

SPEECH, PHONOLOGICAL AWARENESS AND READING SKILLS IN CHILDREN WITH IMPAIRED HEARING

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ABSTRACT - The connection between speech and phonological awareness is discussed in relation to the way in which these might affect the reading ability of children with impaired hearing.

The ability to read requires that the person use a code, prior knowledge, vocabulary and linguistic knowledge, as well as contextual information, in order to understand text. Automatic and rapid decoding skills are essential for effective reading, allowing the short-term memory to be utilised for the linguistic interpretation of the words rather than in taking time to decode the individual words (Perfetti, 1992; Stanovich, 1986). Word identification requires that a phonological form of the word is retrieved as part of the decoding process. Good comprehension of the text is dependant on efficient decoding skills. Studies by Stanovich (1992, 1994), and Jorm and Share (1983), suggest that poorer readers make more use of context in order to comprehend text due to lack of automaticity of decoding skills. In comparison, proficient readers are able to decode the words efficiently and only use context to confirm their understanding of the text. A skilled reader uses context to *interpret* words and sentences rather than to identify words. In fact, Perfetti (1995) believes that "the hallmark of skilled reading is fast *context-free* word identification and rich *context-dependent* text understanding". These two aspects of reading, decoding skill and use of context, have given rise to the two major categories of reading theory. The bases of these theories need to be understood because they have very different implications for the teaching of reading.

The "Top-down" theory emphasises the problem solving nature of the reading process and assumes that reading is a "psycholinguistic guessing game" (Goodman, 1976) in which the reader uses prior knowledge in order to understand the message in the text. The higher cognitive functions, including concepts, inferences and levels of meaning, influence the processing of lower order information (Owens, 1992). In comparison, the "Bottom-up" theory emphasises the ability to convert the written symbol into a semantic correlate in order to understand the text. The lower level perceptual and phonemic processes influence the higher cognitive functioning. In order to decode and recognise a printed word, a knowledge of the perceptual features in letters and in grapheme-phoneme correspondence is required.

Neither theory of reading explains adequately the process and development of reading. The "Interactive" theory, considers reading to consist of parallel processes, both top-down and bottom-up, providing information simultaneously and at different levels of analysis (Owens, 1992). The skill of the reader and the nature of the material being read determine which process will be used. Generally, the faster top-down

processes are used with textual material, whereas the bottom-up processes are used when textual information does not provide enough support.

The top-down, or "thinking" theory assumes that reading relies on the same processes as listening and therefore emphasises the cognitive components rather than translation skills. The bottom-up, or "decoding" theory recognises that reading may draw on quite different skills from those utilised in listening. Listening and speaking can be considered reciprocal acts, whereas, the act of learning to read does not equate with learning to speak (Stanovich, 1995). A similarity does exist, however, in the transparency of both text and speech. Just as in conversation we attend to the meaning or intent of the speaker rather than the spoken form itself, so too, a skilled reader attends to the meaning of the text rather than to the individual words. Both spoken and written forms serve as vehicles for the expression of thought (Stuart, 1995). By the time children are ready to start reading they already know how to produce words and their meanings, but do not pay attention to the individual phonemes comprising each word. The speech stream, in fact, contains a complex mix of phonemes that are coarticulated and merged, making the identification of individual phonemes quite difficult. It appears that reading problems in children are often a result of a difficulty in segmenting spoken language into the various sounds (Blachman, 1991). The metalinguistic skill of being able to reflect and manipulate the sounds of spoken language rather than the meaning is referred to as *phonological awareness*.

The phonological awareness skill of segmenting words into syllabic units, referred to as 'onset' and 'rime', relies on auditory discrimination and rhyme processing. This skill develops as a result of hearing rhyme through nursery songs and in books. There is now a very large body of evidence to show that a child's ability to segment words into onset and rime before learning to read is the strongest single predictor of reading attainment in later years and is an even stronger predictor than intelligence. The more advanced phonological awareness skills of segmenting words into phonemes, deleting phonemes from words, and substituting and blending phonemes, develop as a result of learning to read. It is interesting to note that illiterate but intellectually normal adults do not exhibit these skills (Morais, 1991). In addition, Chinese adults who knew a logographic, or whole word, representation of Chinese, but who had never learned an alphabetic system, performed as poorly as a group of illiterate Portuguese adults on tasks of phoneme deletion and addition (Morais, 1991). It appears that learning of an alphabetic writing system is a requirement for the development of these higher level phonological awareness skills.

