

Dyslexia: Assessment, Treatment, and Comorbidity

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Introduction

James Bylund, Psy.D., ABSNP - Dr. Bylund is a Licensed Educational Psychologist and Owner/Director of Bylund Neuro-Ed Clinic. He specializes in neuropsychological assessment of dyslexia and other learning disorders.

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Guiding Questions

What is dyslexia?

What are the advantages of dyslexia (i.e., strengths-based perspective)?

How is dyslexia assessed?

Why does dyslexia co-occur with other conditions?

How can I support my child with dyslexia?

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What is Dyslexia?

DSM-V - A neurodevelopmental disorder marked by a pattern of learning difficulties characterized by inaccurate or dysfluent word recognition, poor decoding, and poor spelling abilities.

IDA - "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."

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Dyslexia and IDEA

Specific Learning Disability - "a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia" that adversely affects a student's educational performance."

Specific learning disabilities do not include learning problems that are primarily the result of visual, hearing, or motor disabilities; intellectual disability; emotional disturbance; environmental, cultural, or economic disadvantage; limited English proficiency; or lack of appropriate instruction in reading or math

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OSERS - Dear Colleague Letter

"There is nothing in the IDEA that would prohibit the use of the terms dyslexia, dyscalculia, and dysgraphia in IDEA evaluation, eligibility determinations, or IEP documents"

"There could be situations where the child's parents and the team of qualified professionals ... would find it helpful to include information about the specific condition (e.g., dyslexia, dyscalculia, or dysgraphia) ...[and how it] relates to the child's eligibility determination"

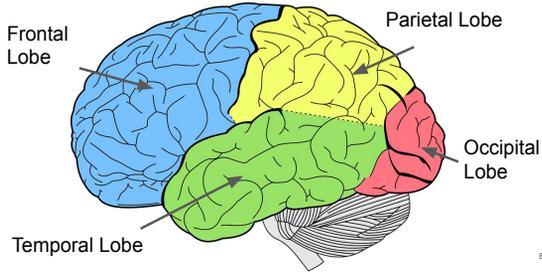
"OSERS encourages SEAs and LEAs to consider situations where it would be appropriate to use the terms dyslexia, dyscalculia, or dysgraphia...[and] review their policies, procedures, and practices to ensure that they do not prohibit the use of the terms dyslexia, dyscalculia, and dysgraphia"

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The Reading Brain

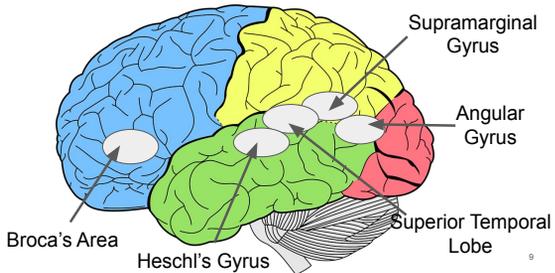
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Primer on Neural Anatomy



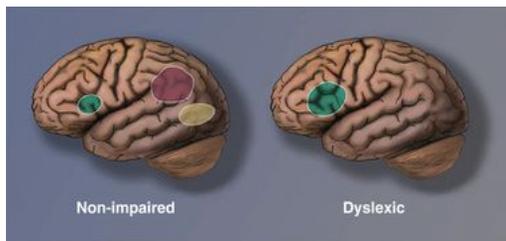
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The Reading Brain

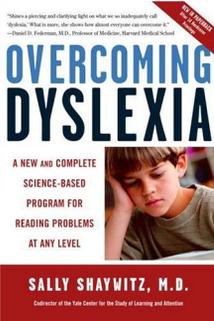


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The Dyslexic Brain



© Sally Shaywitz, *Overcoming Dyslexia*, 2003 ¹⁰



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Neurological Difference v. Disability

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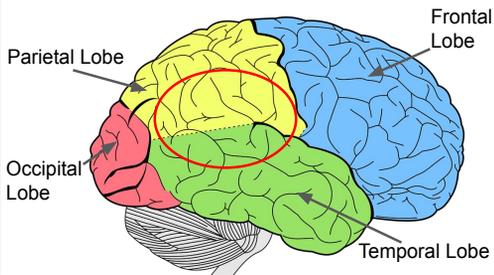
Strength Based Perspective

Many people with dyslexia are *misperceived* as less capable or “not smart” because they struggle with reading.

