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ABSTRACT

The history of three non-Latin based orthographies--Chinese, Japanese, and Korean--is reviewed in this paper. The characteristics of the three orthographies are examined regarding the ease of learning to read with these varied symbol systems. Attention is given to the incidence of reading disability in different orthographies, and research is reviewed concerning the way people process phonetic and nonphonetic systems. It is concluded that the research to date presents more questions than answers to the question of "is it easier to learn to read in an ideographic, syllabic, or alphabetic system?" The existence of linguistic universals across scripts in reading is noted, and research into brain hemispheric capacities regarding the way written language is processed by aphasics in Japan is cited as especially useful to cross-cultural understanding of the process of learning to read. (MKM)

IDEOGRAPHS, SYLLABARIES, AND ALPHABETS: READING AS INFORMATION PROCESSING IN DIFFERENT WRITING SYSTEMS

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Is it any easier to learn to read through an ideographic, syllabic or alphabetic writing system? Would there be less incidence of reading failure with some "ideal" orthography? Does one exist?

One of the ways languages vary is in the nature of their systems for writing. There has been a burgeoning of research on the ways people process information from print, as well as on the differences between the characteristics of the printed form of that information. Recent cross-cultural research on reading and writing in different symbols has shed new light on the degrees of differences and similarities among different writing systems and the resulting effect on reading achievement.

The purpose here is to briefly describe the history of three non-Latin based orthographies - Chinese, Japanese and Korean - and to examine their characteristics regarding the ease of learning to read with these symbol systems. Particular attention will be directed to the incidence of reading disability in different orthographies and research on the way people process phonetic and non-phonetic writing systems.

HISTORY OF WRITING SYSTEMS: IDEOGRAPHS, SYLLABARIES AND ALPHABETS

The oldest known writing systems are ideographic ones which are typified by Sumerian cuneforms, Egyptian hieroglyphics and Chinese characters. The Egyptian system, which developed from Sumerian cuneforms about 3000 B.C., contained both signs for words and signs for syllables. "Pictographic" is the term used to describe a writing system where the symbols look exactly like the objects they represent. In ideographic systems the symbols are

usually abstract conceptualizations which refer to objects or qualities. (Kratochvil; Taylor)

Syllabaries developed in the Semitic countries around 1600 B.C. Syllabaries are writing systems where each sign represents a separate syllable. The latest development in the history of writing systems was the alphabet. The Greeks are credited with originating the alphabetic system in the 9th century B.C.

Chinese characters served as the initial writing system in several East Asian countries. Both the Japanese and Koreans used Chinese characters before developing their own writing systems to supplement characters; and characters are still used to some degree even today in Japan and Korea. The Japanese developed two syllabaries in the 9th century A.D. These syllabaries are used to write different kinds of words, native and foreign. The Koreans developed an alphabet in the 15th century A.D.

CHINESE

The Chinese writing system developed independent of any outside influences around 1300 B.C. and originally appeared on oracle bones and shells. In antiquity, Chinese pictographs looked quite like the objects they represented. Over the centuries the characters became more ideographic, more stylized, and gradually some phonetic characteristics evolved. (Taylor)

Compared to other languages Chinese has a relatively small number of syllables, 420. One of the ways these are distinguished in oral language is through the use of tones. When one alters the tone of a syllable, one alters the meaning as well. This would be analogous to changing a consonant or a vowel in an English word.

The four tones are rising, falling, level, and a falling rising tone. (Leong; Wang) An example of analogous tone differences in English would be comparing the differences between sentences ending in a question mark, a period, or an exclamation point.

In Chinese there are a large number of homophones which are distinguished principly by tone. The other way in which ambiguity between the meanings of homophones can be distinguished in both oral and written language is by context. As the Chinese written language evolved, a character for an existing homophone was borrowed to represent the new word which sounded the same or nearly the same. In this way phonetic loans developed which later contributed to phonetic compounds.