The ability to segment and manipulate the phoneme units in a word is dependent on speech perception. Phonemes that differ by several features will be easier to discriminate than phonemes that vary in only one feature. It has been found that children have more difficulty in discriminating final consonants varying in place than in voicing and that this may be attributable to the increased vowel length associated with

voicing (Snowling, 1994). It is evident from various studies that speech perception processes have an important role to play in sound categorisation tasks and that some poorer readers' performance on phonological awareness tasks may be caused by difficulties in speech perception resulting from an auditory perceptual problem. Inconsistent auditory stimulation during the child's early years when the central nervous system has maximum plasticity can cause auditory perception difficulties. Even a conductive hearing loss can cause degradation of the auditory input. A study by Brady (1983) found that a group of eight year old poor readers made more errors when repeating words presented in noise than did a chronologically matched group of good readers, suggesting that the poor readers had difficulty with speech perception in noise, as is present in most classrooms.

Speech perception and speech production enhance each other in a reciprocal fashion. However, in the early developmental stages of speech acquisition, auditory perception precedes auditory production. Infants are able to auditorily discriminate between the phonemes /p/ and /b/ at three months of age, well before being able to produce these sounds (Subtelný, 1983). Babies seem to be endowed with an auditory system that is able to extract the necessary auditory information from the speech signal. Auditory feedback is essential in the early stages of speech production if the infant is going to match production with the heard sound. In later stages of speech production, auditory feedback is necessary but not so essential since tactile-kinesthetic-proprioceptive feedback can be utilised. This link between perception and production of speech is crucial to an understanding of the development of a consistent internal representation of speech in people with impaired hearing. There are numerous studies that show that training in phoneme production improves phoneme identification in children with impaired hearing (Subtelný, 1983). Despite a degraded auditory signal, given sufficient training, a hearing impaired child can develop a consistent internal representation of sounds and their production, even though the speech may not be particularly intelligible. Verbal rehearsal strategies are more important than in normally hearing speakers since visual and tactile-kinesthetic cues for perception and production need to compensate for reduced auditory input. For those with lesser degrees of hearing loss the rehearsal strategies ensure that the sound is heard and spoken many more times than was necessary for the normally hearing child and therefor eestablish a consistent internal representaion of the sound.

Hearing impairment indisputably affects reading attainment levels. In 1991 the Center for Assessment and Demographic Studies ascertained that the average 18 year old with a severe to profound hearing loss reads with the comprehension level of a third grade child. Further, only 3% of those hearing impaired students could read at the same level as an age equivalent hearing student (Kelly, 1995). Despite this exceptionally gloomy picture, some children with severe and profound hearing loss do read well. However, the extent to which they do so seems to be dependent upon the presence of phonological awareness skills. These skills are, in turn, dependent on a consistent internal speech representation.

Even children with usable residual hearing, but who have not established an internal representation of speech due to the use of sign for communication, have poor reading attainment scores. With the absence of internal speech, the child can not utilise fully the auditory information they receive, and despite considerable residual hearing, acts as if profoundly deaf for speech comprehension (Conrad, 1979).

Poor reading attainment levels place the hearing impaired child in a position of double-jeopardy. A hearing loss means that incoming information about the world and people is reduced. The ability to read enables a person to gain knowledge, not just in the form of information, but about the subtleties of human interaction. Language knowledge will also be improved through reading. The use of slang, quips and puns are often difficult for the hearing impaired person to understand in conversation but can be comprehended in text. Reading can also provide improved understanding of sentence structure in the written form, which then helps in understanding the spoken form. When the hearing impaired person is better able to understand spoken language, communication skill is improved and therefore more information is able to be gained. Gains in reading are reciprocal with gains in spoken language and knowledge. However, while it is recognised that knowledge is largely a result of literacy, it is literacy that continues to elude many hearing impaired people. The reason for this is not the hearing loss per se but the lack of speech and the approaches taken with the child. Once a child is diagnosed as having a severe or profound hearing loss it is usual for the adults involved to use a much more visual mode of communication with the child. The assumption is that the child must make up with the eyes what is unavailable through the ear. It is unusual to find parents singing nursery songs to their severely hearing impaired child. They are more likely to be directing the child to visual information and learning to use some form of sign communication. Unfortunately, while sign language is quite adequate for communication it does not have a written form, and it does not allow the development of phonological representations of symbols that are the springboard to literacy.

