

Florida's Focus on Adults with Learning Disabilities

READING DISABILITIES AND DYSLEXIA

A Resource Guide Developed by Rochelle Kenyon, Ed.D.

Project Director - Florida's Bridges to Practice

A Project of Florida Human Resources Development, Inc.

Ronald D. Froman, Executive Director

A State Leadership Project Funded by the State of Florida Department of Education,

Division of Community Colleges and Workforce Education

Dr. Bonnie Marmor, Vice Chancellor

Nancy Cordill, Director - Office of Workforce Education

April 2004

TABLE OF CONTENTS

Cover Page.....	i
Table of Contents	ii-iii
Introduction	1
General Information about Dyslexia.....	1-2
Dyslexia: An Overview	3-5
What is Dyslexia	6
Reading Disability or Learning Disability?	7-11
Report of the National Reading Panel: Teaching Children to Read	12-20
The NICHD Research Program in Reading Development, Reading Disorders, and Reading Instruction	21-27
Children's Reading Disability Attributed To Brain Impairment	28-29
NICHD-Funded Researchers Map Physical Basis of Dyslexia.....	30-31
What is Dyslexia?	32-34
Current Research on Dyslexia	35-37
The Impact of Learning Disabilities on Adult Reading.....	38
What Do We Know about Learning Disabilities and Teaching Adults to Read?	39-40
The Effect of Dyslexia on Adult Learners' Ability to Learn to Read.....	41-42
Glossary of Dyslexia-Related Terms	43-44
Alphabets.....	43
Automaticity	43
Decoding.....	43
Dyslexia	43
Fluency.....	43
Functional Magnetic Resonance Imaging (fMRI)	43

Morpheme	43
Neuro-developmental Exam	43
Orthographic Processing	43
Orthography.....	43
Phoneme.....	44
Phoneme awareness	44
Phonemic segmentation.....	44
Phonetics	44
Phonics.....	44
Phonological awareness	44
Phonology	44
Syllabication	44
Word attack skills	44
Word decoding.....	44

Introduction

The following resource guide focuses on the topic of Reading Disabilities and Dyslexia. It includes journal articles, research abstracts, newspaper stories, websites, referral sources, national agencies, book listings, and a glossary of terms. Citations for all original sources have been provided. The goal is to provide a multitude of resources that highlight the important topic of reading disabilities and dyslexia for adults as well as children. As research has shown, approximately 80-85% of all persons with Learning Disabilities have their disability in reading. The impact on people's lives and on society due to this problem is of the utmost significance.



LDOnline

http://www.ldonline.org/ld_indepth/reading/reading-4.html

Information provided by The International Dyslexia Association - Formerly the Orton Dyslexia Society)

General Information About Dyslexia

What Is Dyslexia?

The word dyslexia is derived from the Greek "dys" (meaning poor or inadequate) and "lexis" (words or language). Dyslexia is a learning disability characterized by problems in expressive or receptive, oral, or written language. Problems may emerge in reading, spelling, writing, speaking, or listening. Dyslexia is not a disease; it has no cure. Dyslexia describes a different kind of mind, often gifted and productive, that learns differently. Dyslexia is not the result of low intelligence. Intelligence is not the problem. An unexpected gap exists between learning aptitude and achievement in school. The problem is not behavioral, psychological, motivational, or social. It is not a problem of vision; people with dyslexia do not "see backward." Dyslexia results from differences in the structure and function of the brain. People with dyslexia are unique, each having individual strengths and weaknesses. Many dyslexics are creative and have unusual talent in areas such as art, athletics, architecture, graphics, electronics, mechanics, drama, music, or engineering. Dyslexics often show special talent in areas that require visual, spatial, and motor integration. Their problems in language processing distinguish them as a group. This means that the dyslexic has problems translating language to thought (as in listening or reading) or thought to language (as in writing or speaking).

What Characteristics Accompany Dyslexia?

Few dyslexics exhibit all the signs of the disorder. Some common signs are:

- Lack of awareness of sounds in words, sound order, rhymes, or sequence of syllables
- Difficulty decoding words - single word identification
- Difficulty encoding words - spelling
- Poor sequencing of numbers, of letters in words, when read or written, e.g.: b-d; sing-sign; left-felt; soiled-solid; 12-21
- Problems with reading comprehension

- Difficulty expressing thoughts in written form
- Delayed spoken language
- Imprecise or incomplete interpretation of language that is heard
- Difficulty in expressing thoughts orally
- Confusion about directions in space or time (right and left, up and down, early and late, yesterday and tomorrow, months and days)
- Confusion about right or left handedness
- Similar problems among relatives
- Difficulty with handwriting
- Difficulty in mathematics - often related to sequencing of steps or directionality or the language of mathematics

Who Has Dyslexia?

The National Institutes of Health estimate that approximately 15% of the U.S. population is affected by learning disabilities. Of students with learning disabilities who receive special education services, 80-85% have their basic deficits in language and reading. Every year, 120,000 additional students are found to have learning disabilities, a diagnosis now shared by 2.4 million U.S. school children. Many children are never properly diagnosed or treated, or "fall through the cracks" because they are not deemed eligible for services. Dyslexia occurs among all groups, regardless of age, race, or income. Many successful people are dyslexic and many dyslexic people are successful. Recent research has established that dyslexia can run in families. A parent, brother, sister, aunt, or grandparent may have had similar learning difficulties.

What Can Be Done?

Individuals with dyslexia need special programs to learn to read, write, and spell. Traditional educational programs are not always effective for individuals with dyslexia.

Program Content: Individuals with dyslexia require a structured language program. Direct instruction in the code of written language (the letter-sound system) is critical. This code must be taught bit by bit, in a sequential, cumulative way. There must be systematic teaching of the rules governing written language. This approach is called structured or systematic language instruction.

Program Delivery: Individuals with dyslexia require multisensory delivery of language content. Instruction that is multisensory employs all pathways of learning --at the same time, seeing, hearing, touching, writing, and speaking. Such delivery requires a teacher or therapist who is specifically trained in a program which research has documented to be effective for dyslexic individuals.

The Orton Dyslexia Society can provide referrals for testers, tutors, and schools specializing in dyslexia, as well as information on new technologies, Individualized Education Programs (IEPs), Individuals with Disabilities Education Act (I.D.E.A.) legislation, Americans with Disabilities Act accommodations for college students and adults, and medical research updates. We encourage early intervention, including a multisensory, structured, sequential approach to language acquisition for individuals with dyslexia. We offer professionals and educators information on multisensory structured language approaches to teaching individuals with dyslexia.

Dyslexia – An Overview

You've heard the term "dyslexia" and wonder if it applies to your child who's struggling in school. How can you tell if she has this language-based learning disability?

“Dyslexia is a persistent, lifelong condition. There's no cure for it, but there are ways to approach learning and be successful.”

What is Dyslexia?

Dyslexia is a specific learning disability that is neurological 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. Adopted by the IDA Board, November 2002 and by the National Institutes of Health, 2002.

The Learning Disabilities Association of America (LDA) defines dyslexia as a learning disability in the area of reading.

These organizations point out that the term dyslexia is defined in many different ways. While reading is the primary problem, some definitions of dyslexia also include difficulties with: Writing, Spelling, Listening, Speaking, and Math.

A person with dyslexia is someone whose problem in reading is not the result of emotional problems, lack of motivation, poor teaching, mental retardation, or vision or hearing deficits. Dyslexia is a persistent, lifelong condition. There's no cure for it, but there are ways to approach learning and be successful.

Although kids with dyslexia have language processing and learning difficulties in common, the symptoms and severity can be quite different. Kids learn some academic skills at a level lower than others their same age and intellectual peers, but they can do other things quite well. They may be talented in the arts, skilled in technology, or adept with spatial relationships. These strengths and talents need to be encouraged and reinforced.

What Should I Look For?

Most kids have problems in school at one time or another. Ask yourself and the teacher if your child has shown these characteristics to a greater degree than normal over a period of time and in different environments, e.g., school, home, child care.

Ages 6-11

- Has difficulty pronouncing words, may reverse or substitute parts of words
- Has difficulty carrying out a sequence of directions
- Doesn't hear fine differences in words; e.g., writes "pin" for "pen"
- Has problems stating thoughts in an organized way
- Confuses the order of letters in words
- Doesn't recognize words previously learned
- Spells a word several different ways; doesn't recognize the correct version
- Has poor reading comprehension

Ages 12-adult

- Has difficulty remembering what he just read
- Has difficulty concentrating when reading or writing
- Is unable to tell important information from unimportant details
- Spells poorly; misspelling is not phonetic
- Has problems taking notes accurately
- Has difficulty organizing and completing written projects

What if I Suspect My Child Has Dyslexia?

Prepare to talk with your child's teacher about the problems you've observed at home and learn how your child is doing in the classroom. Rest assured: There are many techniques that may help your child succeed, either by gaining new skills or by using bypass strategies.

- Take notes on the types of errors your child makes, how often they occur, and where you've noticed them.
- Keep copies of her work and results from group tests.
- Conference with her teacher to get a sense of how she's doing in comparison with her peers.
- Check to see if the school offers any special instructional programs that might be appropriate for her.
- Request a meeting of your school's student/teacher support team. (These multidisciplinary, general education, pre-referral teams have different names in different school districts and states.) Express your concerns to the group and develop a plan of action with a specific time to be evaluated.
- Ask the teacher if she thinks your child might have a learning disability. (Remember that's the term most schools use instead of dyslexia.) If you feel your child's problems are significant and she may need special education services to benefit from the general academic curriculum, you can make a written request for assessment and send it to the school and/or district administrator. You'll need to be specific about her problems, so the information you gathered earlier will come in handy.

What Can the School Do to Help My Child?

Your child's teachers and other school professionals will want to identify the specific skills your child already has and those she needs to master in developmental sequence, e.g., hearing differences in sounds, learning letter names, spelling words that don't follow the rules, etc. This will allow you and the teacher to plan the next steps of your child's instructional program by building on what she already knows.

What Can I Do to Help My Child?

- Depending on your child's age and language skills, speak with her about the difficulties you've observed.
- Ask her how she feels about school and what she feels she needs help with.
- Tell her you know she tries hard, but you and her teachers are going to help her find ways to succeed.
- Work in collaboration with school staff; let your child see you functioning as a team.
- Look into private tutoring through community agencies or privately if you can afford it.
- Encourage her to use her strengths and talents.
- Be patient with her and support her efforts.

About the Contributor(s)

Jan Baumel, M.S., Licensed Educational Psychologist, spent 35 years in education as a teacher, school psychologist, and special education administrator before joining Schwab Learning. Today she is a consultant to local school districts and university field supervisor for student teachers.

Other Resources

Books

Reading Problems: Assessment and Teaching Strategies

By Margaret Ann Richek, JoAnne Schudt Caldwell, Joyce Holt Jennings, and Janet Lerner

Educational Care - By Dr. Mel Levine

About Dyslexia, Unraveling the Myth - By Priscilla L. Vail and Linda Skladal

Websites

Sally E. Shaywitz, M.D., and Bennett A. Shaywitz, M.D.

The Neurobiology of Reading and Dyslexia - ncsall.gse.harvard.edu/fob/2001/shaywitz.html

International Dyslexia Association (IDA) Website

<http://www.interdys.org/index.jsp>

What Is Dyslexia?

