at an appropriate speed, and using proper expression when reading aloud. Forty years of research studies indicate that fluency is one of the critical building blocks of reading. Evidence supports the following findings:

- Fluency highly correlates with reading comprehension.[47]
- Fluency strongly predicts later reading achievement.[48]
- Fluency causally contributes to improved comprehension.[49]

When students read fluently, they are more likely to comprehend what they are reading. Consequently, teachers need to find ways to intentionally develop their students' fluency. While some students learn to read fluently without explicit fluency instruction, other students need more support than provided during normal classroom instruction.

Fluency practice alone will not remediate missing phonemic awareness or grapheme-phoneme correspondences (that is, phonics). Therefore, it is important that assessment plans evaluate the underlying causes of poor reading fluency, especially for at-risk readers. If phonics deficits are discovered, explicit remedial intervention is required to build this knowledge. While phonics instruction is beneficial for all students, those with underlying disabilities like dyslexia seldom discover these concepts organically like typical readers sometimes do. They must be taught.

Oral Reading Fluency (ORF) assessments and Curriculum-Based Measurement (CBM) have been shown to be valid and reliable measures of reading fluency and overall reading performance. For this reason, these assessments are universally used as screeners to identify readers at risk of ending a school year short of expected reading performance for their age and who may have an underlying disability.

Part III: How Does Dyslexia Affect Typical Reading?

Building on the robust understanding of how proficient readers read presented in Part II, the next part of this paper explores how typical reading can be disrupted for learners with a reading disability. Scientists have identified specific tasks in the word-reading process that may be impaired. Each possible underlying impairment has been labeled, and readers with a specific impairment may be considered to have a certain subtype of dyslexia. While these subtypes are not typically used within educational settings and many individuals with dyslexia do not fit neatly into any one classification, ongoing research into each type may one day provide evidence to inform assessments and interventions to help struggling readers with these specific characteristics.

Overview of Dyslexia Subtypes

There are two prevailing theoretical models held by scientists who study reading disability: the *dual-route* model of reading and the *connectionist* model of reading. This section briefly explores dyslexia classifications from each scientific camp.

Dual-route Subtypes

Cognitive psychologists who study the dual-route theory of oral reading work within a model that describes two primary pathways readers use to identify words. These pathways, called the phonological route and the lexical route, have already been described above (see "Phonics Instruction and Decoding" and "Sight Words and Orthographic Mapping" in Part I). Studies have demonstrated specific breakdowns that may occur within these two pathways.[50]

For those in the dual-route camp, dyslexia is fundamentally considered an impairment in one or more of the linear steps of the model, and the core deficit affects the functions or related connections to the phonological system. Generally, research into this model has found that individuals with dyslexia may have impairment in one of two areas: the initial identification of letters in a word and their order (*peripheral dyslexias*) or the analysis of letters to identify a word (*central dyslexias*).

Peripheral Dyslexias

A reader with a type of peripheral dyslexia may have an impairment in any of three tasks completed during the initial identification of letters in a word. Such a reader may struggle or be unable to:

- connect a letter to its sound (*letter identity dyslexia*)
- correctly identify a letter's position in a word (*letter position dyslexia*)
- correctly associate a letter with the correct word (*attentional dyslexia*)[51]

Central Dyslexias

If the letter string is correctly identified and stored in short-term memory, a learner with a type of central dyslexia may alternatively have impairment in either of the two later analysis processes, the so-called "dual routes" of word recognition:

- breakdown in the phonological route used to decode unknown or nonsense words (*phonological dyslexia*)
- breakdown in the lexical route used to read known sight words (*surface dyslexia*)

Deep Dyslexia

If both routes are compromised, a learner may have a dual impairment that forces them to try to read by meaning alone (*deep dyslexia*).

Connectionist Subtypes

The connectionist model of reading ascribes to the same basic systems (functions and connections) as the dual-route model, but it is based on a theory of *parallel distributed processing*,[52] the idea that information is simultaneously accessed and communicated across all parts of the system (sounds, spellings, and meanings) rather than in a step-by-step, serial fashion. Those who study reading from a connectionist point of view apply a more holistic approach to the study of phonology, orthography, and semantics. Accordingly, researchers in this camp explore the effectiveness and efficiency of the entire neural network as well as the roles of orthographic and semantic processes in reading disability. Using computer models of this theory of reading, researchers have explored the contributions to and possible causes of disability from additional cognitive processes, such as working memory, processing speed, and the synchronization or "timing" of simultaneous tasks (*temporal processing*).

A full exploration of all these areas of research is not relevant to understanding the approaches and benefits of Read Naturally programs for dyslexic learners and, therefore, falls outside the scope of this paper. However, there are a couple of concepts worth highlighting: the double-deficit model of dyslexia and the contribution of rapid automatized naming.

Double-Deficit Subtype

Citing connectionist models, Wolf and Bowers proposed that naming-speed deficits may be a contributing factor in dyslexia beyond core phonological skills and that students with deficits in both areas would be more severely impaired.[53] Many studies support the independent effects of both components of the theory; however, their relationships to and implications for dyslexia are still under investigation.[54]

Rapid Automatized Naming

While the causal role of processing speed and timing deficits to dyslexia are still under study, Rapid Automatized Naming (RAN) has been shown to be an independent core deficit for some dyslexic readers. RAN assessments[55] (the timed naming of items such as pictures, numerals, letters, or colors) have been shown to be excellent predictors of reading performance in beginning readers.[56] Rapid naming is thought to be an indicator of the automaticity, coordination, and synchronization of the visual, sound, spelling, and meaning centers of the reading network which must work efficiently to read at an optimal level. For this reason, RAN assessments are sometimes used as part of assessment plans for the early identification of risk for reading disability in younger children (PreK–Gr. 1) before more direct measures of reading ability become valid indicators.