Most individual with dyslexia have average or *above* range intellectual abilities

When their love for learning and motivation to succeed are not squelched, many people with dyslexia become highly successful entrepreneurs, leaders, attorneys, and doctors

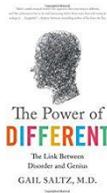
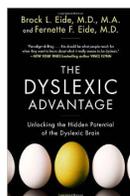
Perceiving the Big Picture



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Sea of Strengths

Seeing the big picture
Creativity
Outside the box
thinking/problem solving
Visual-spatial abilities
Mathematical Reasoning
Grit...



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Dyslexia Subtypes

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The Three Baskets



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Dysphonetic Dyslexia

The student has great difficulty processing phonological information and struggles learning to read as a result. They tend to over rely on the visual features of words at the expense of phonics (i.e., letter to sound conversion)

Target Word	Read As
House	Horse
Ghost	Goat
Hamster	Hamburger
Basement	Baseball

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Surface Dyslexia

The student lacks fluency because they never develop automatic word recognition. Reading is laborious because they over rely on phonics to break down each word one at a time. They have particular difficulty reading and spelling words that do not have a 1:1 correspondence between phonemes and graphemes (e.g., yacht).

Target Word	Read As
One	Own
Island	Izland
Grind	Grinned
Listen	Liston

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Text Orthography

English speaking children develop phonemic processing skills slower than children who learn to speak/read more phonologically consistent languages (e.g. Italian and Spanish)

English is complex and has 1,100 ways of representing 44 sounds (phonemes)

25% of words are phonologically irregular

Italian has 33 graphemes representing 25 phonemes

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Aoccdnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttae in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteers be at the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

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Mixed (Deep) Dyslexia

The students reading development is **severely impaired** as they lack any reliable key for unlocking the reading/spelling code. They **manifest both phonological and orthographic processing deficits**.

Target Word	Read As
Correct	Clorex
Violin	Villent
Material	Mitarinal
Advance	Exvasive

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What About Comprehension?

Dyslexia has a downstream impact on reading comprehension. However, reading comprehension can also be impacted by factors other than dyslexia

Vocabulary development - students enter kindergarten knowing 4,000 words and graduate high school knowing 60,000 words

Attention/executive functioning - students must sustain their attention to the task, self-monitor comprehension, and organize information in meaningful ways

Working memory capacity - students must maintain information in working memory while simultaneously gathering additional information from the text

And, of course, the student must be meaningfully engaged in the task

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Dyslexia and Other Learning Disorders

Developmental learning disorders may be due to impaired functioning across multiple interconnected neural networks

Diagnostic categories (i.e., labels) are based on the "behavioral" (i.e., what can be observed - such as poor reading) manifestation of impaired neural networks

In other words, what we see is difficulty learning, what we don't see are the neural firing patterns that give rise to the difficulty learning

Neural networks are infinitely complex, and each child is different. However, there are some common patterns we observe

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Dysgraphia Subtypes

A learning disorder impacting developing in written expression

Graphomotor Dysgraphia – Motor skills deficits impacting execution of letter formation

Dyslexic Dysgraphia (Dysphonetic and Surface Dysgraphia) – Inability to spell resulting from a reading disorder/dyslexia

Executive Dysgraphia – deficits in working memory and EF impacting ability to combine words and sentences (grammar, structure, organization, production)

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Dysphonetic Dyslexia and Writing

Dysphonetic Dyslexia - Impaired phonological word-form storage and processing (phonological loop) and orthographic loop

Deficits in word reading and spelling (Dyslexia)

Target Word

Point
Train
Old
Climbing

Misspelling

Pot
Chan
Od
Cling

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Surface Dyslexia and Writing

Surface Dyslexia - Impaired orthographic word-form storage and/or processing (orthographic loop)

Deficits in handwriting and orthographic spelling (Dysgraphia)

Target Word

Knock
Build
Mighty
Juice

Misspelling

Nok
Bild
Mite
Juse

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Dyscalculia Subtypes

Visual-Spatial (Non-Symbolic Semantic) Dyscalculia (i.e., Numbers in Space)

Verbal Dyscalculia (i.e., The Language of Math)

Procedural Dyscalculia (i.e., The Chief Executive)

Conceptual (Symbolic Semantic) Dyscalculia (i.e., The Problem Solver)

Tremendously complex functions dependent of efficient processing of multiple interconnected neural networks

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The Language of Math

Verbal Dyscalculia

While the visual aspect of math is an approximation system (limited by magnitude and distance), verbal math skills are needed for precision

e.g., counting a class of items to determine the exact amount

Moving from non-symbolic to *symbolic* representation

Verbal dyscalculia may impact one's ability to memorize and efficiently retrieve basic math facts as well as learn and understand verbal math concepts (e.g., quotient, percent, perpendicular)

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Verbal Dyscalculia - Weakness

Students with verbal dyscalculia often struggle on language based cognitive tasks such as auditory processing, verbal fluency, rapid naming, and/or verbal ability

Many students with verbal dyscalculia also have difficulties with reading (e.g., dyslexia) and other tasks associated with a language based learning disorder.