Dyslexia is an invisible disability. It is caused by a difference in brain structure which is present at birth and is often hereditary. As a result, incoming or outgoing information gets scrambled as it travels between the senses and the brain. Dyslexia does not affect intelligence level -- yet it can impair one's ability to learn, retain and express information. Recognizing and manipulating symbols, especially letters and numbers in sequence, presents the most universally acknowledged problem. Reading, writing and math, taught by traditional methods, can be difficult if not impossible for the person with dyslexia to master. Poor memory, coordination problems, confusion of right and left, and impaired depth perception are also common attributes.

Who Has Dyslexia?

Dyslexia occurs in 15 percent of the population. Men and women from every ethnic, social, and economic background are affected.

What Are the Signs of Dyslexia?

A cluster of characteristics that interferes with one's ability to function in school or at work could be a clue to this hidden disability. The severity of these symptoms vary from person to person. Dyslexia can be identified through proper testing by trained specialists.

Symptoms of Dyslexia in Childhood

- Difficulty expressing thoughts
- Delaying learning of tasks such as tying shoes and telling time
- Inattentiveness and distractability
- Inability to follow directions
- Left-Right Confusion
- Difficulty learning the alphabet, multiplication tables, words, or lyrics
- Difficulty learning to read
- Mixing the order of numbers and letters

Symptoms of Dyslexia in Adolescence and Adulthood

- Difficulty processing information you hear
- Often can't find keys, wallet, other items
- Slow at reading
- Difficulty remembering names
- Hesitant speech, difficulty finding right word
- Difficulty organizing ideas to write a letter or paper
- Poor spelling
- Inability to remember phone numbers

"Reading Disability" or "Learning Disability?"

The debate, models of reading disability or dyslexia, and a review of research-validated reading programs. Current education policy centers on reading disability as a primary feature of children diagnosed with a learning disability. This article briefly reviews the issues. Methods for reading instruction that are research validated are also summarized.

Abstract

Reading and reading disabilities are a primary focus of the President's No Child Left Behind Act (NCLB). This signals a major change for children receiving special education services under the category of learning disability as previously implemented under Individuals with Disabilities Education Act (IDEA) guidelines. This article reviews the shift in policy focus and concerns about the shift. Four models of reading/learning disabilities, or dyslexia, are presented. It is suggested that teaching strategies for reading need to take into account the nature of a student's reading disability. Five research validated reading programs are then reviewed. Links are provided to the supporting research studies.

Reading Disabilities or Learning Disabilities: A change in focus.

Reading disabilities and learning disabilities may, or may not, be the same. It depends on how you look at it. Learning disabilities are lifelong. They come from inefficient processing of information. This means information from the sensory organ such as the eye or ear follows a more disorganized path as it goes to the brain for processing and storage. Studies say 3-6% of all school children may have a learning disability. They struggle in school.

Severe reading disabilities, often called dyslexia, are the most common forms of learning disabilities. Difficulties with spelling are also common. Students with reading disabilities are have difficulties with phonemic segmentation, rapid and automatic recognition and decoding of single words, articulation, sensorimotor coordination and anomia. ADHD and LD are not the same but they do often co-occur.

Poor reading skills, however, can have other causes. These causes are often environmental. They can include "teaching disabilities," schools that operate poorly overall limiting the child's access to quality instruction , lack of focus on the importance within the family, and struggles to learn English as a second language.

Children struggling with emotional issues may fall behind academically. More advanced reading requires comprehension of the meaning of sentences. This requires a higher level of thinking. For some students this level of thinking is difficult. When reading disabilities result from environmental, emotional, or general cognitive ability they are not "learning disabilities" as the term has been traditionally used under the Individuals with Disabilities Education Act (IDEA).

A focus of current education policy and the No Child Left Behind Act (NCLB) is reading. Reading disabilities are more broadly defined to include any child who struggles learning to read. Policy advocates state that 80% of all students with LD have a reading problem. They state these problems can be remediated by proper reading instruction. The thrust of this policy is early identification of reading problems. Students with "reading disabilities," then, are those students who are achieving significantly below expected reading levels for grade and age.

New federal policy also stresses research-validated reading teaching strategies. Have educational specialists shown that a specific teaching program works in the classroom? Does it work consistently in classrooms nationwide?

Concerns

Many professionals and parents working with students with learning disabilities express concern. They have worked for many years to assure special education services to students with learning disabilities. They fear the new focus on reading underachievement will undermine the needs of students with learning disabilities as defined under IDEA. The greatest concern is for the bright student with dyslexia. Under new policies this student may no longer receive special education services. Even though the student's reading achievement scores are significantly below the student's overall learning potential the scores are within the average range. Achievement scores within the average range do not qualify for services when the updated definition of a reading disability is applied. They have other concerns too.

- Assessment of reading/learning disabilities is being shifted to the hands of the classroom teacher. Do classroom teachers have the time to take on yet another responsibility? Moreover, do they have the needed training?
- Current evidence suggests teachers do not have needed diagnostic training. Their college course work did not include courses in assessment of learning disabilities, or courses in perception, neurological processing and the other critical aspects that make up the skills of reading.
- Many teachers and other school faculty also lack the training on research design needed to implement the new policy. Even if they do work to find relevant research about various reading programs many teachers have not had coursework that enables them to know to tell good research from bad.

Models of reading/learning disabilities

Since reading disabilities and learning disabilities are now often co-mingled when referring to special education needs, how to refer to children with specific learning disabilities that affect reading is becoming more complicated. Reading/learning disabilities refers to those children who struggle with reading due to a presumed information processing, or neurological inefficiency. Different theories are often used to explain them. These models serve as a highlight of the different processing systems involved in reading. All children who struggle with reading/learning disabilities are not the same.

In light of the NCLB legislation which mandates that only scientifically validated models of instruction be used when helping students learn, it is important to know the basis of the reading disability and to match the program of instruction to the inefficient information processing system. Here are four general models identifying causes of reading disabilities, dyslexia.

- Phonological processing disorder (PPD)

Consensus among reading experts today is that phonological processing is the core deficit in dyslexia. A phonological deficit means that in some way the sound processing system works inefficiently in a child with a reading disability.

- Double-deficit hypothesis

The double-deficit hypothesis of reading disability is currently popular among those who investigate the neurological components of reading disabilities. This model suggests different degrees of reading disability and different levels of processing impairment. The less severe reading disabilities are characterized by either a phonological processing or rapid word naming problem. The more severe forms of dyslexia have deficits in both phonological processing and rapid word naming.

- Visual processing model

This model suggests that visual pathways are implicated in dyslexia. In this model response to visual stimulus on and off cells in the brain may hold a key. Others suggest deficient flicker/motion detection abilities. Others suggest that poor eye movement may be at the base of dyslexia. Most, however, believe the primary base of the disability is linguistic and not visual. There is little research to support an eye movement hypothesis.

- Orthographic processing

Orthographic processing is related to visual processing of symbols associated with reading. It most often relates to the student's ability to do sight reading. This has a significant impact on a person's ability to comprehend language at more complex levels. It seems to involve more than phonological processing.

Reading programs and links to their research summaries.

This table provides a summary of reading programs most often used in reading research designs. Programs are presented in alphabetical order. One is not endorsed more than another.

It is important to review the quality of the research presented. It is also important to know if the reading program is related to the nature of the specific reading disability for which remediation is sought. Is the disability due to phonological processing? Is the student struggling because of limited instruction?

Reading Treatment Program	<p style="text-align: center;">Description</p> <p style="text-align: center;">Posted March 18, 2003</p>
<u>Fast ForWord</u>	<p>The Fast ForWord program is an individualized CD-ROM and Internet program designed to improve phonemic and acoustic awareness. The program uses computer games and acoustically altered speech in order to train the brain to speed its auditory information processing. As the child becomes more proficient at recognizing the sounds, the Fast ForWord Language program adjusts to the child's improving level of competence by continually shortening the duration of the sound, requiring the brain to process at faster rates of speech. The series includes Fast ForWord Language™, Fast ForWord Language to Reading™, and Fast ForWord Middle & High School™. Fast ForWord Language™ focuses on children ages 5-12, while Fast ForWord Middle & High School™ is geared toward adolescents and adults. Fast ForWord Language to Reading™ is a subsequent program used after mastering Fast ForWord Language™ and is available for those up to age 16.</p>
<u>Lindamood-Bell</u>	<p>Lindamood-Bell Learning Processes® uses three programs to develop the sensory-cognitive brain functions necessary for language and literacy development. 1) The Seeing Stars® for Symbol Imagery (SI™) Program develops the brain's ability to create mental representations for sounds and letters within words. This sensory-cognitive function is highly correlated to phonological processing for word attack skills, orthographic processing for sight words and spelling accuracy, and fluent paragraph reading. Once developed, this sensory-cognitive ability allows individuals to self-correct reading and spelling responses quickly and confidently by matching what they see in print to their visual image of a word. 2) The Lindamood Phonemic Sequencing® (LiPS®) Program successfully stimulates phonemic awareness. This sensory-cognitive function is strongly related to the ability to decode and spell accurately. Individuals with intact phonemic awareness can accurately identify and manipulate sounds within words. This ability assists in enabling them to match the alphabet code with spoken words and to be independent and self-correcting in decoding and spelling. This function underlies the ability to benefit from direct instruction in phonics. 3) Visualizing and Verbalizing for Language Comprehension and Thinking™ (V/V™) Program develops concept imagery. Concept Imagery is the ability to create mental representations for the gestalt or whole of what is read or heard. This sensory-cognitive function underlies the ability to comprehend oral and written language, follow directions, problem solve, and think critically and creatively. Persons with well-developed concept imagery create imaged gestalts or holistic mental representations-processing the "big picture" from which to reason and communicate. They can perform higher order thinking skills such as getting the main idea, making inferences, drawing conclusions, predicting and evaluating.</p>
<u>Phono-Graphix</u>	<p>Phonographix is a system of teaching reading and spelling strategy. It teaches that words are composed of a series of sounds and that the sounds are represented in words or sound pictures. The program uses phoneme awareness, blending and segmenting to teach reading and spelling. For more information visit read.uk as well. Grade levels- K-adult.</p>

<p><u>Orton-Gillingham</u></p>	<p>Orton-Gillingham is a multi-sensory approach to reading, spelling, and writing instruction. This means a student will learn how letters look, sound, and even feel. For example, sandpaper letters are traced as the student hears and sees a letter. An intensive, sequential phonics-based system teaches the basics of word formation before whole meanings. As basic letters are learned more complex language structures are introduced. To learn more about this approach read one teacher's experience in Success is Never Boring (http://www.dyslexia-parent.com/mag33.html). Grades 1-adult.</p>
<p><u>Wilson</u></p>	<p>The Wilson Reading System is a 12-Step remedial reading and writing program for individuals with a language-based learning disability. This program is based on Orton-Gillingham philosophy and principles and current phonologically coding research. It directly teaches the structure of words in the English language so that students master the coding system for reading and spelling. Unlike other programs that overwhelm the student with rules, the language system of English is presented in a very systematic and cumulative manner so that it is manageable. The Wilson Reading System specifically teaches strategies for decoding and spelling. However, from the beginning steps of the program, it includes oral expressive language development and comprehension. Visualization techniques are used for comprehension. Whether caused by dyslexia or some other language-based learning difficulty, a late introduction to English or over-reliance on whole language programs, this deficit must be corrected by direct, multisensory, structured language teaching. New <u>Foundations Program</u> for Grades K-3. Grades 5-adult.</p>
<p><u>Slingerland</u></p>	<p>The Slingerland Multisensory Approach is a classroom adaptation of the Orton-Gillingham Approach. Originally created for preventive instruction, it is used today both as a preventive and remedial approach and is practiced in classrooms, in small groups, and in one-to-one settings with students ranging from primary grade children to adults. The Slingerland approach differs from more traditional approaches in several ways. Simultaneous, multisensory teaching strategies are incorporated into every facet of the lesson. The logic and structure of English are taught using the alphabetic-phonetic principle of beginning with the smallest unit of sight, sound, and feel - a letter. All the language arts skills-oral expression, decoding, reading comprehension, spelling handwriting and written expression-are taught with the one integrated direct instruction approach. Students are given guided practice in functional use of these skills with the goals of independent reading and written expression. Last modified March 15, 2004</p>

About the author:

Kathleen Ross-Kidder, Ph.D. is the Director of LD OnLine (www.LDOnLine.org), the interactive guide to learning disabilities for parents, teachers and other professionals, and the leading Web site in its field. LD OnLine is a service of WETA-TV-FM, the public broadcasting station in Washington, D.C. Dr. Ross-Kidder is also a faculty member of the Department of Psychology at The George Washington University, a former teacher in both private and public education and a licensed school psychologist who has worked extensively in public education and private practice helping children with learning disabilities and/or ADHD and their parents.

