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IMPACT OF SELECTED APPROACHES FOR CHILDREN WITH DYSLEXIA

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ABSTRACT

Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition, spelling and decoding abilities. Research findings agree that these and other observed behavioural manifestations largely result from a deficit in the phonological component of language. However, conflicting theories on the exact nature of the phonological deficit have given rise to divergent treatment approaches. Recent advances in functional brain imaging and genetics have allowed these theories to be examined more closely. If implemented appropriately, commercial programs can be effective in identifying dyslexia. Treatment of dyslexia has been advanced through neuroscience, yet further study is needed to provide rigorous, reproducible findings that will sustain approaches. Multisensory teaching is one important aspect of instruction for dyslexic students that is used by clinically trained teachers. Effective instruction for students with dyslexia is also explicit, direct, cumulative, intensive, and focused on the structure of language. Multisensory learning involves the use of visual, auditory, and kinaesthetic-tactile pathways simultaneously to enhance memory and learning of written language. Links are consistently made between the visual (language we see), auditory (language we hear), and kinaesthetic-tactile (language symbols we feel) pathways in learning to read and spell.

KEYWORDS: Impact, Selected Approaches, Children, Dyslexia.

INTRODUCTION

Teachers who use this approach help students perceive the speech sounds in words (phonemes)by looking in the mirror when they speak or exaggerating the movements of their mouths. Students learn to link speech sounds (phonemes)to letters or letter patterns by saying sounds forletters they see, or writing letters for sounds theyhear. As students learn a new letter or pattern, they may repeat five to seven words that are dictated by the teacher and containthe sound of the new letter or pattern; the studentsdiscover the sound that is the same in all the words. Next, they may look at the words written on a piece of paper or the chalkboard and discover the new letter or pattern. Finally, theycarefully trace, copy, and write the letter(s) while saying the corresponding sound. The sound maybe dictated by the teacher, and the letter name(s)given by the student. Students then read and spell words, phrases, andsentences using thesepatterns to build their reading fluency. Teachers and their students rely on all three pathways forlearning rather than focusing on a “whole wordmemory method,” a “tracing method,” or a “phonetic method” alone. The principle of combining movement with speech and reading is applied at other levels of language learning as well. Students may learnhand gestures to help them memorize the definition of a noun. Students may manipulateword cards to create sentences or classify thewords in sentences by physically moving theminto categories. They might move sentencesaround to make paragraphs. The elements of a story may be taught with reference to a threedimensional, tactile aid. In all, the hand, body, and/or movement are used to support comprehension or production of language.

What is developmental dyslexia?

The definition of dyslexia itself has been the subject of much study, as selection criteria for dyslexics influence research findings and estimates of prevalence (currently 5–10% in the U.S. and the U.K.). In 1969, a formal definition of reading failure was put forward by Critchley with a neurobiological etiology in mind: "Specific Developmental Dyslexia: A disorder manifest by difficulty in learning to read despite conventional instruction, adequate intelligence, and sociocultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin". A definition currentlysupported by the National Institutes of Health states that dyslexia is inaccurate and/or slow, effortful reading that typically originates with weaknesses in the phonological processing system of language, although weaknesses in many other language functionsmay be observed. For example, text reading fluency, vocabulary acquisition and reading comprehension are adversely affected by this impairment5. Today's neuroscientific approaches typically regard dyslexia as an unexpected reading problem that occurs despite normal intelligence, and that is often accompanied by a family history of similar reading, spelling or language problems. Policies that require a discrepancy between a child's IQ and his or her reading achievement in order to qualify for special education services are seen as invalid, however. Poor readers of all levels of intelligence have similar reading-related deficits, and most benefit from similarapproaches to instruction. Although the neurobiological underpinnings of dyslexia and their interaction with environmental events continue to merit study, the focus of education leaders is now on widespread implementation of research-validated treatments. These treatment approaches predominantly evolved on the basis of behavioural deficits seen in dyslexics. Not surprisingly then, different accounts of the etiology of dyslexia have led to different treatment approaches.