Students with verbal dyscalculia may have difficulty with ...

Learning addition and multiplication facts, math fact retrieval fluency, retaining and recalling math procedures, understanding math word problems (i.e., know what procedures to apply), and/or verbally describing how to solve a problem.

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Dyslexia and ADHD

25 – 40% of individuals with ADHD also have a reading disorders

15-35% of individuals with a reading disorder also have ADHD

Neurocognitive skills such as attention, information processing speed, working memory, and executive functions associated with ADHD may also affect reading

And, ADHD and dyslexia may co-occur independent of one another (i.e., ADHD + impaired phonological processing and/or orthographic processing)

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Social Emotional Factors

Estimated 40% of individuals with a reading disability have co-occurring social/emotional disorder

Middle school students with learning disabilities view academic situations as threatening and present with physiological stress responses

- ❑ Dilated pupils, increased sweating, racing heart (i.e. rush of adrenaline, contraction of large skeletal muscles, increased blood pressure)

Excessive levels of stress shut down functioning of prefrontal cortex (i.e., attention, working memory, executive functioning)

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Dyslexia Assessment

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Assessing Dyslexia

Cognitive Functioning	Memory
Phonological Processing	Attention
Orthographic Processing	Executive Functioning
Rapid Automatic Naming	Working Memory
Basic Word Reading	Language/Vocabulary Development
Reading Fluency	
Reading Comprehension	

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Phonological Processing

An individual's awareness of and ability to process the sound structure of oral language

Examples include rhyming, blending and segmenting syllables, blending and segmenting individual sounds (phonemes) within words, isolating phonemes, deleting phonemes

A prerequisite to phonics (grapheme-phoneme associations) and perhaps the best early predictor of dyslexia

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Rapid Naming

Ability to make quick and accurate (i.e., efficient) associations between visual images/symbols and their verbal labels

Strong predictor of dyslexia and early reading acquisition

Strongest association is rapid letter and digit naming, though younger children can be assessed with colors and pictures

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Orthographic Processing

The ability to store and efficiently retrieve *visual word forms* (i.e., the way words look)

The visual component of reading

One of several cognitive abilities that contribute to reading development

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Unexpected Underachievement

Difficulties with accurate and fluent word recognition, decoding, and spelling that are unexpected ...

Given the students age, intellectual ability, and educational history

Often observable deficits in phonological processing, orthographic processing, and/or rapid naming

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Dyslexia Intervention

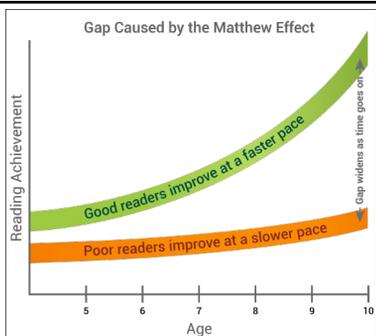
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Matthew Effect

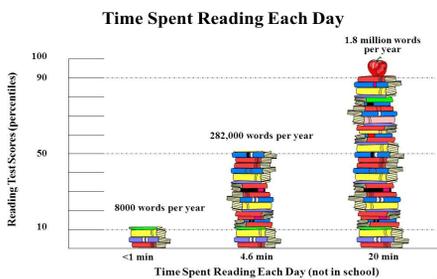
Term coined by Keith Stanovich in 1986, referring to the phenomenon of in which the gap between "slow starters" (i.e., students with dyslexia) and "fast starters" (i.e., typically developing children) widens as "slow starters" read less often and for shorter periods of time, and encounter fewer words when they do read (i.e., poor fluency), and over time they get far less practice as a result.

Over time, the Matthew Effect impacts language/vocabulary development and even IQ

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Good readers spend more time reading each day so they read many more words in a year compared to poor readers.