Part IV: Dyslexia and Read Naturally Programs

In his review of studies of highly successful reading programs, Dr. David Kilpatrick (2015) identifies three key elements of successful reading interventions:

1. Eliminating the phonological awareness deficits and teaching phonemic awareness to the advanced level
2. Teaching and reinforcing phonics skills and phonic decoding
3. Providing opportunities for reading connected text (i.e., authentic reading)

— *Essentials of Assessing, Preventing, and Overcoming Reading Difficulties, p. 304*

Read Naturally offers several supplemental programs that can be used to achieve these identified outcomes. Figure 3 summarizes which Read Naturally programs provide instruction in each area.

Phonemic Awareness	Phonics and Decoding	Fluency (Reading connected text)
*Fun*ēmics	Read Naturally Live / Encore	Read Naturally Live / Encore
GATE+: Reading Intervention for Small Groups	GATE+: Reading Intervention for Small Groups	GATE+: Reading Intervention for Small Groups
	Word Warm-ups	Word Warm-ups
	Signs for Sounds	

Figure 3. Read Naturally programs sorted by the three key elements of successful reading interventions as defined by D. Kilpatrick.

This final section of the paper provides information and explanation about Read Naturally intervention programs designed to achieve each of these three goals. It also discusses the needs of learners at risk or diagnosed with dyslexia and the ways instructional practices and materials support such learners to achieve reading proficiency.

Phonemic Awareness

Blending sounds is essential for decoding words, and segmenting sounds is essential for orthographic mapping of word spellings to establish sight words. For these reasons, phonemic awareness should be evaluated in emerging and at-risk readers and remediated as needed. Learners with dyslexia typically have underlying impairments that make the acquisition of these insights more difficult than for other students. Therefore, a student who has or is at-risk for a reading disability will likely need supplemental and sustained instruction in this area. The following Read Naturally programs build phonemic awareness.

*Fun*ēmics

*Fun*ēmics is an exclusively sound-based phonemic awareness program offering developmentally appropriate instruction for young learners and easy alignment to core programs for use as an intervention for at-risk readers. The program comprehensively teaches all six types of phonemic awareness (isolation, blending, segmentation, addition, deletion, and manipulation) to small groups of pre-readers or struggling readers without reference to print. With this program, a learner gains awareness of words, syllables, rhymes, phonemes, and phoneme manipulation using a scripted curriculum. Spiral-bound lesson guides correspond to interactive exercises displayed for each learner on an iPad or Macintosh computer. View the *Fun*ēmics Sample to see lesson samples. See Appendix B to review the *Fun*ēmics scope and sequence chart.

GATE+: Reading Intervention for Small Groups

Every lesson in the GATE+: Reading Intervention for Small Groups program includes explicit phonemic awareness instruction. Students focus on target sounds and practice segmenting and blending words with that sound with teacher support. Using large flipcharts and student workbooks, GATE+ is intended for small-group or individual instruction. The program lessons also include instruction in the other components of reading: phonics, vocabulary, fluency, and comprehension. See page 4 of the Read Naturally GATE+ Level 1.3 Sample lesson for an example of the phonemic awareness activities "Listen for Vowel Sounds in Words" and "Blend Sounds Into Words."

Phonics and Decoding

All Read Naturally programs are phonics-based and provide explicit, systematic instruction. Programs support a student along the entire continuum of phonics development. In addition to explicit lessons and word reading practice, most programs provide nonfiction stories with multiple decodable words using the featured sounds to reinforce grapheme-phoneme correspondence. Passages are written to provide ample practice in applying phonics knowledge to decode words and the necessary repetition to aid striving readers in orthographic mapping.

As dyslexia researcher Dr. Sally Shaywitz explains, "The use of decodable [texts] enables the repeated practice necessary to build the automatic systems in the word form region that lead to fluent reading."[57] Read Naturally's nonfiction passages contain carefully selected words, many of which are decodable, providing learners with the practice, feedback, and wide reading necessary to conduct the rewiring in the brain needed to build the letterbox and conquer the code.

Read Naturally Live / Encore

Both the web-based intervention program Read Naturally Live and its print/audio CD alternative Read Naturally Encore build phonics skills in a variety of ways. The Phonics series of these programs is a specific collection of levels designed to teach and reinforce phonics skills.

Each phonics level in the series provides:

- an explicit phonics lessons with every nonfiction passage
- word lists for practice with the featured phonics sound(s), including many words within word families
- stories to provide practice with decoding skills and to reinforce orthographic mapping

To view the scope and sequence of phonemes, graphemes, and word families covered in the Phonics series, see the Read Naturally Live/Encore Phonics Elements by Level chart found in Appendix B.

Extensive audio supports built into the Read Naturally Live and Read Naturally Encore programs offer additional benefits for learners with dyslexia. Audio-supported key words, story narration, and clickable story words (only in Read Live) help dyslexic learners in the following ways:

- **Audio supports teach pronunciation of unknown words and activate prior knowledge in a student's oral vocabulary.** Remember, this knowledge brought to the story is the Linguistic Comprehension part of the Simple View of Reading framework. Because dyslexia is not associated with IQ, children with dyslexia often have very well-developed listening vocabularies. Activating this knowledge allows readers to access this information while focusing on decoding and practicing words.
- **The Read Along step provides simultaneous, multimodal exposure to both pronunciation and visual word forms.** Both Read Live and Encore include every passage narrated at three progressively faster speeds. The slower recordings can be especially helpful for a student whose phonological system works but processes slowly. Because orthographic mapping requires a two-step process of segmenting the sounds in a word and then mapping them to the graphemes in the word, this slower pace should help dyslexic readers to map words to their mental sight-word dictionaries.