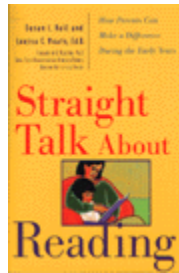
http://www.ldonline.org/ld_indepth/reading/teaching_children_to_read.html

LD OnLine's Special Report (also available in PDF) on the recently released Report of the National Reading Panel by Susan Hall offers a comprehensive overview of this important study.



Report of the National Reading Panel: Teaching Children to Read

By Susan L. Hall - Past President of the Illinois Branch of the International Dyslexia Association and co-author with Louisa C. Moats, Ed.D. of a parenting book about reading called,



Straight Talk About Reading: How Parents Can Make a Difference During the Early Years
(Chicago: Contemporary Books, 1999).

On April 13, 2000 a major development in the field of reading and reading difficulties occurred with the release of the National Reading Panel's (NRP) report titled Teaching Children to Read. To many parents and observers this may appear to be one more major report in a series that recently has been coming fast and furiously. Just a little over 2 years ago The National Academy of Sciences released their report called Preventing Reading Difficulties in Young Children followed about a year later by the Learning First Alliance's document about early reading instruction. Now this report follows within a short time frame. With each document the media has reported that a combination of teaching approaches, or a balance of phonics and whole language strategies, is recommended. What are the major conclusions of the NRP report? Is this report significant given the backdrop of all these other recent reports?

National Reading Panel was Formed by Congressional Legislation

The National Reading Panel was initiated and funded by the Congress of the United States. In 1997 Congress passed legislation which called upon a branch of the National Institutes of Health (NIH) to work with the Department of Education in order to create a Panel to identify research-based evidence on how best to teach children to read. Senator Thad Cochran (Mississippi), who was one of the key advocates of the legislation, wanted to resolve the question of which reading research policymakers and the public should believe. After a formal process where over 300 candidates were nominated and considered, 14 members representing researchers, teachers and administrators, psychologists, education leaders, child development experts, and parents were appointed and assembled in April of 1998 ([list of Panel members](#))

(<http://www.nationalreadingpanel.org/NRPAbout/Biographies.htm>). During the nomination process the NICHD did something that is commonly done in many other fields—they asked all nominees to disclose any potential conflicts of interest, including consulting contracts with publishers.

During the Panel’s first meeting in April, 1998 Dr. Duane Alexander, Director of the National Institute of Child Health and Human Development (NICHD), the branch of the NIH that Congress asked to oversee the Panel, charged the Panel with answering 7 questions (http://www.ldonline.org/ld_indepth/reading/alexander_7_questions.html). Dr. Alexander asked the Panel to conclude, based on the scientific evidence, which instructional approaches used to teach reading are the most effective.

Methodology is Different in the NRP Report

One of the most significant outcomes of the Panel’s work is that the methodology they used suggests a set of guidelines to define what high quality, scientific research is in the field of reading. Spurred on by the public concern expressed during the regional meetings about what constitutes credible research, the Panel decided to spend time up front defining a methodology that would constitute a rigorous and replicable scientific exploration. Two members of the Panel, Dr. Sally Shaywitz and Dr. Timothy Shanahan, were asked by the chair to advise the Panel about reliability of research and to develop criteria that could be uniformly used by all the subgroups in their review and evaluation of research findings. This set of criteria, which was used by all the subgroups, enabled consistency across the work of the separate committees.

The Panel decided to select only experimental and quasi-experimental studies that were constructed to compare reading performance between groups that received a specific kind of reading instruction versus a control group. They wanted to be able to make causal statements that a particular type of instruction leads to higher reading achievement. Therefore they generally did not include research studies that were only qualitative and descriptive without measuring outcomes of instruction groups vs. control groups.

To identify research on a topic area the subgroups searched 2 major databases. Each study was then held up against the Panel’s criteria. They used a procedure to comprehensively code each research study. This procedure not only enabled extensive analysis of the amount of improvement in reading achievement with specific types of instruction but it also documented which criteria a study failed to meet if it was dropped from the group. Only a small percentage of the research identified on a topic met the Panel’s strict criteria. The field of reading has been notorious for its lax standards of research, an issue that often is raised to explain the pendulum swings in approaches used to teach reading. This Panel raised the bar so that hopefully a strong message has been sent to researchers in the field of reading; in order for a study to be included as scientific evidence, it needs to meet minimum scientific standards of research. For more information on the Panel’s methodology, see the detailed report (http://www.ldonline.org/ld_indepth/reading/methodology_of_the_nrp.html).

Major Conclusions of the NRP

The Panel came out strongly recommending that children learn to read best when taught with an approach that includes explicit instruction in the sounds in words, and by using an approach that teaches a planned sequence of phonics elements, rather than highlighting elements as they happen to appear in text. The Panel determined that effective reading instruction includes the following components:

- Teaching children to break apart and manipulate the sounds in words, often referred to as phonemic awareness
- Teaching children by using phonics, an approach that explicitly teaches that the sounds in words are represented by letters of the alphabet which can then be blended together to form words
- Have children practice what they've learned by reading aloud with guidance and feedback, sometimes called guided oral reading
- Applying strategies to guide and improve reading comprehension.

While on the surface these conclusions might not seem much different from those reached by other recent reports, this report is actually very newsworthy. It's comforting that the conclusions are consistent between these reports, but what makes this one unique is that it is written with much stronger definitive statements. Since the conclusions were based on a rigorous analysis of data that had to meet minimum standards, the Panel was able to make more definitive statements about the most effective ways to teach reading. Many of the caveats and qualifying phrases present in other reports are not there this time. It says clearly that the most effective way to teach reading includes instruction in phonemic awareness and phonics. Because of the methodology to define scientific research and the conclusiveness of their statements, the NRP's work provides a major breakthrough in reading education. I believe this will be the document we will all quote in the years to come.

Reports of the Subgroups

The Panel first decided which topics to study and then divided their work into 5 topic areas and worked as subgroups. All members served on one subgroup and a few members served on more than one subgroup. The subgroup topics are alphabets (phonemic awareness and phonics), fluency, comprehension, teacher education, and computer technology. The conclusions for each topic are summarized below.

1. Alphabets – Phonemic Awareness and Phonics

1.A. Phonemic Awareness

Instruction in phonemic awareness (PA) involves teaching children to focus on and manipulate the sounds in spoken words, or phonemes. PA is one of the 2 best predictors in kindergarten of how well a child will learn to read. Since PA is such a strong predictor of success is instruction in this skill effective, especially for children who lack it? The Panel chose to study this topic because they wanted to know whether teaching PA skills could be shown to play a causal role in

learning to read – not just whether students who have PA skills are better readers, but rather whether this skill causes them to read better.

The results were not only positive, the effect size was large (0.86). Training in PA not only led to an increase in a child's phonemic awareness skills, but it also produced improvements in reading and spelling. To appreciate how conclusive the Panel was in their report about the benefit of providing PA training, a quote from the subgroup's report is provided:

"In sum, these findings lead the Panel to conclude with much confidence that phonemic awareness training is more effective than alternative forms of training or no training in helping children acquire phonemic awareness and in facilitating transfer of PA skills to reading and spelling. PA training improves children's reading performance in various types of tasks, including word reading, pseudoword reading and reading comprehension. Benefits are evident on standardized tests as well as experimenter-designed tests of reading and spelling. Improvement in reading and spelling is not short-lived but lasts beyond the immediate training period." (page 2-19 of the Alphabetic Subgroup report)

PA tasks are ordered in this list from easiest (1) to hardest (6) from research by Schatschneider et al. (1999).

1. First sound comparison – identifying the names of pictures beginning with the same sound
2. Blending onset-rime units into real words
3. Blending phonemes into real words
4. Deleting a phoneme and saying the word that remains (say hat without the /h/ sound – at)
5. Segmenting words into phonemes (/c/ /a/ /t/)
6. Blending phonemes into non-words

Methodology of Phonemic Awareness Subgroup

The Alphabetic subgroup found 637 citations in the ERIC database and 1325 in the PsychInfo database about phonemic awareness. Although there might be a great number of citations that overlap between these 2 databases, there was clearly a lot of research in this area. The subgroup decided to only accept experimental studies where the active manipulation of phonemes was taught, not just phoneme discrimination, which is easier. The study also couldn't provide reading and writing training because it would not be a pure representation of the benefits just due to the PA instruction. From these citations, only 52 studies met the NRP criteria and they contained 96 cases comparing treatment and control groups. There still was a great deal of diversity among the studies which included students from preschool through 6th grade, at-risk and reading disabled students, instruction delivered by classroom teachers, researchers, and computers, and instruction delivered in individual tutoring sessions, small groups, or in classrooms.

The primary statistic used in the meta-analysis of the experimental research was to assess the extent to which the treatment group's performance on the outcome measures exceeded the

control group's performance. The difference was expressed in standard deviation units. The Panel determined that an effect size of .20 was small, an effect size of .50 was moderate, and .80 or more was considered large.

Conclusions about Phonemic Awareness

The Panel concluded that explicit training in phonemic awareness helps teaching a child to read.