Figure 29.16 "Overcoming Dyslexia", Sally Shaywitz, 2003

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Recommendation for Parents - Paired Reading

Sit with daughter/son in a quiet location and position the book so you can both easily follow the text. Have daughter/son read aloud and when s/he misreads a word, or pauses for 3 seconds, point to the word and pronounce it correctly. Then have her/him repeat the word and continue reading

Read aloud for roughly 2 minutes as son/daughter follows along silently (time should be adjusted appropriately in response to his/her attention). Then son/daughter reads the same passage aloud, receiving corrective feedback as needed

It may also be helpful to make note of the incorrect words so that she can review them later

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The National Reading Panel 2000

5 components of effective reading instruction include *phonemic awareness, phonics, fluency, vocabulary, and text comprehension*

Instruction must be **structured, sequential, and explicit** (i.e., **structured literacy instruction**)

Structured - Step-by-step procedures to introduce, reviewing, and practicing concepts with continual formative assessment

Sequential - Concepts follow a logical order (i.e., basic to complex)

Explicit - All skills are deliberately taught and practiced with teacher guidance and feedback

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The National Reading Panel 2000

Grades K - 1: *Better outcomes (than older students), respond best to small group (3:1) instruction, instruction should target phonological awareness and phonics, instruction should be provided on frequent basis (4 -5 days/week)*

Grades 2 - 6: *Response not as strong as younger students, more intensive intervention required over longer period, computer instruction was useful aide but not effective by itself*

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Phonological Awareness

Phonemes are the smallest units of spoken language

Instruction involves teaching children to focus on and manipulate phonemes in words

Teaching students to manipulate sounds in words is highly effective and significantly improves reading

The National Reading Panel concluded there was a **causal relationship PA training and improved phonemic awareness, reading, and spelling**

PA training is not a complete reading program, but one necessary component

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Phonics Instruction

Phonics instruction is teaching students sound-letter relationships to read and spell

Primary focus is teaching beginning readers to understand how letters are linked to sounds and to apply this knowledge to reading

Phonics elements are explicitly taught in a specific sequential fashion

Systematic phonics instruction greatly enhancing word reading and spelling over instruction with little or no phonics (K - 6)

The impact is greatest at younger ages with decrease in later grades

While critically important, only one part of a total reading program

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Key Components of Highly Effective Programs

1. **Aggressively teach phonological awareness to the advanced level**
2. Provide phonics/decoding instruction and reinforcement
3. Provide ample opportunities to apply developing skills to reading connected text.

The most effective reading intervention programs include all three components (e.g., LiPS; Read, Write, & Type)

Less effective program are typically missing one or more of these components

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Research Based Strategies for Phonics

Decodable texts (e.g., Bob Books) - most of the words conform to regular phoneme - grapheme relationships

Work with "word families" - words that share similar spelling patterns (e.g. tank, bank, thank, ect.)

Choose a word of the week (ideally a word or letter combination that s/he is struggling with) and come up with as many words that belong to the family as possible and review these words over the following week.

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Reading Fluency

The ability to read with speed, accuracy, and proper expression

A critical factor in reading comprehension - if reading is slow and laborious it is very difficult for the reader to remember what is read and relate to background knowledge

Guided repeated oral reading procedures has a significant positive impact on word recognition, fluency, and comprehension across all grade levels, with both strong readers and those experiencing difficulty (not the same for independent silent reading)

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Research Based Strategies for Fluency

Practicing "high frequency" words - words that show up most frequently in reading material (e.g., Dolch Sight Words, Fry Sight Words)

Multi-sensory approaches that involve tracing (paper-pencil, sand, shaving cream) may be most effective

Use of a "rapid word recognition chart" - Student is timed for one minute as they read a chart of sight words and graph their performance

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Research Based Strategies for Fluency

Flash card practice -

- Present each word for 5 seconds and say it twice.
- Shuffle the cards and have child read each word
- If they misread the word or does not read it within 5 seconds, tell him the word and have them repeat it
- Continue until they can successfully read all of the words
- Practice the same list for several days and then add the words to a "word bank"
- It may be helpful to mix up words so that there are 3 words that they already knows for each one that they are learning

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Research Based Strategies for Fluency

Repeated oral reading may be the best strategy for building reading fluency skills (and confidence!)

