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Why Johnny Can Read

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Research indicates that profoundly deaf students with experience in Cued Speech read on the same level as their hearing peers (Wandel, 1989); and speak correct sentences as often as hearing children (Berendet, Krupnik-Goldman & Rupp, 1990). Deaf users of Cued Speech also surpass the majority of other deaf children in tests of language comprehension and expression (Peterson, 1991).

Language comprehension and expression precede reading in normally hearing children; and both infer a prereading base of linguistic, experiential, and cognitive skills which are typically lacking in the deaf child (King & Quigley, 1985). Most deaf students graduate from high school reading on the fourth or fifth grade level, in spite of consistent evidence and agreement among educators and psychologists that deaf and hearing people have equal cognitive and intellectual ability (Furth, 1966; Moores, 1978; Quigley & Kretchmer, 1982).

Given this situation, two questions emerge. First, why should the majority of students exposed to Cued Speech reach English reading and writing skills levels attained by relatively few profoundly deaf students? And second, does Cued Speech provide access to information necessary for reading according to current reading theory and research? These questions can be addressed in the research literature of a number of education-related disciplines.

The studies and essays reviewed here are from general education research, investigations in the area of learning disabilities, and studies in deaf education. While not exhaustive, they have the potential to explain the Cued Speech connection with reading and may, because of that, appear to reflect an opinion in "the great debate" in general education reading. This apparent bias is not deliberate but comes out of the search for a logical link between the Cued Speech approach and what is known about the reading process.

Popular debate on the value of phonics in reading followed publication of the best seller *Why Johnny Can't Read: and What You Can Do About It* (Flesch, 1955). Flesch attacked what he called the "look-say" method of reading instruction. His work was criticized by academic researchers as unsupported by scientific study.

The academic debate began in earnest when *Learning to Read: The Great Debate* (Chall, 1967) appeared on public library shelves. Chall published the results of a number of studies on the effects of phonics instruction on early reading and, conversely, on the results of the lack of such instruction. Her work eventually demanded the attention of the research community; and hundreds of studies followed, with conflicting articles and reports documenting the debate.

Journal literature appeared to shift subtly after Stanovich's (1986) analysis of work in the field. His critique of experimental design and methodology in reading research and his insightful analysis of the work that had been done, may have engendered greater caution in the discussions and conclusions drawn from research results.

Reading Research: Models and Theories

Theories of the reading process and their reflective models currently fall into three categories: bottom-up, top-down, and interactive. Bottom-up, very simply, refers to letter recognition, phoneme awareness, or word recognition. Those who support bottom-up theories posit that reading has to do with recognizing words and subsequently attaching meaning. The phonics component is strong here because "recognizing" the printed orthography, coming to know it as a matched word in your spoken lexicon, or decoding, is the prerequisite to getting meaning from the text.

Top-down theorists approach orthography as shapes of characters and words that take on meaning as they are used in an ever-expanding visual lexicon. The young reader has a dictionary of sight words and makes educated guesses about unknown words by using syntax, semantics, and prediction. While certainly simpler than the modern researcher would describe the process, this explanation generally corresponds to what is known as the "whole language approach" to reading. Some whole language advocates believe a phonological connection is made by early readers and then abandoned as unnecessary when they become skilled readers. Others believe a phonological connection is made when the word becomes clear through contextual clues. They place the phonetic component at the end of a graphic model of the process.

Interactive model proponents suggest that both word recognition and context contribute to the process and that one influences the other. Some models suggest the possibility of the early, or bottom-up, components influencing the later, skilled, or top-down, components. Since Stanovich's 1986 review of the research, the interactive model has gained acceptance as the most likely schemata.

Over time, models of the reading process have evolved from simple flow charts that either emphasized the phonetic component or discounted it, to complex interactive designs that include all components, though not always at the same place in the reading process nor with the same emphasis. Under the influence of behaviorists, graphic representations of the reading process previously included only observable phenomena. Now, advances in the cognitive sciences and the advent of computer information-processing models have resulted in complex flow charts. They typically begin with eye contact on the text and progress through letter recognition, phonemological coding, short and long-term memory storage, and semantic and syntactical manipulation--all leading unilaterally or multidirectionally to a decision known as comprehension.

The inclusion of phonology in this process may seem obvious and essential, but the fact that not all spoken languages are closely related to their written orthography raises questions. In comparisons among languages, Chinese characters probably bear the least relationship to the spoken dialects of Chinese of any orthography; and written Korean probably resembles its corresponding spoken language more than any other orthography. English is closely connected, but not precisely, to its written form. Clearly, it is possible to ignore the spoken language and learn to read. Most educators agree, however, that the process is facilitated by the phonological connection, depending on its richness.