"It is important to recognize that children will acquire some phonemic awareness in the course of learning to read and spell even though they are not taught PA explicitly. ... However, the extent of PA that is needed to contribute maximally to children's reading development does not arise from incidental learning or instruction that is not focused on this objective. This is indicated by the finding that children receiving explicit training in PA gained much more PA and reading skill than children in the control groups." (Page 2-33 of the Alphabetics subgroup report)

Some of the more specific conclusions discussed in the subgroup's report are listed below.
PA training:

- Is very effective at teaching PA to students
- Improves reading performance in preschoolers and elementary students
- Improves reading performance in normally progressing children, as well as in older disabled readers and younger children at-risk for reading difficulties
- Improves spelling performance in K, first graders, and at-risk students but not in older disabled readers – in fact PA training gives at-risk students a bigger boost in reading than it gives normal or disabled readers – younger students gained more than older, not surprisingly because they started out with the least PA
- English-speaking children showed larger effects of PA training than children of other languages
- SES exerted no differential impact on learning PA
- Children in the lower grades benefited more (especially preschool and K) than first grade and above
- Many types of PA training are effective, including those that teach one or multiple types of phonemic awareness, those that incorporate letters into training, and those that limit phoneme manipulation to speech.
- Many different categories of people were shown to be effective delivering the instruction including researchers, classroom teachers, and computers
- Instruction can be effective when delivered in whole classrooms, small groups and individually
- Training does not have to be lengthy to be effective

- Students retained the skill after training ended
- The improvement for segmentation and deletion was larger than for blending
- PA training benefited decoding skills – comprehension skills also improved, but not as much as word reading

Properties of Effective PA Training

- The subgroup also gave some advice about the properties of PA training that was found to be most effective.
- Focusing PA instruction on 1 or 2 skills was significantly more effective in PA learning and for improvements in reading than focusing on multiple skills – blend-and-segment training benefited children’s reading more than multiple skills training did.
- Teaching phoneme manipulation with letters is more effective for improving reading in helping non-disabled readers acquire phonemic awareness than teaching it without letters (speech only).
- The greatest effects on reading occurred when PA was taught in small groups.
- Although the optimum length of time needs further research, training from between 5 to 18 hours showed larger effect sizes on reading than when either less or more time was spent – the Panel cautioned against translating this finding into any prescriptions regarding how long teachers should spend teaching PA.
- Computers resulted in a moderately strong learning, but were not as effective as other forms of instruction.

Disabled Readers Scores Showed Less Improvement in PA

The Panel was interested in whether PA training was effective for at-risk and disabled readers and whether this improved their reading and spelling performance, thus providing evidence of a causal relationship. They found that although there was some improvement in their reading scores, it was not as great as for other groups of readers, and there was little improvement in spelling. The committee offered a possible explanation that disabled readers were older and relatively more advanced in PA leaving less room for significant gains. Also disabled readers were taught more advanced forms of PA (segmenting and blending with letters) than younger students. Disabled readers can be resistant to learning PA skills. Perhaps PA training is not effective for improving disabled reader’s spelling because their spelling skills are much harder to remediate than their reading skills.

When the 17 comparisons with disabled readers were removed from the sample, the effect sizes changed several conclusions about spelling for other groups. PA training does not improve spelling in disabled readers, but it does improve spelling in normally developing readers below 2nd grade and children at risk. It doesn’t depend on whether 1 or 2 or multiple PA skills are taught, whether instruction is delivered in groups or individually, how long training lasts, or whether teachers or researchers are the trainers.

There clearly is a need for more research on what is effective for disabled readers as the panel's report left many questions in this area.

1.B. Phonics

The Panel states that systematic synthetic phonics instruction produced the greatest gains among beginning readers in using the alphabetic system to read and spell words in and out of text, especially with children from low socioeconomic levels. Synthetic phonics is explicit instruction in how to convert letters into sounds (phonemes) and then blend the sounds to form words. According to a press release of the NICHD on April 13, 2000:

"The panel also concluded that the research literature provides solid evidence that phonics instruction produces significant benefits for children from kindergarten through 6th grade and for children having difficulties learning to read. The greatest improvements in reading were seen from systematic phonics instruction. This type of phonics instruction consists of teaching a planned sequence of phonics elements, rather than highlighting elements as they happen to appear in a text. Here again, the evidence was so strong that the panel concluded that systematic phonics instruction is appropriate for routine classroom instruction.

For children with learning disabilities and children who are low achievers, systematic phonics instruction, combined with synthetic phonics instruction produced the greatest gains. Synthetic phonics instruction consists of teaching students to explicitly convert letters into phonemes and then blend the phonemes to form words. Moreover, systematic synthetic phonics instruction was significantly more effective in improving the reading skills of children from low socioeconomic levels. Across all grade levels, systematic synthetic phonics instruction improved the ability of good readers to spell."

The Panel's report was also clear that phonics instruction is only one component – albeit a necessary component - of a total reading program, not all phonics programs are equally effective, and that making determinations about how much intensive and systematic phonics any student needs is critical. Teacher training needs to better equip teachers to determine how to incorporate systematic phonics instruction within a complete and balanced program that includes instruction in phonemic awareness, fluency, and comprehension strategies.

2. Fluency

The Panel reviewed research about fluency, the ability to read with speed, accuracy, and proper expression. Fluency is important because it enables the reader to remember what has been read and apply energy toward comprehension. Two strategies that are often used to teach fluency were evaluated - guided oral reading, and independent silent reading. The data supported that guided oral reading, where a student reads aloud and receives guidance from a teacher or parent, had significant positive impact on word recognition, fluency and comprehension across a range of grade levels. Much to everyone's surprise, there wasn't enough conclusive data about the impact of independent silent reading. Hundreds of correlational studies find that the best readers read the most, but the experimental data available was insufficient to conclude that increased silent reading causes improved reading achievement. The Panel cautioned that the public should not lessen their efforts to encourage students to read silently, but rather that more research is needed in this area.

3. Comprehension

The Panel evaluated the research about the impact of vocabulary on comprehension. From their work they offered the following suggestions:

- Vocabulary should be taught both directly and indirectly
- Repetition and multiple exposures to vocabulary items are important
- Learning vocabulary in context, incidental learning, and the use of computer technology all enhance the acquisition of vocabulary
- Direct instruction in vocabulary should include task restructuring
- Active engagement of the student is important

The Panel also reviewed studies about approaches to teach a student comprehension strategies. Readers derive meaning from text when they are actively relating the ideas in print with their own knowledge and experiences and are constructing mental representations as they read. The Panel was interested in learning whether there was evidence that explicitly teaching a student how to do this active and engaging process aids their ability to comprehend. Few research studies met all the NRP criteria so the Comprehension Subgroup employed the criteria to the maximum extent possible even though a meta-analysis was not possible. The subgroup also identified 7 categories of instruction that improved comprehension in non-impaired readers, including using graphic and semantic organizers, story structure, and summarization techniques.

7 Categories of Comprehension Instruction:

- Comprehension Monitoring, where readers learn how to be aware of their understanding of the material
- Cooperative Learning, where students learn reading strategies together
- Graphic and Semantic Organizers (including story maps), where readers make graphic representations of the material to assist comprehension
- Question Answering, where readers answer questions posed by the teacher and receive immediate feedback
- Question Generation, where readers ask themselves questions about various aspects of the story
- Story Structure, where students are taught to use the structure of the story as a means of helping them recall story content in order to answer questions about what they have read
- Summarization, where readers are taught to integrate ideas and generalize from the text information

When students use some of the strategies appropriately they assist with recall, question answering and generation, and summarization of text. There are still some questions, such as whether to teach comprehension as a skill in content areas such as social studies and which

strategies are best for which age groups. Questions also remain about how to prepare teachers to optimally teach comprehension strategies, especially teaching several strategies in combination.

4. Teacher Education and Reading Instruction

Only a small number of experimental studies have been published about the effectiveness of preservice and inservice teacher education, and many of these failed to measure student outcomes as well as teacher outcomes. While the Panel felt that inservice professional development produced higher student achievement, there was not enough information to reach conclusions about the content of this education. The Panel identified a number of areas where further research is needed including the optimal combination of preservice and inservice education, and the relationship between standards and teacher education.

5. Computer Technology and Reading Instruction

Because this is such a new field there were very few studies to review. However the Panel did believe it was possible to make some general statements from the research that was available. The studies showed positive results suggesting that it is possible to use computer technology for reading instruction. Three promising areas identified were:

1. The addition of speech to computer-presented text
2. The use of hypertext (highlighted text linked to definitions or related text)
3. The use of computers as word processors given that reading instruction is most effective when combined with writing instruction

G. Reid Lyon, Ph.D.
Chief, Child Development and Behavior Branch
National Institute of Child Health and Human Development - National Institutes of Health

The NICHD Research Program
in Reading Development, Reading Disorders and Reading Instruction

Background and Purpose

Learning to read is critical to a child's (and an adult's) well-being. The child and adult who cannot read at a comfortable level experience significant difficulties mastering many types of academic content, are at substantial risk for failure in school, and are frequently unable to reach their potential in the vocational and occupational arena. Unfortunately, the rate of reading failure and illiteracy are unacceptably high in the United States. Over 40 percent of fourth grade students performed below basic levels on the National Assessment of Educational Progress (NAEP) in both 1994 and 1998. Over 10% of fourth grade children could not even participate in the NAEP due to severe reading difficulties. Moreover, converging evidence from longitudinal, population-based data indicate that at least 17 percent to 20 percent of children have a significant reading disability. A real crisis revealed in these statistics is the disproportionate representation of children who are poor, racial minorities, and non-native speakers of English. However, it is also noteworthy that large numbers of school-age children from all social classes, races and ethnic groups have significant difficulties learning to read. Because reading is so critical to success in our society, reading failure constitutes not only an educational problem but also rises to the level of a major public health problem.

Since 1965, the National Institute of Child Health and Human Development (NICHD), within the National Institutes of Health (NIH), has conducted and continuously supported research efforts to address three fundamental questions that must be answered if reading failure is to be understood and addressed successfully. These three questions are: (1) How do children learn to read? What are the critical environmental, experiential, cognitive, linguistic, genetic, neurobiological, and instructional conditions that foster reading development? (2) Why do some children and adults have difficulties learning to read? What specific cognitive, linguistic, environmental, and instructional factors impede the development of accurate and fluent reading skills, and what are the most significant risk factors that predispose youngsters to reading failure? (3) How can we help most children learn to read? Specifically, for which children are which teaching approaches and strategies most beneficial at which stages of reading development?

To answer these three questions, the NICHD has developed a research network consisting of 41 research sites in North America, Europe, and Asia to study reading development, reading disorders and other learning disabilities, and reading instruction. During the past 33 years, NICHD scientists have studied the reading development of 34,501 children and adults. Many studies have been devoted to understanding normal reading development, and 21,860 good readers have participated in these investigations, many for as long as 12 years. Significant efforts have also been deployed to understand why many children do not learn to read. Within this context, 12,641 individuals with reading difficulties have been studied, many for as long as 12 years. In addition, since 1985, the NICHD has initiated studies designed to develop early identification methods that can recognize those children during kindergarten and first-grade who are most at-risk for reading failure. These studies have provided the foundation for several

longitudinal prevention and early intervention projects now underway at 11 sites in the U.S. and Canada. Since 1985, 7,669 children (including 1,423 good readers) have participated in these reading prevention, early intervention, and remediation studies, and 3,600 children are currently enrolled in longitudinal intervention trials in Texas, Washington, DC, Georgia, Massachusetts, New York, Florida, Colorado, North Carolina, and the state of Washington. These studies involve the participation of 1,012 classroom teachers, working in 266 schools and 985 classrooms.

The purpose of this report is to synthesize the major converging findings that have been obtained by NICHD scientists for each of the three questions that have guided the reading research program. This synthesis is derived from an analysis of over 2,500 publications generated by NICHD scientists since 1965.