- Select a passage from the book that is 100 words in length and have the child read the passage aloud. Tell him/her that s/he will be timed to see how fast s/he can read, but remind him/her that it is just as important to read the words correctly.
- If s/he misreads a word or pauses for 3 seconds, tell him/her the word and have him/her repeat the word before continuing to read.
- After s/he completes the passage, record the time in seconds (e.g. 1 minute 15 seconds = 75 seconds) and have him/her read the same passage again for a total of 4 times.
- Calculate his reading rate for each time he read the passage. To calculate reading rate (per minute), use the following equation:

$$\frac{100 \text{ (words)}}{\# \text{ of seconds}} = \frac{X}{60 \text{ (seconds)}}$$

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Research Based Strategies for Spelling

Cover – Copy – Compare

- Divide a sheet of paper down the middle
- On the left hand side, write the new reading/spelling words.
- 1) Have child look at the word and say it out loud, 2) have her/him say each letter in sequence, and 3) have her/him look at the word carefully, close her/his eyes, and create a picture of it in her/his mind.
- Cover the left hand side and child spells the word on the right hand side.
- Uncover the correct spelling and compare the two. If spelling is correct, cover the word again and have her/him repeat the cover, spell, and compare sequence 5 times. If her/his spelling is incorrect, repeat the sequence starting with #1. |

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Evidence Based Intervention - Mixed Dyslexia

The most impacted students, with no reliable way of accessing print

Require the most intensive reading intervention using a balanced, multi-sensory (i.e., Orton-Gillingham) approach to literacy instruction coupled with fluency practice.

Example - Wilson Reading System (PA, P, V, F, C) coupled with Read Naturally or Great Leaps (PA, P, F) to provide feedback and build motivation

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Vocabulary

If a reader can decode a word, and it's part of their oral vocabulary, they will understand it

If the word is not part of their oral vocabulary, they must have some other way of determining the meaning

Vocabulary must be taught directly (including tech) and indirectly (e.g., reading and listening to others read)

Repeated exposures to vocabulary across multiple contexts is important

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Text Comprehension

Comprehension requires intentional and thoughtful interaction between the reader and the text (i.e., the author)

Students must actively relate ideas represented in the text with their own prior knowledge and experience

Students require explicit instruction in reading comprehension strategies

Teaching comprehension strategies in the context of specific academic areas is also effective (e.g., science and social studies)

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Research Based Strategies for Comprehension

Listening to interesting, engaging stories to develop vocabulary and background knowledge

Vocabulary Development -

- ❑ Teach synonyms, antonyms, and multiple word meanings;
- ❑ use semantic maps, word webs, and other visual graphic organizers to develop his language comprehension skills;
- ❑ pre-teach new vocabulary prior to reading assignments

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Research Based Strategies - Comprehension

Reading Aloud - Hearing one's own voice while reading facilitates working memory capacity while reading

Start and Stop Techniques (e.g., the student stops every 30 seconds or after every paragraph to summarize what they've read or ask a question)

Story Mapping - Using graphic organizers to outline and organize information while reading, encourages active (v. passive) participation

SQ3R - survey headings, pictures, captions; turn the headings into questions; read a section; recite or retell what the section was about in own words; re-read if necessary

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Accommodations

Extended time of tests and assignments

Speech to Text (STT)/Text to Speech (TTS)

Dictated responses/oral tests

Modified spelling tests

Testing in separate location

Use of calculator

Use of graph paper

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Assistive Technology

While students reading skills must be remediated, at some point (i.e., 4th grade) students must develop strategies for accessing text content

Consistent with IDEA, AT can assist students in accessing the general curriculum (i.e., supplemental aides and services)

IDEA requires that AT be considered for every eligible student

Audiobooks and digital text for students with print disabilities - Bookshare (www.bookshare.org) and Learning Ally (www.learningally.org)

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Assistive Technology

TTS programs - e.g. Microsoft Natural Reader and Read&Write (available as a Google App)

Word Processing - Spell check, grammar check, thesaurus; speech recognition (STT), autocorrect, auto summary

Concept Mapping - Kidspiration, Inspiration, and Webspiration (www.inspiration.com) provide applications for concept mapping for grades K-12

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Resources - Dyslexia

International Dyslexia Association - <https://dyslexiaida.org/>

The Yale Center for Dyslexia and Creativity - <http://dyslexia.yale.edu/index.html>

Decoding Dyslexia - <http://www.decodingdyslexia.net/>

Reading Rockets - www.readingrockets.org

Understood - <http://understood.org>

LDOnline - <http://www.ldonline.org>

Learning Ally - www.learningally.org

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