Another beneficial feature of the Read Live and Encore programs is the significant word repetition. As mentioned previously, dyslexic readers often need many more exposures to words to make them sight words. A reader may learn far fewer words than non-impaired classmates when the student's reading pace is slow. Lesson and word repetition ensure that striving readers receive enough exposures and opportunities to decode and read words aloud to map them into their mental dictionaries (*lexicons*). A learner experiences repetition in these programs in several ways:

- Vocabulary words are often repeated within passages and occur across stories in each level.
- A learner experiences several read-along practices. (The default is three.)
- A learner conducts 3–10 independent practices with each word list and story.
- Featured phonics elements are introduced in an opening lesson.
- Nonfiction passages use many decodable words, offering multiple exposures to featured patterns.

- Word lists include columns of words that share and reinforce featured patterns.
- Glossaries provide definitions and additional sample sentences for many words.

Finally, the Read Live and Encore programs utilize teacher conferencing and ongoing progress monitoring. Through frequent and structured interactions with a learner, teachers have many opportunities to provide mini lessons, differentiate supports through customizable story options, provide feedback and encouragement, and ensure that each reader is responding to intervention as intended. Managing frustration for a student with a disability is very important; emotional and behavioral issues have been widely documented for students facing the challenges of reading disability. Built-in progress monitoring allows a student to see reading improvement over time and thus be motivated to continue working towards proficiency. View Phonics Series Sample Stories for a preview of each level in the Read Live and Encore programs' Phonics series.

Word Warm-ups

The Word Warm-ups phonics program specifically targets the development of proficient decoding through supplemental phonics lessons. This reading program features systematic phonics instruction that teaches a student to decode and encode one-, two-, and three-syllable words easily. Audio-supported lessons for teaching phonics allow for individualization and enable students to work independently. The phonics elements covered within each level of Word Warm-ups are presented in Appendix B of this paper. Examples of lessons and materials from the program may be viewed in the Word Warm-ups Sample.

GATE+: Reading Intervention for Small Groups

The GATE+ program provides explicit, systematic phonics instruction for individuals or small groups. Using the program, a teacher models each lesson on a large flipchart before students work in individual student booklets. Story questions review the featured sounds, and students spell words with the featured pattern. See page 4 of the Read Naturally GATE+ Level 0.8 Sample to view phonics activities in the program that teach grapheme-phoneme correspondences: "Practice Letter Sounds With and Without Teacher Support." Page 6 offers sample lessons for decoding and word-reading practice. See Appendix B in this paper to review charts showing the scope and sequence of skills and featured sounds used in GATE+.

Signs for Sounds

The Signs for Sounds program provides explicit phonics instruction paired with explicit spelling instruction. Lessons teach and reinforce the skills necessary to read and spell decodable and irregular words, thereby building the knowledge required for orthographic mapping. While not specifically a phonemic awareness program, Signs for Sounds does help reinforce phonemes and phoneme-grapheme correspondences. All phonics rules are revisited in this unique spelling program.

Fluency (Reading Connected Text)

> During independent reading time, many at-risk students do not read at all, will not or cannot independently read the books in classroom libraries, pretend to read, or just look at the pictures.
>
> As a result, poor fluency is a self-perpetuating problem. Striving readers read so few words during their instructional and independent reading time that the gap between the number of words they read compared to their peers continually widens. These readers need targeted and intensive instruction in order to achieve fluency.

This excerpt from the 2019 *Read Naturally Encore II Teacher's Manual* highlights an experience seen all too often in some classrooms.[58] By providing phonemic awareness and phonics interventions, a student gains the tools necessary to "self-teach" new words through the process of orthographic mapping.[59]

Read Naturally Live, Read Naturally Encore, GATE+: Reading Intervention for Small Groups, and Word Warm-ups all provide opportunities to read connected text at appropriate levels of rigor, supported by many program features. The Read Naturally Strategy at the core of each program incorporates a framework of evidence-based practices (word preview, prediction, listening passage preview, goal setting, student choice, assisted repeated reading, feedback, performance reading, progress monitoring, question answering) and best practices in phonemic awareness, phonics, fluency, and vocabulary instruction. Once a student has gained phonemic awareness and cracked the code, the leveled nonfiction passages within these fluency programs provide structured, supported, and highly motivating opportunities to practice and reinforce these skills in connected texts.

Conclusion

Learning to read is an unnatural act and highly complex. For individuals with dyslexia, acquiring the ability to read and write can be much more difficult. This hereditary, genetic disorder is the result of abnormal early brain development and, therefore, affects every person differently. Through use of early screening and diagnostic assessments, education systems can identify learners with the characteristics of dyslexia and provide necessary intervention and supports to assist students in learning to read known, unknown, and made up words—a critical part of a simple view of reading. Reading acquisition requires effective instruction in the foundational components of phonemic awareness, phonics, and fluency.

Read Naturally provides a menu of supplemental intervention programs to assist educators in providing effective instruction in a variety of contexts. These programs build knowledge and skills across critical components of proficient reading. Questions about Read Naturally's programs or the content of this paper may be directed to the following:

For program questions, contact customer service: customerservice@readnaturally.com

Note: While the scope of this paper was limited to the foundational components of phonemic awareness, phonics, and fluency—the areas most affected by the phonological deficit of dyslexia—the goal of reading is comprehension of text. Discussion of comprehension and Read Naturally programs can be found on the Comprehension webpage.