The neurobiological basis of dyslexia

Specific regions of the genome have been shown to be involved in a number of readingrelated processes, and linkages have been replicated at independent laboratories across the world. The multigenetic nature of dyslexia is likely to be one explanation for its observed heterogeneity and its coexistence with disorders of attention. Brain imaging studies are driven by observations of behavioural manifestations of dyslexia. In the last 30 years, classroom- and laboratory-based studies have converged on the critical role of phonological processing in successful reading acquisition. Phonological awareness (PA), the ability to identify and mentally manipulate the constituent speech sounds, has been found to predict much of the variance in reading skills at any age, even in kindergarteners who are just learning the alphabetic principle (how sounds are represented by letter symbols). PA can be tested by asking a subject to repeat a word after omitting one of its sounds (for example, 'cat' without the /k/ or 'Germany' without the /m/). Because explicit instruction in speech sound awareness and sound–symbol association helps to prevent reading failure16, concerted research efforts have attempted to elucidatethe functional neuroanatomy of phonological processing. Although initial studies gave inconsistent results, persistence and advances in brain imaging technology have brought us closer to understanding the functional neuroanatomy for phonological processing. Significant challenges remain, however: psychological models provide few clues about the underlying physiology, and this research does not benefit from animal models in the way that sensorimotor research does. Connectionist approaches have influenced reading models, moving the field away from assumptions that independent routes underlie the reading process. It has now become clear that PA shares attributes with other perceptual and cognitive skills and, not surprisingly, is widely distributed across the brain. It has also been established that throughout reading acquisition, PA and reading itself have a relationship of reciprocal causation: learning how letters represent sounds (phonology) and seeing words in print (orthography) helps novice readers to attend to speech sounds. Consistent with this observation, functional brain imaging studies in Portuguese illiterates have shown that the neural representation of phoneme processing is modified by a person's print experience19. Similarly, genetic studies have shown that although much of one's PA skills can be accounted for by hereditary factors, significant variance also stems from one's environment. A low heritability for orthographic coding suggests significant environmental influences, including instruction. The exact mechanisms by which the brain recovers phonemes and associates them with visually presented orthography remain elusive. It has been suggested that this process relies on a linguistic process such as the 'articulatory gesture' rather than the speech sound, whereas others have argued for a very tangible link between the ability to process auditory input and the ability to perceive phonemes. These contrasting theories—a metalinguistic deficit hypothesis versus a temporal processing deficit in the auditory system—epitomize divergent research approaches that both seek to understand the etiology of reading difficulties and to eventually offer solutions

What is the rationale behind multisensory, structured language teaching?

Students with dyslexia often exhibit weaknesses in underlying language skills involving speechsound (phonological) and print (orthographic) processing and in building brain pathways that connect speech with print. The brain pathways used for reading and spelling must develop toconnect many brain areas and must transmit information with sufficient speed and accuracy. Most students with dys-

lexia have weak phonemicawareness, meaning they are unaware of the rolesounds play in words. These students may alsohave difficulty rhyming words, blending soundsto make words, or segmenting words into sounds. Because of their trouble establishing associationsbetween sounds and symbols, they also have trouble learning to recognize words automatically ("by sight") or fast enough to allowcomprehension. If they are not accurate with sounds or symbols, they will have trouble forming memories for common words, even the "little" words in students' books. They need specialized instruction to master the alphabetic code and to form those memories. When taught by a multisensory approach, students have the advantage of learning alphabetic patterns and words with engagement of all learning modalities. Dr.Samuel Terry Orton, one of the first to recognize the syndrome of dyslexia in students, suggested that teaching the "fundamentals of phonic association with letter forms, both visually presented and reproduced in writing until the correct associations were built up," would benefit students of all ages.

Is there solid evidence that multisensory teaching is effective for students with dyslexia?

Current research, much of it supported by the National Institute of Child Health and Human Development (NICHD), has demonstrated thevalue of explicit, structured language teaching forall students, especially those with dyslexia. Programs that work differ in their techniques buthave many principles in common. Themultisensory principle that is so valued byexperienced clinicians has not yet been isolated incontrolled, comparison studies of readinginstruction, but most programs that work do include multisensory practice for symbol learning. Instructional approaches that are effective use direct, explicit teaching of lettersound relationships, syllable patterns, and meaningful word parts, and provide a great deal of successful practice of skills that have been taught. Fluency-building exercises, vocabulary instruction, language comprehension and writingare also included in comprehensive programs of instruction and intervention. Word recognition and spelling skills are applied in meaningfulreading and writing of sentences and textpassages, and students receive immediatefeedback if they make mistakes. Guessing atwords and skipping words are discouraged andreplaced by knowledge of how to analyse and read unknown words. Other key principles ofinstruction are listed below.