Hearing speakers of English access the written lexicon more or less through the phonological connection-more, if they have an awareness of letter-sound correlations and phonemic segmentation, and if they are reading unfamiliar words; and presumably, less, if they learned to process text through syntactic, semantic and experiential clues.

The current debate may be, in the final analysis, whether top-down reading is compensatory to phonologic decoding or bottom-up reading is compensatory to whole language skills.

Cued Speech

Cued Speech is a speech-based code. It is a phonemically-based hand supplement to speechreading comprised of eight handshapes to represent consonant sounds and four positions about the face that represent vowel sounds. Combined with the information available on the lips, the cues make spoken phonemes visible to deaf readers of the system. Cueing to a deaf child, then, would be analogous to speaking to a hearing child. Rather than presenting one-on-one, letter-by-letter representations of written words, the cuer presents the equivalent of sounds, leaving intact the ambiguities present in spoken communication between hearing people.

For example, if the sender communicates with dactylology (fingerspelling), manually spelling "two," the receiver almost directly accesses the written lexicon. If a sender cues to communicate, however, the receiver has to decode the phoneme, recognize the word in its spoken form, then consult contextual clues to determine which of three like-sounding words is meant. Consulting the cognitive linguistic manipulator--most likely in the left hemisphere--to determine which similar-sounding phoneme was presented, is common in such instances to both hearing and deaf receivers.

Clearly, dactylology (fingerspelling) may be an attractive vehicle for teaching English reading and writing to deaf children. Indeed, some deaf adults recommend using it for that purpose; and they have had support from professionals in the field of deaf education (Moores, 1970). Their rationale points to the difficulties posed by ambiguities in the spoken language that challenge young hearing readers.

One could argue that ambiguity should be eliminated for deaf children; but, recognizing their cognitive and intellectual ability as equal to hearing children, replicating the development of language experienced by hearing children would, logically, achieve the same results. Based on the little that is actually known about the development of the hemispheres, the process of linguistic manipulation and interpretation encountered by hearing children likely enhances the development of other cognitive skills. Teachers of mathematics at Gallaudet University's School of Preparatory Studies have begun to study the approach of deaf students to problem solving from this linguistic perspective. Modern cognitive explorers would need to study the effects of direct access to the written lexicon through dactylology to know whether it slows or alters the development of other components, particularly those linked to language learning.

Research Studies in General Education Reading

In his analysis of reading research, Stanovich (1986) borrowed from the biblical book of Matthew to describe a phenomenon he called the "Matthew effect" on reading. He suggested that, as poor readers encounter decoding problems, they read less. Skilled readers read more. The effect is that poor readers fall farther and farther behind while skilled readers continue to gain. Thus, the rich get richer and the poor get poorer.

Stanovich pointed to mounting evidence that the primary mechanism that enables early reading success is phonological awareness--conscious access to the phonemic level of the speech stream and some ability to manipulate

cognitively representations at this level. He acknowledged the position that reading itself facilitates phonological awareness (Ehri & Sweet, 1992) and the probable reciprocal causation, thus the Matthew effect.

Stanovich concluded his research review by suggesting that, if there is a specific cause of reading disability, it resides in the area of phonological awareness. In his view, identification and subsequent training in that area can overcome the reading deficits of many children.

Various researchers have studied remediation through direct instruction in phonemic segmentation. Ball and Blachman (1991) studied 90 kindergarten students from three city public school systems. Group A received instruction in phoneme awareness, letter names, and letter sounds. The result was significant improvement in the early reading and spelling. Group B was trained in letter names and letter sounds alone. This group showed no significant improvement in early reading or spelling skills. Ball and Blachman also demonstrated that young children can be taught to recognize phonemes and that they will carry over this skill to novel items.

Jorm, Share, Maclean, and Matthews (1984) measured phonological abilities of children at the end of kindergarten in groups matched on sight word reading, verbal intelligence, sex, and school attended. The researchers followed their progress over grades one and two and found that children who had better phonological skills at the start were significantly ahead of those who did not by the second grade and that the two groups diverged further with time.

A study in the Netherlands (Reitsma, 1984) designed experiments to test various explanations about the place of phonics in the reading process. Reitsma's study provided evidence that beginning readers translate print to sound before meaning can be retrieved. He suggested that early readers identify graphemes, map them into phonemic code, and determine meaning from that code. He mentioned the relative difficulty of the decoding task, noting, however, that Dutch is more regular in its sound/spelling correlations than is English. Reitsma concluded that, for a long period in the development of beginning reading skills, phonemic representations need to be reproduced on the way to word identification.