End Notes

1 Many states in the U.S. have adopted into law the 2002 definition of the International Dyslexia Association: "Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge" (IDA Board of Directors, 2002).

2 Roberts, Christo, & Shefelbine, 2011 (p. 242).

3 Ferrer, B. Shaywitz, Holahan, Marchione, & S. Shaywitz, 2010.

4 *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5), 2013 (p. 63).

5 Lerner (1989) as cited in Shaywitz (2003) and S. Shaywitz & J. Shaywitz (2020).

6 Researchers have discussed the challenges of estimating prevalence of reading disability for decades without common resolution; see Hammill & Allen (2020) and Miles (2004) for representative examples. Waesche, Schatschneider, Maner, Ahmed, & Wagner (2011) demonstrate the significant difference that methods of analysis can have on prevalence rates; their data analysis from one pool of students using several methods found poor to moderate rates of agreement among four methods, a traditional IQ-achievement discrepancy and three methods of Response to Intervention identification of reading disability (low achievement, low growth, a combined "dual discrepancy"). That is, each method identified different students as having or not having a reading disability. More surprisingly, longitudinal analysis found that individual methods identified the same students differently (having a reading disability or not) across grade levels.

7 Hasbrouck, 2020; S. Shaywitz & J. Shaywitz, 2020.

8 A small sample of the breadth of theories and potential contributors to dyslexia currently being studied and debated includes: consideration of temporal processing issues as evidenced by differences in magnocellular neurons (Stein, 2018; Blythe, Kirkby, & Liversedge, 2018) or "sluggish attentional shifting" (Krause, 2015), differences in hemisphere dominance and anomalies in the corpus callosum connecting the "left brain" and "right brain," deficits in rapid information processing (Tallal, Miller, & Fitch, 1993), dysfunction in the cerebellum (Stoodley, 2015), developmental abnormalities (e.g., ectopias), and other causes that impair any of the many different components and connections within and among the various networks of the broader language system.

9 Anatomical differences include cortical thickness and gyrification abnormalities affecting gray matter density (Williams, Juranek, Cirino, & Fletcher, 2018).

10 Connectivity differences have been found to include abnormal connections under the parieto-temporal region of the left hemisphere (Klingberg, Hedehus, Temple, Salz, Gabrieli, Moseley, & Poldrack, 2000; Beaulieu, Plewes, Paulson, Roy, Snook, Concha, & Phillips, 2005; Deutsch, Dougherty, Bammer, Siok, Gabrieli, & Wandell, 2005; Silani, U. Frith, Demonet, Fazio, Perani, Price, C. Frith, & Paulesu, 2005; Niogi & McCandliss, 2006), the occipito-temporal visual processing cortex, which includes the "visual word-form area" (Dehaene, Le Clec'H, Poline, Le Bihan, & Cohen, 2002), and of the corpus callosum (Njiokiktjien, de Sonneville, & Vaal,

1994; Hynd, Hall, Novey, Eliopulos, Black, Gonzalez, Edmonds, Riccio, & Cohen, 1995; Rumsey, Casanova, Mannheim, Patronas, DeVaughn, Hamburger, & Aquino, 1996). See also Richlan, Kronbichler, & Wimmer (2011).

11 These differences include both under-activations (for example, Pugh, Mencl, B. Shaywitz, S. Shaywitz, Fulbright, Constable, Skudlarski, Marchione, Jenner, Fletcher, Liberman, Shankweiler, Katz, Lacadie, & Gore, 2000), which signal impairment of specific processes, and over-activations (for example, Simos, Fletcher, Bergman, Breier, Foorman, Castillo, Davis, Fitzgerald, & Papanicolaou, 2002), which are hypothesized to signal compensatory processing as early as the start of kindergarten.

12 For a discussion of this process and its possible explanation for dyslexia, see Dehaene (2009), pp. 249–254, and Galaburda, Sherman, Rosen, Aboitiz, & Geschwind (1985).

13 See Hinshelwood (1907) as one example of several such reports.

14 The heritability of dyslexia has been found to be between .5 and .6 on a 0 to 1 scale (Byrne, Coventry, Olson, Samuelsson, Corley, Willcutt, Wadsworth, & DeFries, 2009).

15 Scarborough, 1990.

16 Fisher & DeFries, 2002.

17 The first genes thought to potentially induce dyslexia (*DYX1C1*, *DCDC2*, and *KIAA0319*) were found at the beginning of this century (Grigorenko, 2003; Fisher & Francks, 2006; Galaburda, LoTurco, Ramus, Fitch, & Rosen, 2006) and have been shown to influence neuronal migration during in utero brain development (Darki, Peyrard-Janvid, Matsson, Kere, & Klingberg, 2012; Meng, Smith, Hager, Held, Liu, Oson, Pennington, DeFries, Gelernter, O'Reilly-Pol, Somlo, Skudlarski, S. Shaywitz, B. Shaywitz, Marchione, Wang, Paramasivam, LoTurco, Page, & Gruen, 2005; Paracchini, Thomas, Castro, Lai, Paramasivam, Wang, Keating, Taylor, Hacking, Scerri, Francks, Richardson, Wade-Martins, Stein, Knight, Copp, LoTurco, & Monaco, 2006). A variety of additional genes thought to contribute to dyslexia have been identified since.