Converging Evidence and Findings Relevant to Each Major Research Question:
How Do Children Learn to Read?

Evidence and Findings

- Reading is not a natural process. In contrast to oral language development, reading does not emerge naturally from interactions with parents and other adults, even in print-rich environments. For most children, reading requires systematic and explicit instruction, although the degree of explicitness, directiveness, intensity and duration of instruction requires developing specific reading components that would vary across children.
- Learning to read is a relatively lengthy process that begins very early in children's development and substantially before they enter formal schooling. There is a strong and critical relationship between the amount and quality of early language and literacy interactions and experiences and the acquisition of the linguistic skills necessary for reading. Moreover, frequent language and literacy interactions from birth onward serve to aid in the development of oral vocabulary, an awareness of print and literacy concepts, and an understanding of the goals of reading. Exposure to oral reading and language play (e.g., rhyming) has been found to serve a foundational role in the development of phonemic awareness.
- Reading development requires the acquisition of phonemic awareness and other phonological processing skills. Specifically, a necessary foundational skill that beginning readers must master is that the words and syllables that they hear via oral language are composed of small units of sound, termed phonemes.
- Becoming aware of the sound structure (phonemes) within syllables and words is made difficult because unlike writing, when communicating orally, the separate sounds composing an utterance cannot be "heard" by the ear due to a process termed co-articulation. Specifically, when producing speech orally, as in saying the word cat, only one sound is heard, not three, as in c/a/t. The vocal apparatus merges the three sounds to permit rapid communication, and it is the brain, not the ear that recovers the sound segments from the acoustic bundle. In essence, to learn to read, the individual must discover that spoken words can be segmented into smaller units of sound, that letters on the page represent these sounds, and that written words have the same number and sequence of sounds heard in a spoken word.

- As noted above, the beginning reader must be able to translate print to speech. In an alphabetic language, like English, the individual letters on a page are initially abstract and meaningless optical units. These optical shapes must eventually be linked to sounds - the phonemes discussed above. In essence, the beginning reader must learn the connections between the 26 letters of the alphabet and the approximately 44 English-language phonemes. The understanding that written spellings systematically represent the phonemes of spoken words is termed "the alphabetic principle" and is absolutely necessary for the development of accurate and rapid decoding and word reading skills. The development of sound-symbol relationships is also frequently termed "phonics."
- Although the development of phoneme awareness and the alphabetic principle are necessary to learn to read, these skills, in and of themselves, are not sufficient. Specifically, in order for the novice reader to begin to devote more attention and memory capacity to the text that is being read for strong comprehension to occur, phonological and decoding skills must be applied accurately, fluently and automatically. Laborious application of decoding and word recognition skills while reading text reduces attentional and memory resources, thus impeding reading comprehension.
- The ability to understand what has been read appears to be based on several factors. Children who comprehend well are able to activate their relevant background knowledge when reading - they can relate what has been read to their own experiences and background knowledge. Strong comprehension abilities are clearly related to oral language comprehension, which like reading comprehension is also critically dependent on the acquisition of a robust oral vocabulary. Individual differences in reading comprehension also vary with the reader's ability to actively summarize, clarify, and predict while reading and the ability to employ syntactical conventions to enhance comprehension.
- The development of phoneme awareness, the alphabetic principle, word reading accuracy and fluency, reading vocabulary, and active reading comprehension strategies are all necessary, but not sufficient in and of themselves, to produce robust reading capabilities. These reading elements or components must be exquisitely integrated via informed instruction and practice.
- Opportunities to learn to read and to practice the application of reading skills are essential to developing accuracy and fluency and a strong sight word vocabulary. In turn, reading practice serves as a major factor in the continued development of oral vocabulary, particularly as children move past the third grade.

Why Do Some Children and Adults Have Difficulties Learning to Read? Evidence and Findings.

Prevalence, Developmental Course, and Psychometric Characteristics

- NICHD population-based, epidemiological longitudinal studies indicate that at least 17 percent to 20 percent of the nation's population displays a reading disability. Thus, at least 10 million children, or 1 child in 5 will experience significant difficulties learning to read well enough to utilize reading to learn and for enjoyment. Non-NICHD prevalence studies and assessments (e.g., NAEP) place reading failure at higher levels ranging from 20 percent in some states to 59 percent in others.

- While public schools identify approximately four times as many boys as girls as reading disabled, NICHD longitudinal and epidemiological studies show that as many girls as boys have difficulties learning to read.
- Reading disabilities typically persist throughout childhood, adolescence, and adulthood. Difficulties learning to read do not reflect a transient developmental lag. NICHD longitudinal studies indicate that of children who are reading disabled in the third grade, 74 percent remain disabled at the end of high school.

Distinguishing between disabled readers with an IQ-reading achievement discrepancy and those without a discrepancy reflects an invalid practice at the beginning stages of reading. Specifically, children with and without a discrepancy do not differ in the information processing skills (phonological and orthographic coding) that are necessary for the accurate and rapid reading of single words. Likewise, genetic and neurophysiological (functional MRI) studies have not indicated differential etiologies for reading disabled children with and without discrepancies. Converging data from several NICHD sites also indicates that the presence and magnitude of IQ-reading achievement discrepancies are not related significantly to a child's response to intervention.

- Children with reading disabilities differ from one another and from other good readers along a continuous distribution, and do not aggregate together in a distinct "hump" at the tail of the distribution. Reading disabilities reflect dimensional rather than categorical individual differences.

Environmental, Experiential, and Individual Difference Factors

- Children most at-risk for reading failure are those who enter school with limited exposure to the English language and who have little prior understanding of concepts related to phonemic sensitivity, letter knowledge, print awareness, the purposes of reading, and oral language and verbal skills, including vocabulary. Children raised in poverty, youngsters with limited proficiency in English, children with speech and hearing impairments, and children from homes where the parent's or caretaker's reading levels are low are relatively predisposed to difficulties learning to read. Likewise, youngsters with sub-average intellectual capabilities frequently manifest greater difficulties in reading comprehension.
- The most frequent characteristic observed among children and adults with reading disabilities is a slow, labored approach to decoding or "sounding-out" unknown or unfamiliar words and frequent misidentification of familiar words. Oral reading is hesitant and characterized by frequent starts and stops and multiple mispronunciations.
- One of the most powerful predictors of reading comprehension abilities is the speed and accuracy of reading single words. Likewise, one of the most powerful predictors of speed and accuracy in reading single words is the strength of phonemic awareness skill development.
- In contrast to good readers who have discovered that letters and letter patterns represent segmented units of sound (phonemes), poor readers have substantial difficulty developing this principle. As noted in the discussion of reading development, the major factor impeding the development of the alphabetic principle and thus decoding and word reading skills is a lack of facility in phonemic awareness.

- Phonemic awareness skills assessed in kindergarten, in combination with assessment of the child's ability to provide letter and number names and letter sounds, are strong predictors of difficulties learning to read. Deficits in phoneme awareness skills impact the ability to develop accurate and fluent word reading capabilities which significantly degrade comprehension of what has been read.
- In addition to being negatively affected by phonological and word level deficits, reading comprehension is impeded by, among other factors: (1) vocabulary deficits; (2) inadequate background knowledge relevant to the information presented in text; (3) lack of familiarity with semantic and syntactic structures that can be employed to predict and better understand word and grammatical relationships; (4) lack of knowledge about different writing conventions that are employed by the author to achieve different purposes via text (humor, explanation, dialogue, etc.); (5) lack of verbal reasoning ability which enables the reader to "read between the lines;" and (6) the ability to remember and/or recall verbal information.
- Motivational factors are clearly relevant to reading development and reading disorders, given that the improvement a disabled reader may make in learning to read is highly related to their willingness to persist despite difficulties. Unfortunately, little is specifically known about the exact timing and course of motivational influences in reading development.
- There is strong converging evidence for a genetic cause of some types of reading disability with deficits in phonemic awareness being the greatest hereditary factor. Family history is one of the most important risk factors, with 23 to as much as 65 percent of children who have a parent with reading disability having the same difficulties. A rate among siblings of affected persons of approximately 40 percent and among parents ranging from 27 to 49 percent provides opportunities for early identification.
- Converging evidence suggests that at least one type of reading disability can be linked to the HLA region of chromosome 6 reflecting a possible association with autoimmune disorders. Evidence obtained from twin and kindred siblings with severe deficits in reading performance support a Quantitative Trait Locus on chromosome 6. Chromosome 15 has recently been linked to individual differences in word reading skills.
- Phonemic awareness and word reading deficits can also result from a lack of oral language and literacy exposure and interactions following birth and through the preschool years. If children are not provided opportunities to listen to and interact with language in multiple contexts, their background knowledge about sounds, print concepts, and vocabulary concepts will be negatively affected. Whether or not limited oral language exposure is reflected in differences in neural development during the early years is not yet known.
- A range of neurobiological investigations employing post-mortem brain specimens, brain morphometry, functional brain imaging, and electrophysiology suggests there are differences in the temporo-parieto-occipital neural regions between some individuals with reading disability and those who are not reading-impaired. Additional studies suggest differences in the striate or extrastriate cortex, converging with a large body of literature describing anatomical lesions in posterior brain regions in acquired alexia, most prominently located in the angular gyrus.

How Can We Help Most Children Learn to Read?

Specifically, for Which Children Are Which Teaching Approaches and Strategies Most Beneficial at Which Stages of Reading Development?

Evidence and Findings

- A massive effort must be undertaken to inform parents and caretakers of the importance of providing oral language and literacy experiences from the first days of life - to engage children in playing with language through nursery rhymes, storybooks, and as they mature, early writing activities. Parents and caretakers must become intimately aware of the importance of vocabulary development and must interact verbally with their children to enhance verbal reasoning, semantic, and syntactical abilities.
- Reading out loud to children is a proven activity for developing vocabulary and language expansion characteristics, and plays an important role in developing receptive and expressive language skills. Reading out loud to children can also help to enhance children's background knowledge of new concepts that will appear in both oral and written language.
- NICHD prevention and early intervention studies continue to provide converging evidence on the importance of developing accurate and fluent word reading skills, given the significant importance of such skills in developing reading comprehension abilities.
- Prevention and early intervention studies in Tallahassee, Gainesville, Syracuse, Albany, Houston, Seattle, and Washington, DC are providing converging evidence that for those children who are at risk for reading failure, highly direct and systematic instruction to develop phoneme awareness and phonics skills, reading fluency and automaticity, and reading comprehension strategies within a literature-rich environment will be required to obtain maximum gains. It is also imperative that each of these reading components be taught within an integrated context and that ample practice in reading familiar material be afforded to enhance fluency and automaticity. Likewise, the most effective interventions provide ample opportunities to read and discuss authentic literature.
- NICHD and substantial non-NICHD research does not support the claim that the use of context is a proxy for applying decoding strategies to unknown or unfamiliar words. To guess the pronunciation of words from context, the context must predict the words. But content words - the most important words for text comprehension can be predicted only 10-20% of the time. Instead, the strategy of choice among well developing good readers is to decode letters to sound in an increasingly complete and accurate manner, which is dependent upon robust development of phonemic and phonics skills.
- Without a doubt, early identification and intervention is essential to maximizing treatment success in children who are at risk for reading failure. NICHD studies have led to the development of accurate and reliable identification procedures that are linked to prevention programs. NICHD studies have clearly demonstrated that the intensity and duration of reading interventions must increase exponentially as children get older just to achieve the same degree of improvement attainable during kindergarten and first grade.
- One factor that impedes effective instruction with children at risk for reading failure is current teacher preparation practices. Many teachers have not had the opportunity to develop basic knowledge about the structure of the English language, reading development, and the nature of reading difficulties. Major efforts must be undertaken to

ensure that colleges of education develop preparation programs to foster the necessary content and pedagogical expertise at both preservice and inservice levels.