Foorman and Liberman (1989) studied 80 first graders and found that those reading above grade level had stronger phonological skills, effectively applied grapheme-phoneme correspondence rules, and were weaker in the use of visual-orthographic knowledge. Those below grade level applied visual more than phonological coding. The researchers did not blame the lack of phonological awareness for the performance of poor readers. Instead they attributed inadequate "bootstrapping" (Stanovich, 1986) of phonological awareness on orthographic awareness as the cause and went on to discuss the difference between phonics rules and assignment of sound representations to semantic units.

Ehri and Sweet (1991) studied 36 preschool children in an investigation of how beginners process print. They concluded that knowledge of letter sounds, sight words, and phonemic segmentation was important when children read word-by-word. They cautioned against an interpretation of their work as a challenge to memorized reading instruction in the classroom; however, they found that phonemic segmentation contributed to subjects' ability to remember how to read individual words in the text and match print with speech. The evidence indicated that phonemic segmentation was more important than preprimer reading skill. They suggested that phonemic units may be more central than lexical units in learning the kind of finger-point reading they examined.

Developmental Language Disorders

By definition**,** dyslexic children have normal or above average IQs, but exhibit difficulty in learning to read and spell. Familial factors and heritability have been established. Studies have shown that reading disabilities occur more often in near relatives than in the general population and occur more often in twins than in siblings, with a higher rate in monozygotic twins (DeFries, Fulker & LaBuda, 1987). Longitudinal studies of children (Wagner & Torgesen, 1987) suggest that future dyslexics have phonological processing problems in preschool years.

Studies of dyslexic students, like those of other readers, employ a variety of methodologies. Some measure reading abilities of students of the same age; others compare specific abilities of students at different ages but at the same level of reading development; and some attempt to allow for a period of incubation after a particular method of remediation is used. So much research is underway and so many methods are used that analysis is problematic. At this juncture, no firm conclusion can be drawn as to the basic nature of the problem. Dyslexics may have primarily a deficit in phonological language skills, or they may have uniformly deficient component reading skills (Rack, Snowling & Olson, 1992).

After reviewing models of reading development and studies of short-term memory, pig-Latin experiments, nonwords and phonemic segmentation, Rack et al suggested that there may be two types of dyslexia: developmental phonological dyslexia and developmental surface dyslexia. Rack and colleagues, however, cite Ehri's models of reading development and consider the possibility that phonologic information contributes to direct lexical access. Dyslexic readers may, therefore, encounter restrictions at different points in the development of phonemic decoding. The literature suggests that phonological dyslexics may be remediated and become surface dyslexics.

While it is too easy to label deaf children dyslexic, at the same time they have been essentially denied the advantages of children so identified by the exclusive definition of the disorder in PL 94-142. At first glance, the phonological remediation recommended by disabilities specialists seems inappropriate in the case of deaf children with no sound base; however, recent studies of skilled deaf readers may indicate otherwise.

Recent Studies of Skilled Deaf Readers

Hanson, Goodell & Perfetti (1991) studied effects of the phonetic content of sentences in the silent reading of hearing and deaf college students. The researchers were interested in establishing the importance of phonological process in reading. Their investigation built on earlier findings in short-term memory research that some deaf subjects are sensitive to rhyme and do use phonological coding. To avoid the confounding results from some previous studies that involved proofreading tasks, they used tongue-twister tasks. Silent reading and semantic acceptability judgments of tongue-twister sentences take longer than those of typical control sentences.

Presenting mixed grapheme tongue twisters to reduce the effects of visual similarity, Hanson et al found that both the hearing and deaf college students made more errors on acceptability judgments when reading tonguetwister sentences. The researchers suggested the possibility that a phonological code for deaf readers could be developed through speechreading. They noted that studies of hearing lipreaders have shown that hearing subjects, without explicit instruction in lipreading, demonstrate an awareness of the visual correlates with phonemes.

Narrowing the Focus

It would appear on the surface that phonological awareness through visual input of phonemic units accounts for the reading ability of deaf students with Cued Speech experience. The study of reading, however, is far from simple. While Cued Speech communication delivers incidental, however precise, phonemic information, it simultaneously transmits accurate syntactical information. Phonological and syntactical input may very well work together to produce the positive outcome. The phonological connection, therefore, remains a part of the cognitive process that cannot be effectively isolated.

However complex current reading models may be, the study of deaf readers should interest researchers in general education and cognitive psychology. Deaf subjects by definition lack auditory input. The missing auditory input is replaced by identifiable means--manual language (American Sign Language); that language adapted for English and aided by speechreading; signs used with speech to represent English words rather than concepts; speechreading alone; fingerspelling with speech; and finally, Cued Speech. If Cued Speech continues to produce skilled readers, and if other inputs do not produce similar or comparable results, then in addition to the implication within the field of deaf education, proponents of an essential phonological component in the reading process will have strong support.

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