18 Cattell, 1886.

19 Dehaene & Cohen, 2011; Forster, 2012; Simos, Rezaie, Fletcher, & Papanicolaou, 2013; van den Broeck & Geudens, 2012.

20 American neurologist Samuel Orton (1925) erroneously believed letter reversals to be an underlying cause of dyslexia and coined the term *strephosymbolia* to refer to the behavior.

21 Tinker, 1963.

22 Morrison & Rayner, 1981; O'Regan, 1990.

23 Adams, 1990; McClelland, 1976.

24 Duranovic, Senka, & Babic-Gavric, 2018; Kuster, van Weerdenburg, Gompel, & Bosman, 2018; Rello & Baeza-Yates, 2013; Wery & Diliberto, 2017.

25 Marinus, Mostard, Segers, Schubert, Madelaine, & Wheldall, 2016; Masulli, Galluccio, Gerard, Peyre, Rovetta, & Bucci, 2018.

26 Handler & Fierson, 2011.

27 Gough & Tunmer, 1986; Hoover & Gough, 1990.

28 Kilpatrick, 2015 (p. 46).

29 Anatomically, this is the left occipito-temporal area, also known as the "visual word form area," or VWFA (Cohen, Dehaene, Naccache, Lehéricy, Dehaene-Lambertz, Hénaff, & Michel, 2000).

30 Unlike learning to speak, which is a developmental process that occurs naturally through exposure, reading requires explicit instruction. For this reason, learning to read and write (which humans had never done until just a few thousand years ago), is commonly referred to as an "unnatural" process (Gough & Hillinger, 1980).

31 Dehaene, 2009.

32 For a full exploration of visual mirroring and a possible low-incidence visuospatial root cause of dyslexic symptoms for some readers, see Dehaene (2009), pp. 263–299.

33 Morais, Cary, Alegria, & Bertelson, 1979; Morais, Bertelson, Cary, & Alegria, 1986.

34 National Institute of Child Health and Human Development, 2000 (pp. 2–7).

35 Share (1984) found that student achievement on a phoneme segmentation measure at the beginning of kindergarten was the best predictor of end of kindergarten (0.66) and end of first grade (0.62) reading achievement among many factors analyzed.

36 Cardoso-Martins, Mesquita, & Ehri, 2011; Juel, Griffith, & Gough, 1986; Kim, Petscher, Foorman, & Zhou, 2010.

37 Kim, Petscher, Foorman, & Zhou (2010) found that letter name knowledge has a large impact on letter-sound learning, dramatically increasing the likelihood of a student knowing letter sounds from 4% (without knowing letter names) to 63% when a student knew letter names. See also Cardoso-Martins, Mesquita, & Ehri (2011).

38 In their famous first-grade studies, Bond & Dykstra (1967) found that beginning of the year letter naming performance accounted for 25 to 36 percent of the variance in students' reading ability at the end of the year.

39 See Seidenberg (2017), pp. 144–145, for discussion of why spelling-sound consistency in English is best considered "statistical" instead of "rule-governed."

40 Seymour, Aro, & Erskine, 2003.

41 Decades of analyses and reports of current evidence for effective early reading instruction have universally found that early explicit, systematic phonics and phonological awareness instruction prevents and remediates reading difficulties (Anderson, Hiebert, Scott, & Wilkinson, 1985; Adams, 1990; Snow, Burns, & Griffin, 1998; National Institute of Child Health and Human Development, 2000; National Early Literacy Panel, 2008).

42 In addition to a push to ensure effective phonics instruction for all beginning readers, there has been a simultaneous effort to stop unproductive methods of early reading instruction, such as the three-cueing system (for example, see Hanford, 2019) or "whole word" teaching methods.

43 For a full articulation of this theory and current evidence, see Seidenberg (2017), pp. 170–176.

44 Hasbrouck, 2017.

45 Ehri, 2014, p. 5.

46 Ehri, 2005, 2014.

47 L. Fuchs, D. Fuchs, Hosp, & Jenkins (2001) summarize research that found oral reading fluency correlates (.91) to comprehension even more highly than more direct comprehension measures (i.e., question answering, .82; recall, .70; cloze, .72).

48 Reschly, Busch, Betts, Deno, & Long's meta-analysis (2009) of correlational evidence from 41 studies found significant, strong overall correlation (.67) among measures of fluency and prediction on state-specific and national tests. These findings were consistent across grades 1–5 and when tests were administered individually or by group.

49 For example, Price, Meisinger, Louwerse, & D'Mello (2015) found text reading fluency (oral and silent) to account for 47% of variance in 4th grade students' comprehension.

50 A non-technical summary of the most common subtypes is provided in this section. For a deep exploration of the characteristics of these and other subtypes, see Friedmann & Coltheart (2018).

51 It is worth noting here that this subtype of dyslexia is not associated with general attention deficits (Lukov, Friedmann, L. Shalev, Khentov-Kraus, N. Shalev, Lorber, & Guggenheim, 2015). Additionally, this subtype has been shown to present without similar issues in reading number and symbol strings; therefore, attentional dyslexia is a domain-specific issue related to the orthographic visual analyzer when reading and has not been found to be universally related to visuo-graphic analysis/vision (Friedmann, Dotan, & Rahamim, 2010).

52 Rumelhart & McClelland, 1986.

53 Wolf & Bowers, 1999.

54 For a summary of research, evidence, and active questions about the theory, see Norton, Black, Stanley, Tanaka, Gabrieli, Sawyer, & Hoeft (2014).

55 Denckla, 1972; Denckla & Rudel, 1974.

56 A meta-analysis of 137 RAN studies by Araújo, Reis, Petersson, & Faísca (2014) found a moderate to strong correlation between RAN assessments and reading performance (.43). See also Kirby, Georgiou, Martinussen, & Parrila (2010).