Normal development in reading traverses four stages, commencing with the preliterate stage. This is when the child acquires the skill of segmenting whole words into onset and rime using audition and speech. The next phase, the logographic, will overlap with the first. This stage is dependent on visual processing skills as the child begins to associate a group of letters as representing an object. A manually communicating child with impaired hearing is also able to associate the whole word with a sign for an object. In fact, children of deaf parents often make very good progress in this stage of reading, since they are likely to have a good sign vocabulary to attach the words to. The third phase is crucial to the further development of reading skills since the whole word method of learning to read does not permit the child to decode new words without initially having someone say (or sign) what the word represents. In the alphabetic phase the relationship between letters and sounds is learned and words that have not been encountered in written form can be deciphered using phoneme-grapheme translation skills. The child is now able to recode

printed words phonologically in order to match them with words in the lexicon. A child who has not developed phonological awareness skills may recognise the word "hat" at the whole word level, but because he is unable to segment that word into the sound units, /h/ and /at/, will not be able to read the word "fat" which he has never seen before. If a child has not developed the necessary sound based information, and therefore needs to continue to read at the logographic phase, enormous demands will be placed on memory function as each new written word must be learned and remembered as a whole unit. The fourth phase is orthographic and involves access to the lexicon using the orthographic features of words. Through reading experience at the alphabetic level children learn to recognise regularities across words and the orthographic patterns that represent the morphophonemic rules. It is at this level that skilled readers decode text most of the time. If an unfamiliar word is encountered the alphabetic phase is utilised to decode the word. It is quite usual to see the person mouthing the word as it is put into phonetic form. Skilled hearing impaired readers who have unintelligible speech also mouth words as they read. They are using their internal speech and known articulatory patterns to decode print. It is suggested that speech processing involves the use of a code that can deal with phonemes irrespective of the modality of perception (Dodd & Campbell, 1987).

Unfortunately, when a child has impaired hearing, not only do adults utilise a less auditory communication style, but the assumption is made that the child will need to learn to read with a whole language, or top-down approach. Unfortunately it is widely believed by many educators that a phonic, or bottom-up, approach is not appropriate for hearing impaired children. Dolman (in Kelly, 1995) reviewed the literature with hearing children on the effectiveness of phonic approaches compared with the whole language approach. His conclusion was that the relatively indirect methods of the whole language approach were not as effective in developing the reading skills of children from disadvantaged backgrounds, including hearing impaired children. Blachman (1991) goes so far as to say that despite lack of research to support their premise "some of the most vocal proponents of whole language are telling teachers to avoid doing exactly that which research has shown promotes literacy acquisition".

Stackhouse (1990) makes the suggestion that speech therapy programs should more adequately address the links between spoken and written language programs. Literacy skills in the young at-risk child can be improved with general metalinguistic awareness activities and with more specific rhyme, syllable and sound segmentation games. Teaching programs need to take account of the phases of reading development, with alphabetic skills training supported by visual cueing being critical to the development of skilled reading, particularly in speech disordered populations. In the case of children with significant hearing loss, specific attention should be given to rhythm, intonation and vowel production. These features which are rarely a problem in the normally hearing population (Parker & Rose, 1990).

There have been numerous phonological awareness training programs carried out with hearing children. A discussion of these would require another paper, but it is sufficient to summarise the results as remarkably successful in improving phonological awareness skills and subsequent reading skills. The effect of similar training programs with hearing impaired children remains to be seen, but can be expected to be no less worthwhile.