This document was prepared for the Keys to Successful Learning Summit held in May 1999 in Washington, D.C. Keys to Successful Learning is an ongoing collaboration sponsored by the National Center for Learning Disabilities in partnership with the Office of Special Education Programs (US Department of Education) and the National Institute of Child Health & Human Development (National Institutes of Health).

The purpose of this initiative is to translate research and policy on learning disabilities into high standards for learning and achievement in the classroom, and to take action at the local, state and federal levels to ensure that all students, including those with learning disabilities, are afforded the highest quality education. Keys to Successful Learning is supported by a coalition of national and regional funders as well as a broad range of participating education organizations.

Children's Reading Disability Attributed To Brain Impairment

Children who are poor readers appear to have a disruption in the part of their brain involved in reading phonetically, according to a sophisticated brain imaging study funded by the National Institute of Child Health and Human Development (NICHD).

The study also found that children who read poorly but who do not receive any extra help or training eventually compensate for their disability by using other parts of the brain as backup systems for the impaired brain regions. Although most of these children eventually do learn to read, they never do so with the same fluency as do good readers. This is probably because the "backup" brain systems they use when reading apparently cannot process printed information as easily as can the brain systems primarily involved in reading.

The researchers, led by Bennett Shaywitz, M.D., of the Yale University School of Medicine, published their results in the July *Biological Psychiatry*.

"This study shows us the physical basis of why some children have difficulty reading," said Duane Alexander, M.D., Director of the NICHD. "We are now in a position to observe the brain changes that take place when poor readers receive the training that allows them to become proficient readers. In turn, this knowledge may allow us to design even more effective therapies to help poor readers overcome their disability."

In the study, the researchers used a technology known as functional magnetic resonance imaging (fMRI), which produced computer-generated images of the brain while the children were reading. With fMRI, the team demonstrated differences in brain images between children with dyslexia and non-reading impaired control children. The disruption in the brain systems for reading was evident when the children performed phonologic tasks, that is, tasks that required knowing the sound structure of words. Written English is a kind of code-letters or combinations of letters stand for the individual sounds within words. The reading impaired children had difficulty with tasks that required interpretation of this code.

Dr. Shaywitz noted that the current study with children confirmed the researchers' earlier finding with adults that people with dyslexia have an impairment in the brain regions involved with reading words phonetically. And like adults with dyslexia, they use an alternate brain region as a backup system when reading. [The earlier study is described at: <http://www.nichd.nih.gov/new/releases/dyslexianews.cfm>.]

"The study shows some very important findings," Dr. Shaywitz said. "First it identifies neural pathways for reading in good readers while showing a disruption of these pathways in children who are dyslexic (Fig 1). "Second, Dr. Shaywitz explained, the study identifies a region for skilled reading in the brain area known as the left occipito-temporal region (Fig. 2). Better readers are more likely to activate this region than are poor readers. Third, the study shows areas of compensatory systems in the front and the right side of the brain in dyslexic children who are older (Fig.3).

These three images can be found at:

http://www.nichd.nih.gov/new/releases/reading_disability.htm

The researchers tested the ability of children to rhyme nonsense words, for example, asking them: "Do [LEAT] and [JETE] rhyme?" The children were also asked to determine the category of real words-- "Are [CORN] and [RICE] in the same category?" These tasks require children to use phonology, that is, their knowledge of the sound structure of words, which is very difficult for dyslexic readers. Shaywitz and his collaborators used fMRI to study 144 children ranging in age from 7 to 18 years, 70 dyslexic readers (21 girls, 49 boys) and 74 non-impaired readers (31 girls, 43 boys).

"Our findings show that the impairment in the brains of children with reading disability persists into adulthood," said another author of the study, G. Reid Lyon, Chief of NICHD's Child Development and Behavior Branch. "The findings provide compelling evidence that children with reading disabilities need to receive educational services to help them overcome their disabilities."

Dr. Lyon added that NICHD-funded research has shown that such services should have a firm foundation in phonological awareness. Before most poor readers can learn to read successfully, he said, they need to learn that spoken words can be broken apart into smaller segments called phonemes. Next, they usually require training in phonics-"mapping" phonemes to the printed words on a page. Once children have mastered these steps, they can then receive training to help them read fluently, and to comprehend what they read.

The NICHD is part of the National Institutes of Health, the biomedical research arm of the federal government. The Institute sponsors research on development, before and after birth; maternal, child, and family health; reproductive biology and population issues; and medical rehabilitation. NICHD publications, as well as information about the Institute, are available from the NICHD Web site, <http://www.nichd.nih.gov>, or from the NICHD Information Resource Center, 1-800-370-2943; E-mail NICHDInformationResourceCenter@mail.nih.gov.

NICHD-Funded Researchers Map Physical Basis of Dyslexia

A Yale research team funded by the National Institute of Child Health and Human Development (NICHD) has used sophisticated brain imaging technology to show that there is decreased functioning while performing reading tasks in certain brain regions of individuals with the most common form of dyslexia. The study appears in the March 3 issue of the Proceedings of the National Academy of Sciences.

In their study, the researchers used a technology known as functional magnetic resonance imaging (fMRI), which produces computer-generated images of the brain while it is performing intellectual tasks. With fMRI, the team produced images of an impairment in the brains of dyslexic readers that became apparent when they tried to perform tasks which would require a firm command of the ability to decipher words phonetically.

"If you have a broken arm, we can see that on an X-ray," said the study's first author, Sally E. Shaywitz, MD, of the Yale University School of Medicine. "These brain activation patterns now provide us with hard evidence of a disruption in the brain regions responsible for reading--evidence for what has previously been a hidden disability."

Dr. Shaywitz explained that the words we speak are made up of individual sounds called phonemes. In spoken language, the brain automatically combines these sounds to form words. To make normal conversation possible, such sound pieces are strung together rapidly--about 8 to 10 per second--and blended so thoroughly that it's often impossible to separate them.

For people with dyslexia, the problem arises in converting this natural process to print. Written English is a kind of code: The 26 letters of the alphabet, either singly or in combination with other letters, stand for the 44 letter phonemes in spoken English. Dyslexic readers have extreme difficulty with phonological awareness (breaking spoken words into their component sounds) and with phonetics (the ability to match these letter sounds to the letters that represent them).

In their study, Dr. Shaywitz and her coworkers presented 29 dyslexic readers (14 men and 15 women, ages 16-54) and 32 normal readers (16 men and 16 women, ages 18-63) with a battery of reading tasks while observing their brain functioning with the fMRI scanner. Most of these tasks required the readers to manipulate and understand phonologic principals--the skills needed to consciously manipulate the letter sounds in words.

The dyslexic readers found it difficult to read nonsense rhyming words, such as "lete" and "jeat." This task is designed to measure the phonologic principals underlying reading and is far more difficult for dyslexic readers to complete than rhyming actual words, which they may have previously memorized.

When performing such tasks, the dyslexic readers in the study showed less activation in a brain region linking print skills to the brain's language areas, in comparison to normal readers. Specifically, dyslexic readers showed reduced activity in a large brain region that links the

visual cortex and visual association areas (angular gyrus) to the language regions in the superior temporal gyrus (Wernike's area).

In the article, the authors noted that their findings are consistent with those of earlier studies of acquired inability to read (alexia). In both alexia and dyslexia, the same brain regions appear to be affected; however, in people with dyslexia, the study shows the impairment is a functional one, whereas in alexia, it has been attributed to a tumor or brain injury due to a stroke.

When they performed phonologic tasks, the dyslexic readers also showed activation in the brain region known as Broca's area, which has been associated with spoken language. In contrast, the normal readers did not show any increased activity in Broca's area when reading. Dr. Shaywitz explained that the dyslexic readers may have used this brain region in an attempt to compensate for impairments in the brain regions normally used for phonological skills.

"In summary, for dyslexic readers, these brain activation patterns provide evidence of an imperfectly functioning system for segmenting words into their phonologic constituents; accordingly, this disruption is evident when dyslexic readers are asked to respond to increasing demands on phonologic analysis," the authors wrote. "The pattern of relative underactivation in posterior brain regions contrasted with relative overactivation in the anterior regions may provide a neural signature for the phonologic difficulties characterizing dyslexia."

Dr. Shaywitz explained that it is too early to use fMRI as a method for diagnosing dyslexia. Nonetheless, the findings have important implications. First, they provide neurologic evidence for the critical role that lack of phonological awareness plays in dyslexia. They also confirm the fundamental neurobiologic nature of dyslexia and provide a neural signature for the phonologic difficulties accompanying the disorder.

What is Dyslexia?

About Dyslexia & Reading Problems

Developmental dyslexia is a condition related to poor reading. Children with dyslexia have difficulty learning to read due to one or more information processing problems such as visual perceptual or auditory perceptual deficits. Many but not all children with dyslexia have difficulty with reversals of numbers, letters or words. New research points the way to specific methods of instruction that can help anyone learn to read well no matter what the underlying problem may be. Following the links will provide interesting new information as well as extremely effective solutions for all types of reading problems including developmental dyslexia.

What is Dyslexia?

Children who have an average or above IQ and are reading 1 ½ grades or more below grade level may be dyslexic. True dyslexia affects about 3 to 6 percent of the population yet in some parts of the country up to 50% of the students are not reading at grade level. This means that the reason for most children not reading at grade level is ineffective reading instruction. The dyslexic child often suffers from having a specific learning disability as well as being exposed to ineffective instruction.

Children may have dyslexia or a learning disability if they have one or more of the following:

- Letter or word reversals when reading. (Such as was/saw, b/d, p/q)
- Letter or word reversals when writing
- Difficulty repeating what is said to them
- Poor handwriting or printing ability
- Poor drawing ability
- Reversing letters or words when spelling words that are presented orally
- Difficulty comprehending written or spoken directions
- Difficulty with right - left directionality
- Difficulty understanding or remembering what is said to them
- Difficulty understanding or remembering what they have just read
- Difficulty putting their thoughts on paper

Children with dyslexia do not exhibit these symptoms due to poor vision or hearing but because of brain dysfunction. The eyes and ears are working properly but the lower centers of the brain scramble the images or sounds before they reach the higher (more intelligent) centers of the brain. This causes confusion as well as frustration for the learner.

When a child is having difficulty learning, a comprehensive neuro-developmental exam is important. This includes testing of hearing, vision, neurological development, coordination, visual perception, auditory perception, intelligence, and academic achievement. Often, perception problems can be helped with simple exercises which either help to improve a

specific problem or teach techniques to compensate for a problem. These often can be done at home. In a few cases, a referral to an educational or speech therapist may be helpful.

What Causes Dyslexia and Reading Problems?