57 S. Shaywitz & B. Shaywitz, 2004.

58 Read Naturally, 2019, p. 2.

59 This reflects Share's self-teaching hypothesis (Jorm & Share, 1983; Share, 1995; Cunningham, Perry, Stanovich, & Share, 2002).

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Appendix A: Further Reading

For more information about dyslexia and its impact on the lives of children and adults, access resources for parents and educators from the International Dyslexia Association (www.dyslexiaida.org).

Selected Works from the International Dyslexia Association

Dyslexia in the classroom: What every teacher needs to know. (2017). International Dyslexia Association. https://dyslexiaida.org/wp-content/uploads/2015/01/DITC-Handbook.pdf

Knowledge and practice standards for teachers of reading. (2018). International Dyslexia Association. https://dyslexiaida.org/knowledge-and-practices/

Selected Books on the Science of Reading

Dehaene, S. (2009). *Reading in the brain: The new science of how we read.* Penguin Books. https://doi.org/10.1111/ijal.12055

Kilpatrick, D. A. (2015). *Essentials of assessing, preventing, and overcoming reading difficulties.* Wiley and Sons.

Seidenberg, M. (2017). *Language at the speed of sight: How we read, why so many can't, and what can be done about it.* Basic Books.

Shaywitz, S., & Shaywitz, J. (2020). *Overcoming dyslexia: Second edition, completely revised and updated.* Knopf.

Wolf, M. (2019). *Reader, come home: The reading brain in a digital world.* Harper.

Appendix B: Program Scope and Sequence Summaries

Funēmics

*Fun*ēmics Scope and Sequence Chart

BOOK	1										2									3								4										5										6											
LESSON	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	11	12
Word isolation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																																																	
Rhyme recognition											✓	✓	✓	✓	✓	✓	✓	✓	✓																																								
Rhyme discrimination														✓	✓	✓	✓	✓	✓																																								
Rhyme production																												✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																						
Onsets and rimes																												✓	✓	✓	✓	✓									✓	✓																	
Compound words																				✓	✓																																						
Syllable recognition																				✓	✓	✓	✓	✓	✓	✓	✓																																
Syllable counting																						✓	✓	✓	✓																																		
Syllable isolation																					✓			✓	✓	✓	✓																																
Syllable deletion																										✓	✓																																
Phoneme blending																												✓	✓	✓	✓	✓									✓	✓		✓				✓	✓	✓	✓	✓	✓				✓	✓	✓
Phoneme segmentation																																												✓					✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Adding initial phonemes																												✓	✓	✓	✓	✓									✓	✓																	
Initial phoneme isolation																																						✓	✓	✓			✓	✓					✓	✓	✓	✓	✓		✓		✓		
Initial phoneme production																																						✓	✓																				
Initial phoneme deletion																																																							✓	✓			
Initial phoneme substitution																																	✓	✓	✓	✓	✓																				✓		
Adding final phonemes																																														✓	✓												
Final phoneme isolation																																												✓	✓				✓	✓	✓	✓	✓					✓	
Final phoneme deletion																																																								✓			
Final phoneme substitution																																																										✓	
Medial phoneme isolation																																																			✓	✓	✓	✓					✓
Medial phoneme substitution																																																											✓

Read Naturally GATE+: Reading Intervention for Small Groups

Scope and Sequence of Skills

	LEVEL 0.8			LEVEL 1.3			LEVEL 1.8		
	T	R	A	T	R	A	T	R	A
Phonemic Awareness	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phonics	✓	✓	✓	✓	✓	✓	✓	✓	✓
Consonants	✓	✓	✓	✓	✓	✓	–	–	✓
Short Vowels	✓	✓	✓	–	✓	✓	–	✓	✓
Long Vowels	–	–	–	✓	✓	✓	–	✓	✓
Blends and Digraphs	–	–	–	–	–	–	✓	✓	✓
Common Suffixes[1]	–	–	–	–	–	–	✓	✓	✓
Spelling Phonetically Regular and Irregular High-Frequency Words	✓	✓	✓	✓	✓	✓	✓	✓	✓
High-Frequency Words	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fluency	✓	✓	✓	✓	✓	✓	✓	✓	✓
Comprehension	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nonfiction Stories[2]	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vocabulary	✓	✓	✓	✓	✓	✓	✓	✓	✓

T = Taught R = Reviewed A = Applied

[1] *Common suffixes: -s, -es, -ing, -er, -es, -ed (/d/), -ed (/t/), -ed (/ed/), -y, -ies, -ied, -ly*

[2] *Read Naturally uses Lexile measures and the Spache and Fry readability formulas to determine the level of each story.*

Featured Sounds in GATE+

GATE+ Level 0.8
Short Vowels

Level 0.8 includes four lessons for each short-vowel sound and four lessons with mixed short-vowel sounds.

Sounds taught in level 0.8 are:

- short a
- short e
- short i
- short o
- short u

The level also reviews the regular sounds of all the consonants.

GATE+ Level 1.3
Long Vowels

Level 1.3 includes lessons featuring long-vowel patterns.

Sounds taught in level 1.3 are:

- long vowels with silent e
  - a_e
  - i_e
  - o_e
  - u_e
  - e_e
- long-vowel patterns
  - ai
  - ay
  - oa
  - ea
  - ee
  - ie
  - ue
  - igh
  - ow
  - e
  - y
  - o

The level also reviews the regular sounds of all the consonants and short-vowel sounds.

GATE+ Level 1.8
Digraphs, Blends, and Suffixes

Level 1.8 includes lessons featuring beginning and ending digraphs and blends as well as common suffixes.