What are the principles of a multisensory, structured language approach?

Teaching uses all learning pathways in thebrain (i.e., visual, auditory, kinaesthetic, tactile) simultaneously or sequentially in order to enhance memory and learning.Multisensory language instruction requires that the organization of material follows the logical order of the language. The sequence must begin with the easiestand most basic concepts and progress methodically to more difficult material. Each concept must also be based on those already learned. Concepts taught must be systematically reviewed to strengthen memory. Theinferentiallearning of any concept cannot be takenfor granted. Multisensory languageinstruction requires direct teaching of all concepts with continuous student-teacherinteraction.The teacher must be adept at flexible or individualizedteaching. The teaching plan is based on careful and continuous assessment of theindividual's needs. The content presentedmust be mastered step by step for the student to progress. Multisensory, structured languageprograms include both synthetic andanalytic instructions. Synthetic instructionpresents the parts of the language and then teaches how the parts work together to form a whole. Analytic instructionpresents the whole and teaches how thiscan be broken down into its component parts.All levels of language are addressed, often in parallel, including sounds (phonemes),symbols (graphemes), meaningful word parts (morphemes), word and phrase meanings (semantics), sentences (syntax),longer passages (discourse), and the socialises of language (pragmatics).

Studies of phonologically-based approaches

In its annual review of reading instruction (2000), the National Reading Panel (NRP) screened 1,962 citations on PA studies and reviewed that satisfied research methodology criteria. These showed that PA-based instruction significantly improved the reading performance of poor readers in first grade. Most intensive instructional approaches for students with dyslexia include the same strategies as recommended by the NRP for the general classroom. They differ, however, in the way in which phonology and other language structures are explicitly and systematically taught, the amount of practice given, the mode of delivery (small group or one-on-one) and the use of multi-sensory enhancing techniques that link listening, speaking, reading and writing. The efficacy of these different approaches has been assessed, and findings show that reading accuracy can be significantly improved in younger and older poor readers using several phonologically based methods. However, reading rate and, to some extent, reading comprehension have proven to be more difficult to treat, and research is needed to understand why reading fluency is difficult to achieve. Although intensive, structured, explicit, phonologically based reading instruction has been validated, the neurobiological mechanisms by which this approach operates are largely unknown

Studies of perceptual training

One prevailing approach in neuroscience research has involved the study of the relationship between early sensory processing of verbal and non-verbal sounds and its effects on phonological processing. Studies of individuals with specific language impairment (defined by poor oral language and frequently accompanied by reading problems) show that these individuals require longer time intervals between successive auditory inputs to discriminate or sequence them, as would be required to discriminatebetween phonemes. As these children may be limited in their ability to segment speech into small time 'chunks' for fine analysis at the phonetic level, computer-based training exercises were devised. The aim of these exercises is two-fold: to drive processing of rapidly successive acoustic stimuli to faster rates and to temporarily extends acoustic speech stimuli to improve speech perception. Consistent with single-unit recording studies in non-human primates after perceptual training, functional brain imaging studies in children undergoing this type of training have demonstrated physiological changes. This laboratory evidence for improved language processing however has yet to be validated by independent findings of positive long-term outcomes with the commercial product Fastforword. Further, the link between poor rapid temporal processing in the auditory domain and poor reading has not been solidified by evidence that fast for word improves reading ability.

CONCLUSION

Neuroscience research has contributed to our understanding of the biological basis of reading and reading disability. Regarding treatment, future work promises the advantages of technology, but also requires the integration of information that has been accumulated from long-term clinical and educational practices that dominate the more successful commercial efforts in reading remediation. Functional brain imaging studies of skill acquisition and practice-induced plasticity have paved the way toward a better understanding of the neural mechanisms of normal reading developmentand reading remediation. Neuroscientists can evaluate the efficacy and mechanisms of intervention programs and thereby determine their suitability for wider dissemination through commercial avenues. For example, future studies can systematically evaluate the efficacy of instructional components and sequences (such as multisensory techniques in structured language programs). As such, scientific-based approaches have the potential for commercialization as effective reading remediation programs, enriching the partnership between science, industry and special education and providing help to families with reading disability.

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