The main reasons for reading problems are:

1. Ineffective reading instruction
2. Auditory perception difficulties
3. Visual perception difficulties
4. Language processing difficulties

Over 180 research studies to date have proven that phonics is the BEST WAY to teach reading to all students. They also have shown that phonics is the ONLY WAY to teach reading to students with dyslexia and other learning disabilities.

Unfortunately, 80% of our nation's schools do not use an intensified phonics approach for reading instruction. They either use the whole word (see & say) approach or a cursory use of phonics along with the whole word method.

While most people can learn to read using the whole word approach, it is not the best way to learn. It teaches through memorization of word pictures and guessing. Unlike Chinese or Japanese which are picture languages, the English language is a phonetic language. With the exception of the United States which dropped phonics in the 1930's, all other countries that have a phonetic language, teach reading through phonics.

There are only 44 sounds while there are about 1 million words in English. These facts readily explain why having to memorize 44 sounds as opposed to memorizing hundreds of thousands of words is the most efficient way to learn to read.

Reading and writing is simply "talking on paper." Children learn to talk by imitating sounds and then combining the sounds to form words. The brain is programmed to learn language in this fashion. Therefore, the most efficient way to learn to read is through phonics because it teaches children to read the same way they learned to talk.

Children and adults who do not learn to read through an intensive phonics program often have one or more of the following symptoms:

- Below grade level reading achievement
- Slow reading
- Poor comprehension
- Fatigue after reading only for a short while
- Poor spelling skills
- Lack of enjoyment from reading

Some children have auditory discrimination problems. This may have been the result of having chronic ear infections when they were young. Others may be born with this learning disability. Correction involves educational exercises to train the brain in discrimination and to over teach the formation of the sounds used in speaking and reading.

Another group of children have visual perception problems. They may actually reverse letters or words. They have difficulty matching the word image on the page with a previously stored image in their brain. Exercises that train the brain to "see" more accurately may help but instruction with phonics is the best approach to overcome this problem.

Language development problems can contribute to poor reading and listening comprehension along with difficulty in verbal and written expression. Learning appropriate word attack skills through phonics along with special help in receptive and/or expressive language skills improves this type of learning disability.

Helping Children With Reversals

It is not unusual for children to reverse letters and words when they read or write up to the age of 6 or 7. This is due to immaturity in brain development. Children who have problems with reversals usually also have problems with left-right directionality. Below are some exercises that have been found to help improve directionality and reduce reversals.

Symptoms:

1. Spatial confusion - unable to differentiate left-right, on self, other, or paper
2. Confuses letter pairs as b-d, m-w, p-q. Confuses words such as was-saw, on-no.

Remediation:

1. Simplify tasks so only one new discrimination is made at a time.
2. Make each simple discrimination automatic before the next one is introduced. Overteach 'b,' then overteach 'd,' before presenting both together.
3. Each discrimination that causes repeated errors should be worked with by itself until the problem is overcome.
4. Trace, then write the confused letter or word, and pronounce it as written.
5. Use short frequent practice periods. Lengthen the time between practice sessions as the material is retained.
6. If the child is confused about his own left/right, use a ring, watch, ribbon, or band on his writing arm. Color cue the side of desk or paper or word as a starting place.
7. Gradually increase the difficulty of material to discriminate. If errors are made, go back to simpler practice.

Suggestions for Improving Laterality:

1. Trace hands on paper. Label 'right,' 'left.'
2. Play 'Simon Says' - 'Touch right foot; raise left hand,' etc.
3. Child follows directions drawing lines up, down, right to left, in touching parts of body.
4. Child connects dots on blackboard to make completed pattern; repeats on paper.
5. Child shows hands in sequence pattern: left, right, left, right, etc. March as a variation.
6. Child names objects on right/left. He moves to different parts of the room and repeats.
7. Arrange story pictures in sequence, left to right.
8. Use lined paper for writing.
9. Use weighted wristband to designate right or left hand.
10. Tracing activities, left to right. Mark left with small 'x.' Use color tracing to repeat.

Current Research On Dyslexia

Atypical Brain Activity Detected in People with Dyslexia

(http://www.eurekalert.org/pub_releases/1996-07/NIoM-ABAD-150796.php)

Brain imaging studies at the National Institute of Mental Health (NIMH) have revealed dramatic evidence of a deficit in the brain's visual system in people with dyslexia, a disorder that affects the reading ability of millions of American school children and adults. While it has been commonly believed that only the language related areas of the brain are affected in dyslexia, this study adds to the growing body of research pointing to dysfunction of another portion of the brain known as V5/MT.

Using functional magnetic resonance imaging (fMRI), NIH scientists Guinevere Eden, D.Phil., and colleagues demonstrated in a small controlled study of adult males that people with dyslexia showed no activation in the V5/MT brain area, which specializes in movement perception. Dr. Eden's research confirms that people with dyslexia, hobbled by problems with reading, writing, and spelling, have trouble processing specific visual information. "We found that maps of brain activity measured while subjects were given a visual task of looking at moving dots were very different in individuals with dyslexia compared to normal control subjects," said Dr. Eden.

Poor Reading Skills Have Both Physical, Environmental Causes

(<http://www.sciencedaily.com/releases/2001/07/010720092903.htm>)

Reading problems in young children may be influenced by a combination of both neurological and environmental factors, according to a new study.

A New Way of Seeing Dyslexia

The most well-known symptoms of dyslexia are language-based. Though many sufferers have an average or above average IQ (and, not uncommonly, a proficiency in math), they'll also have a poor visual memory for language symbols. Often there are problems of letter and word reversal, and difficulties in finding the right word, fluency, meaning, or sequence. All these symptoms point to an abnormality in the language centers of the brain. But a new theory suggests that the abnormalities may be occurring in a very different place. John Stein of Oxford University thinks that the malady might represent a widespread neurological phenomenon that traces its roots to fetal development, and may be triggered by the mother's immune system. - Discovery Canada

Brains of Lefties Organized Differently

(<http://www.newswise.com/articles/view/?id=LEFTY.UCL>)

For the first time, UCLA researchers have determined that genetics plays a significant role in shaping brain structure and influences the brains of left-handed and right-handed people differently. Reported in March's Proceedings of the National Academy of Sciences, the findings may offer insights into autism, dyslexia and stuttering -- language disorders more prevalent in left-handers. Scientists have long known that the left side of the brain typically controls the

right side of the body and vice versa. That's why the language control center for most right-handed people operates from the left side of the brain. But the organization of left-handed people's brains has never been fully understood.

"Ninety percent of the world is right-handed," explained Dr. Daniel Geschwind, UCLA assistant professor of neurology and principal investigator. "Close to 99% of these people have language localized in the left hemispheres of their brains. But previous studies have shown that left-handed people don't mirror this model. We wanted to determine whether genetics explained this difference." - Newswise

Fish Oils "Help to Improve Dyslexics' Concentration" Children with dyslexia and other learning problems can benefit from being fed fish oils, scientists reported last week. Researchers from Imperial College School of Medicine in London and the University of Oxford found that children given the oils were less anxious, more able to concentrate and significantly better behaved than before. Their results will be presented at the British Dyslexia Association's conference at York University alongside other work suggesting that a bodily deficiency of fats of the type found in fish oil may cause, or at least exacerbate, problems in some children who have trouble with their reading and behavior.

Simpler spellings 'would make life easier for dyslexics' A study of dyslexic adults has shown that simplifying English spellings could be one way to help sufferers. It also confirmed that the cause of the reading difficulty was a brain disorder. Experiments showed for the first time last week that the neurological cause of dyslexia is the same in sufferers across Europe. But the disorder appears to be twice as common here as in Italy because English has a more complex writing system, or orthography, than Italian, which is more phonetic.

NYU Neuroscientist Explores Changes In The Brain Following Hearing Loss
(<http://www.sciencedaily.com/releases/1999/02/990204081932.htm>)

In the United States alone, 28 million people have some degree of hearing impairment. The problem is particularly severe in childhood, when deafness can have a profound impact on intellectual and emotional development.

Immune Proteins Play Role In Brain Development And Remodeling; Discovery Suggests New Theory For Dyslexia, Parkinson's Disease And Multiple Sclerosis

Two immune proteins found in the brains of mice help the brain develop and may play key roles in triggering developmental disorders like dyslexia and neurodegenerative disorders like Parkinson's, according to a Harvard Medical School study reported in today's issue of Science.

Brain Structure May Play Role in Children's Ability To Learn To Read
(<http://www.sciencedaily.com/releases/1998/11/981104092933.htm>)

Brain structure and hand preference may be as important as environment in influencing a child's ability to learn to read, according to a University of Florida Brain Institute study. The seven-year study of 39 Alachua County students from kindergarten to sixth grade indicates that while children from a lower socioeconomic class may be at risk for reading failure, the detrimental effects of environment are greatly increased in children with unusual brain asymmetry.

Treatment Helps Dyslexics Significantly Improve Reading, Shows Brain Changes As Children Learn (<http://www.sciencedaily.com/releases/2000/05/000525072407.htm>)

A novel treatment for dyslexia not only helps children to significantly improve their reading skills but also shows that the brain changes as dyslexics learn, according to a study by an interdisciplinary team of University of Washington scientists.

NICHD-Funded Researchers Map Physical Basis Of Dyslexia
(<http://www.sciencedaily.com/releases/1998/03/980304073929.htm>)

A Yale research team funded by the National Institute of Child Health and Human Development (NICHD) has used sophisticated brain imaging technology to show that there is decreased functioning while performing reading tasks in certain brain regions of individuals with the most common form of dyslexia.

Dyslexic Children Use Nearly Five Times The Brain Area To Perform An Ordinary Language Task As Normal Children (<http://www.sciencedaily.com/releases/1999/10/991006075536.htm>)

Dyslexic children use nearly five times the brain area as normal children while performing a simple language task, according to a new study by an interdisciplinary team of University of Washington researchers.

UCSF-Led Team Offers New Insight Into Neurological Basis Of Dyslexia
(<http://www.sciencedaily.com/releases/1999/05/990526060955.htm>)

Researchers are reporting direct neurological evidence that the region of the brain that processes brief, rapidly successive sounds is functionally abnormal in adults with the reading disability known as dyslexia.

NYU Neuroscientist Explores Changes In The Brain Following Hearing Loss
(<http://www.sciencedaily.com/releases/1999/05/990526060955.htm>)

In the United States alone, 28 million people have some degree of hearing impairment. The problem is particularly severe in childhood, when deafness can have a profound impact on intellectual and emotional development. NYU neuroscientist Dan H. Sanes works to understand how deafness affects the growth and function of the central nervous system, and how these effects might be averted or reversed.

UF Study: Students Improve Reading Skills By Tutoring Younger Kids
(<http://www.sciencedaily.com/releases/1999/10/991025113634.htm>)

High school students struggling with reading can improve their skills significantly over short periods of time by becoming tutors to younger students, a University of Florida study has found. In the seven-month span that students were tested last year, the tutors' reading comprehension grew as much as it would have in two years without the program, and their reading skills grew as much as they would have in a year and four months, the study shows. Their vocabulary skills and attitudes toward reading also improved.