Beginning and ending digraphs include:

- sh
- th
- wh
- ch
- ng

Beginning and ending blends include:

- blends with l
  e.g., bl, cl, fl, gl, pl, _lk, _ld, _lt
- blends with r
  e.g., br, cr, dr, fr, gr, pr, tr
- blends with s
  e.g., sp, st, sn, sk, sl
- blends with n
  e.g. _nk, _nd, _nt
- three-letter blends (some with digraphs)
  e.g., str, spl, scr, thr, shr, tch

Common suffixes include:

- -s
- -es
- -ing
- -er
- -est
- -ed (/d/)
- -ed (/t/)
- -ed (/ed/)
- -y
- -ies
- -ied
- -ly

The level also reviews the regular sounds of all the consonants and short- and long-vowel sounds.

Word Warm-ups Phonics Elements by Level

Phonics Skills Reinforced Within Word Warm-ups Levels 1, 2 and 3

Word Warm-ups Live*
Level 1: One-syllable Words

Section	Exercise
A: Letter sounds	Short a and b, g, t, f, s
	Short i and p, c, m, r, h
	Short o and d, j, n, c, y
	Short u and v, b, x, g, l
	Short e and k, z, d, w, qu
B. Short vowels	Short a
	Short i
	Short o
	Short e
	Short u
C. Long vowels with silent e	Long a with silent e
	Long i with silent e
	Long o with silent e
	Long u with silent e
D. Long vowels	Long vowels: ai, ay
	Long vowels: ee, e, ea
	Long vowels: oa, o, oe, ow
	Long vowels: ie, igh, y , ui, ue
E. Consonant digraphs with short vowels	Consonant digraph: sh
	Consonant digraph: ch
	Consonant digraph: th
	Consonant digraph: wh
	Consonant digraph: ng
F. Consonant blends with short vowels	Beginning blends with an r
	Beginning blends with an l
	Beginning blends with an s
	Ending blends with an n
	Ending blends with an s
	Ending blends with an l
G. Vowels and the consonant r	One vowel and r: ar
	One vowel and r: or
	One vowel and r: ir, er, ur
	One vowel and r with silent e: ure, are, ore
	Two vowels and r: ear, air, oar, eer
H. Other consonant sounds	Soft sound of c: ce, ci, cy
	Soft sound of g: ge, gi, gy
	Silent consonants: kn, wr, gn
I. Other Vowel Sounds	Vowel sound: aw, au, all
	Vowel sound: ow, ou
	Vowel sound: oi, oy
	Vowel sound: oo, ew
	Vowel sound: oo, u

*Based on Word Warm-ups Live content in Read Live

Word Warm-ups 1 (Print Edition)
One-syllable Words

Section	Exercise
A: Sounds of the consonants and short vowels	Letter sounds
	The sounds of the consonants
	The short sounds of the vowels
B. Words with short vowels	Words with short a
	Words with short i
	Words with short o
	Words with short e
	Words with short u
C. Words with sh, ch, th, wh, ng	Words with sh
	Words with ch
	Words with th, wh
	Words with ng
D. Words ending with two consonants	Words ending with n followed by another consonant
	Words ending with s followed by another consonant
	Words ending with l followed by another consonant
	Words ending with a consonant followed by t or p
E. Words beginning with two or more consonants	Words beginning with a consonant followed by r
	Words beginning with a consonant followed by l
	Words beginning with s followed by another consonant
	Words beginning with three consonants
F. Words with long vowels and silent e	Words with long a and silent e
	Words with long i and silent e
	Words with long o and silent e
	Words with long u and silent e
G. Words with long vowels with vowel pairs	Words with long a with vowel pairs
	Words with long e with vowel pairs
	Words with long o with vowel pairs
	Words with long i or u with vowel pairs
H. Words with one vowel followed by r	Words with ar
	Words with or
	Words with ir, er, or ur
I. Words with the less common sounds of consonants	Words with the consonant c saying /s/
	Words with the consonant g saying /j/
	Words beginning with a silent consonant
J. Words with other sounds of vowels	Words with aw, au, or all
	Words with ow or ou
	Words with oy or oi
	Words with or or ew
	Words with oo or u

Word Warm-ups 2 (Print Edition)

Two-syllable Words

Section	Exercise
A. Compound words	Words with short vowels
	Words with consonant digraphs
	Words ending with consonant blends
	Words beginning with consonant blends
B. More compound words	Words with long vowels and silent e
	Words with long vowel pairs
	Words with one vowel followed by r
	Words with less common sounds of consonants
	Words with other sounds of vowels
	More words with other sounds of vowels
C. Two-syllable words	Compound words
	Words with two consonants between two vowels
	Words with three consonants between two vowels
	Words with one vowel followed by r
	Words with long vowel pairs
	Words with other sounds of vowels
D. More two-syllable words	Short vowel words that end with -le
	Long vowel words that end with -le
	Words that end with -le
	Short vowel words with one medial consonant
	Long vowel words with one medial consonant
	Words with one medial consonant
E. Words with suffixes	Words with the suffixes -s, -es
	Words with the suffix -ing
	Words with the suffix -er
	Words with the suffix -ed /t/
	Words with the suffix -ed /d/
	Words with the suffix -ed /ed/
F. Words with prefixes	Words with the prefix re-
	Words with the prefix un-
	Words with the prefix dis-
	Words with the prefix mis-
	Words with the prefix de-

Word Warm-ups 3 (Print Edition)

Multi-syllabic Words

Section	Exercise
A. Words with common prefixes	Words with prefixes re-, un-, dis-, mis- de-
	Words with prefixes non-, in-, pre-, pro-, en-
	Words with prefixes im-, over-, em-, under-, a-
B. Words with common suffixes	Words with suffixes -able. -less. -ible, -ful, -ness
	Words with suffixes -tion, -en, -ment, -ly, -sion
	Words with suffixes -ture, -ist, -ty, -est, -ary
C. Words with additional prefixes	Words with prefixes ab-, be-, per-, sub-, trans-
	Words with prefixes ad-, con-, com-, fore, ex-
	Words with prefixes anti-, inter-, mid-, semi-, super-
D. Words with additional suffixes	Words with suffixes -age, -ic, -ate, -ize, -ish
	Words with suffixes -ism, -ous, -ity, -ent, -ant
	Words with suffixes –cial, -tial, -ance, -ence, -sive, -tive
E. Words with open/closed syllables	Words with open syllables
	Words with open syllables
	Words with open syllables
	Words with open/closed syllables mixed practice
F. Words with schwa (ə) syllables	Words with a **ə** sound single vowel syllables
	Words with a **ə** sound open syllables
	Words with a **ə** sound closed syllables
	Words with a **ə** sound mixed practice
	Words with a **ə** sound mixed practice
G. Words with Latin roots	Words with Latin roots urb, stat, mem, vac, ped
	Words with Latin roots pop, spec, dic, fig, pul
	Words with Latin roots ject, vis, miss, cred, rupt
	Words with Latin roots flec, form, man, junct, struct
	Words with Latin roots ven, bene, cap, script, fac
	Words with Latin roots duc, scend, tract, fract, vor
H. Words with Greek roots	Words with Greek roots graph, scope, astro, phon, hydro
	Words with Greek roots photo, sphere, hemi, bio, geo
	Words with Greek roots syn, tele, pod, meter, auto
	Words with Greek roots ology, micro, hyper, chron, macro
	Words with Greek roots biblio, thermo, para, mech, psycho
	Words with Greek roots mono, logue, ortho, phys, the

Read Naturally Live/Encore Phonics Elements by Level

Short and Long Vowels Reinforced in Phonics Series Levels

Level	Vowel Phonemes (Sounds)	Vowel Graphemes (Spellings)	Word Families
0.8 Short Vowels (in single-syllable words)	/ă/ /ĕ/ /ĭ/ /ŏ/ /ŭ/	a e i o u	-ab, -ad, -an, -ap, -at, -ack, -and -ed, -en, -et, -eck, -ell -id, -ig, -in, -ip, -it, -ill -ob, -od, -og, -op, -ot, -ox, -ock -ub, -ud, -ug, -un, -ut, -uck
1.3 Long Vowels	/ā/ /ē/ /ī/ /ō/ /ū/	a_e, ai, ay ee, ea, e i_e, ie, igh, y o_e, oa, o u_e, ue	-ade, -ake, -ale, -ame, -ane, -ape, -ate, -ave; -aid, -ail, -ain, -ait; -ay -ee, -eed, -een, -eep; -eal, -eam, -eat; -e -ide, -ike, -ile, -ime, -ine, -ite, -ive; -ie, -ies; -ight; -y -ode, -oke, -ole, -ome, -one, -ope, -ose, -ove, -oze; -oad, -oak, -oal, -oam, -oan, -oap, -oat; -o -ude, -uke, -ule, -ume, -une, -use, -ute; -ue
2.6 Short Vowels	/ă/ /ĕ/ /ĭ/ /ŏ/ /ŭ/	a, e, i, o, u	*Level 2.6 continues to reinforce short vowels within compound and other multi-syllable words, many including common affixes.*
2.7 Long Vowels	/ā/ /ē/ /ī/ /ō/ /ū/	*Review of Level 1.3 and:* e_e old ild ow ind ui oe	*Level 2.7 continues to reinforce long vowels within compound and other multi-syllable words, many including common affixes.*

Digraphs and Blends Reinforced in Phonics Series Levels

Level	Digraph Phonemes (Sounds)	Digraph Graphemes (Spellings)	Initial Blends	Final Blends
1.8 Blends & Digraphs	/sh/ /th/ /<u>th</u>/ /wh/ /ch/ /ng/	sh, _sh th, _th wh ch, _ch, _tch _ng	bl_, cl_, fl_, gl_, pl_, sl_ br_, cr_, dr_, fr_, gr_, pr_, tr_ sc_, sk_, sl_, sn_, sp_, st_ scr_, spl_, spr_, str_	_sk, _sp, _st _nd, _nk, _nt _ld, _lk, _lt

Other Vowel Phonemes and Graphemes Reinforced in Phonics Series Levels

Level	R-Controlled Vowel Phonemes (Sounds)	R-Controlled Vowel Graphemes (Spellings)	Other Vowel Phonemes (Sounds)	Other Vowel Graphemes (Spellings)
2.3 R-controlled & Other Letter Combinations	/ar/ /er/ /or/	ar er, ir, ur or	/aw/ /oi/ /ow/ /ō/ /ū/ /o͞o/ /o͝o/	all, au, aw, augh oi, oy ou, ow ow ew, oo oo

Soft c & g and Silent Letter Combinations Reinforced in Phonics Series Levels

Level	Other Consonant Phonemes (Sounds)	Other Consonant Graphemes (Spellings)	Consonant Phonemes (Sounds)	Silent Letter Combinations (Spellings)
2.3 Soft c and g; Silent Letter Combinations	/s/ /j/	ce, ci, cy ge, gi, _dge, _ge	/n/ /r/	gn, kn wr