The Impact of Learning Disabilities on Adult Reading

Acquiring a good education is key to an adult's potential earnings, lifestyle, personal contentment, ability to be independent in society, and 'success' in later life. Think about how difficult this would be for an adult that is not able to read. Our daily exposure to words is so great, as we encounter words in their many forms when we speak, read, spell, and write, as well as in mathematics and in organizing, understanding, and expressing thought. Adults with reading difficulties may have been the victims of many years of verbal abuse from classmates when they were children because of their problems with literacy. They have probably learned to hide their reading difficulty from others. They may experience frustration about reading and anxiety when they come to class or to a tutoring situation. They usually recognize there is a problem but don't know how to get the help they need to 'fix' it.

According to the National Literacy Survey, it was estimated that 44 million adults in the United States experience difficulties in literacy. More and more, the importance of having literacy programs and a literate workforce is realized. But, how often are educators aware of the important connection between literacy and learning disabilities? Consider this question - What is the relationship between serious reading problems and learning disabilities?

The statistic that describes this best is that 50 - 80% of students in ABE and literacy programs with low reading skills (below 5th - 7th grade level) may have either a suspected or diagnosed learning disability (*National Institute for Literacy*). Based on the newest research, dyslexia appears to be more widespread than previously thought, with upwards of 15-20% of school-age children being diagnosed. When faced with this reality, we understand why so many of our students don't read at grade level, drop out of school, or fail to progress. For adult educators, the challenge becomes ours as these students enroll in our programs.

In reading instruction, the most commonly recognized type of learning disability is dyslexia. The word dyslexia is derived from the Greek *dys*, difficulty with, and *lex* (from *legein*, to speak), having to do with words. Approximately 85% of all individuals with learning disabilities have difficulties in the area of reading - or dyslexia. According to the International Dyslexia Association, *dyslexia is a specific language-based disorder of constitutional origin characterized by difficulties in single word decoding, reflecting insufficient phonological processing.*

Dyslexia is a language-based auditory processing disorder. Dyslexia occurs on a continuum from mild to severe. It often results in a profound difficulty with learning to read, write, and spell despite instruction, normal intelligence, and good sensory functioning. It persists even in people who have learned to read and comprehend with accuracy.

Dyslexia does not mean that the person sees 'backwards.' It does mean is that the person has difficulty with phonological processing and may require more structured methods in order to learn to read and write and spell.

How does dyslexia affect an adult's ability to learn to read? The answer to that and more will be in the next issue.

What Do We Know about Learning Disabilities and Teaching Adults to Read?

Students enroll in Adult Secondary, GED Preparation, and VPI with strengths and weaknesses. Adults bring greater experiential background to the reading process. Some have a good vocabulary learned through listening to others, but they also bring bad habits that have been practiced for years, and a feeling of frustration about reading when they return to school. If they cannot read well, they may have been the victims of many years of verbal abuse from their classmates because of their reading problems. When they find themselves in an adult education class, they bring their past difficulties as well as feelings of insecurity to the learning environment. They have probably learned to hide their reading difficulty from others by finding ways to compensate - or to get around them. They may have listened to tapes, or watched a video of a book they were supposed to read.

Millions of dollars in grants to have been awarded to researchers around the country to investigate how children learn to read. Coordinated through the National Institute for Child Health and Human Development, the studies are being conducted using scientific methods of enquiry. Control groups, exacting methodology, and quantitative reporting of results were required for the studies. The initial findings of these studies have been disseminated, but the debate about reading instruction continues unabated.

Reading researchers do agree on one thing. The major factors about reading instruction that were identified in the adult studies were determined to be similar to those recommended in the research on the teaching of reading to children. There are some basic skills that all readers need to have. Adult new readers have to acquire these skills just as children who are new readers need to acquire them. The teaching techniques may differ, but reading instruction based on these skills appears to be required if an adult is to be successful.

Research into the ways in which adults learn to read is sparse. A review of the refereed, published research about adult reading, sponsored and paid for by the National Institute for Literacy provided some guidance. The requirements for inclusion in the review were stringent and many studies were not included in the final tally because they did not meet the scientific requirements of the survey. Unpublished studies were not considered. The results of this review appear to indicate that much research is needed in the field of adult reading education.

To be a successful teacher of reading, one must be able to adjust instruction for the individual. Teachers need professional development programs to help them learn more about reading, and curriculum and textbooks need to be revised to reflect the new research findings.

Research has shown us that experiencing problems in reading will affect success in all other areas. Teachers need to recognize the difference between reading difficulties, reading problems, and reading disabilities. As important, teachers need to have a basic understanding about learning disabilities and their effect on reading.

Being an adult education teacher does not automatically mean one has had the necessary teacher preparation in reading methodologies. Yet, teaching of any subject area requires knowledge of how one learns to read - and strategies to help them improve. See if you can you answer the following questions:

1. How does dyslexia affect an adult's ability to learn to read?
2. How many theories about how to teach reading are you familiar with?
3. What has scientific research shown is a major impact on reading achievement?
4. Good reading instruction addresses what four areas of reading skills?
5. What percent of adult education students can read-on or above grade level?
6. What is an average rate of reading for an adult?

Answers to these questions will be in the next issue of *GED Connections*.

The Effect of Dyslexia on Adult Learners' Ability to Learn to Read

Dyslexia can be easily defined as a severe difficulty in understanding or using one or more areas of language - both receptive and expressive, including listening, speaking, reading, writing, and spelling. According to research, most children that are problem readers in 3rd grade will be problem readers in 9th grade. Further, most that are still problem readers in 9th grade will remain so as adults. Since we live in a print-based society, an adult with reading disabilities is very likely to suffer problems that affect his economic self-sufficiency and livelihood.

Teachers will recognize students in their classes that may exhibit mild to severe difficulties that are characteristic of learning disabilities in reading. Those include, but are not limited to:

- Does not read for pleasure
- Does not use reading to gather information
- Frequently guesses at words when reading
- Has problems identifying individual sounds in spoken words or has weak sound/symbol knowledge
- Needs many repetitions to learn to recognize a new or unused word
- Oral reading contains many errors, repetitions, and pauses
- Relies heavily on context to read new or unused words
- Efforts in reading are so focused on word recognition that they detract from reading comprehension
- Lacks complex language and word knowledge
- Have problems learning to translate printed words into spoken words with ease, beginning reading skills (decoding)
- Often reverses or mis-sequences letters or numbers within words when reading or writing (b/d, brid/bird, on/no)
- Oral language difficulties in word retrieval, articulation, rapid naming, and object naming
- Exhibits poor handwriting and significant spelling deficiency

In the last few years, neuroscientists and medical researchers have studied the cognitive processes involved in translating print to speech and speech to print to determine why these processes are not automatic for up to 20% of learners. Shaywitz (2003) did some groundbreaking research that shed light onto possible reasons. Functional Magnetic Resonance Imaging (fMRI) technology has been used to do brain scans of people that struggle to read as well as those with 'good' reading skills. The resulting brain activity patterns are significantly different. Sections of the brain worked overtime while essential parts hardly functioned. This significant brain-based difference is reflected in adults' limited ability to perceive sounds (phonemic awareness) and difficulty blending and segmenting sounds (phonological processing). In short, it can be described as a problem with the "wiring of the brain."

In a 2001 Harvard University study on adult reading conducted by Dr. John Strucker and Dr. Rosalind Davidson, 676 ABE and 279 ESOL students from 21 different literacy centers across the country were studied. Reading skill areas they tested include:

- Passages of graded difficulty
- Silent reading to answer comprehension questions
- Creative recall of the silent reading to check understanding
- Vocabulary, both expressive and receptive
- Phonological awareness
- Word analysis
- Short-term memory
- General information
- Fluency
- Rapid automatized naming

Adults in this study tested well below the mean in reading in every category, but the skills they lacked were not the same in each case. The results enabled the researchers to identify the adults who lacked the basic reading skills and to plan individualized instruction that would help them overcome these deficits. The test of phonemic awareness, for instance, indicated that some adult readers had not mastered the sounds of all the consonants. Others could manage patterns of consonant-vowel-consonant, but they were unable to hear and delete consonant blends correctly when asked to repeat a word without the blend (example: smack; sm...ack).

The results reflect the hypothesis that adults need the same basic reading skills as children, and if there are gaps in the knowledge, good reading programs will provide appropriate instruction in these areas. The implications for the field indicate that adult education teachers must have an excellent knowledge about how to teach reading, learned through coursework and practice - not from brief training. Reading instruction is a major staff development need.

So, what can we do to teach adults with reading disabilities - or dyslexia? Find that information in the next issue of *GED Connections*.

GLOSSARY OF DYSLEXIA RELATED-TERMS

Alphabetics - Phonemic awareness and phonics

Automaticity - Automatic and correct responses to stimuli without conscious effort.

Decoding - A process of recognizing unfamiliar written words by sequentially segmenting the sounds represented by the letters of the word and then by blending the sounds into a meaningful word or syllables which are then combined into words.

Dyslexia - A specific language-based disorder characterized by problems in learning to read, write, and spell.

Dyslexia is a learning disability characterized by problems in expressive or receptive, oral, or written language.

Dyslexia is a specific language-based disorder of constitutional origin characterized by difficulties in single word decoding, reflecting insufficient phonological processing.

Dyslexia is a specific learning disability that is neurological 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. Adopted by the International Dyslexia Association Board, November 2002 and by the National Institutes of Health, 2002.

Fluency- the ability to read with speed, accuracy, and proper expression.

Functional Magnetic Resonance Imaging (fMRI) - produces computer-generated images of the brain while it is performing intellectual tasks.

Morpheme - The smallest unit of meaning in a word, including prefixes, root words, and suffixes. They can be free-form (as in the word pin) or bound (as in the s in pins).

Neurodevelopmental Exam - Important in diagnosing reading disabilities, this includes testing of hearing, vision, neurological development, coordination, visual perception, auditory perception, intelligence, and academic achievement.

Orthographic Processing - Related to visual processing of symbols associated with reading. It most often relates to the student's ability to do sight reading.

Orthography - The total writing system of spoken language. The term also refers to the established spelling rules of a written language.

Phoneme - The smallest unit of speech that serves to distinguish one utterance from another in a language or dialect (as in the /b/ of bat and /m/ of mat). English is made up of 44 phonemes.

Phoneme awareness - Awareness of the phonological structure of words is exemplified by the ability to manipulate or separate the sounds within words (e.g., which sounds come first or last; which words rhyme; which sounds are the same or different), implying meta-linguistic knowledge.

Phonemic segmentation - The process of sequentially isolating the speech sounds which comprise a spoken word or syllable.

Phonetics - The study of speech sounds, how they are produced (articulatory phonetics), how they are perceived (auditory phonetics), and what are their physical properties (acoustic phonetics).

Phonics - A teaching approach that gives attention to letter-sound correspondences in the teaching of reading and spelling. Phonics is a teaching approach and should not be confused with phonetics.

Phonological awareness - Speech sound awareness is the conscious awareness of the sounds of language; the ability to reflect on the sounds in words separate from the meanings of words.

Phonology - The sound system of a language; the part of grammar which includes the inventory of sounds and rules for their combination and pronunciation; the study of the sound systems of all languages.

Syllabication - Breaking a word into its syllables.

Word attack skills - The ability to decode words using knowledge of the sound-letter correspondence of the language.

Word decoding - A process used to identify words through sounding out letters, letter patterns, or blended sounds.