These phonetic compounds are made up of a meaning component called a "radical," and a phonetic loan word. The same radical character would be used to represent a common class of words. For example, the words river, waves, wet and wash would all contain the water radical, (Zhou Enlai) Chinese is the only language which has the radical feature. As part of the reforms of the Chinese language which have taken place since 1949 in the People's Republic of China, the number of radicals in common use have been reduced from 214 to 189. (Wang)

Chinese is an uninflected language. That is, endings such as those indicating tense or number are not added directly to characters, and are instead either inferred from context or represented as separate characters. Each character forms a separate syllable which can stand alone and has meaning, Thus, each character is a morpheme.

During the mid-1950's in the People's Republic of China, linguistic reform policies were instituted which made changes in the visual format of Chinese. Horizontal printing was adopted as well as the use of Western punctuation, but there is still no such thing as a capital letter in written Chinese. (Taylor; Wang; Alitto) Each character is square in shape and has a fixed length. As it appears on a printed page, a character takes up the same space as a letter, and no space is left between characters. In this sense a page of Chinese characters contains more information than a page of alphabetic words. (Liu)

Characters are more visually and semantically distinct than letters. While there are about 20 distinct brush strokes, the most difficult characters might require up to 30 different strokes to write. Wang compares these strokes to the letters of the alphabet, with a character of five to six strokes analogous to five or six letter words. Chinese is more difficult to read since even if a person were already a good reader and came upon an unknown character there would be virtually little way he or she would be able to pronounce the character except by guessing from content.

In the past 25 years in the People's Republic of China, approximately one-third of the most common characters have been simplified. The average number of brush strokes in these characters has been reduced from 16 to 8. Officially the People's Republic of China ultimately intends to simplify up to half of the high frequency characters, or about 3,500 of the 6,000 to 7,000 most common characters. (Wu; Ong) Another aspect of language reform over this period was the official adoption of the use of Arabic numerals. (Mills; Beijing Review)

About 50,000 characters have appeared and been used throughout Chinese history, with about 10,000 still in use today. Graduates of primary school should know between 2,000 and 3,000 with newspapers using about 6,000. The official list for adult education in China includes 2,421 characters. (China Reconstructs)

JAPANESE

What is unique about the Japanese written language is that it uses a combination of writing systems. About 30% of Japanese words are written in Chinese characters and are referred to as kanji. Approximately 69% of the words in Japanese text are written in one of two Japanese syllabaries which together are referred to as kana. These kana syllabaries are hiragana, 65% of Japanese texts; and katagana, 4% of the texts. The hiragana script is used to represent words which are Japanese in origin. Those words written in katagana script are loan words from European languages. The remaining 1% of textual material in Japanese are written in Arabic numerals and Roman letters. (Taylor)

Each of the kana syllabaries have 47 basic letters which represent 47 syllables. With the possible addition of one of two different kinds of diacritical marks, related or secondary letters can be created bringing the total to 72 syllables which can be written in either katagana or hiragana. (Taylor) All of these kana symbols are different from one another, but hiragana and katagana are roughly equivalent to each other, comparable to upper and lower case letters. (Makita) With only one exception kana letters always begin with a consonant and end with a vowel. Each syllable is read consistently the same way. When reading is introduced to children in Japan, the kana syllabaries are introduced before kanji characters. (Taylor)

In appearance the Japanese letters are relatively simple in shape, with the average letter requiring about three strokes. (Muraishi) No space is left between words, and writing can occur either vertically as in old Chinese or horizontally as in the Western mode. The two kana syllabaries along with a core of 1,850 kanji ideographs borrowed from Chinese make up the daily reading demand in Japan.

KOREAN

The Korean writing system has been called the most logical system of writing. Korean writing was invented in the 15th Century A.D. at the decree of the king. Prior to this time Chinese characters were used exclusively for writing and are still in partial use today. The Korean alphabet was developed by scholars in a systematic way with only one symbol for each sound and with related sounds having related symbols. Korean is an alphabet/syllabary with 11 vowel and 13 consonant symbols. These symbols combine together in block forms so the resulting words are all the same size and shape. (Taylor)

Korean newspapers are printed in both the Korean alphabet and with Chinese characters which are used to represent the numerous loan words. Characters predominate in the newspapers though personal writing is generally in alphabetic script. Unlike Chinese, there are personal typewriters available in Korean script. (Park and Arbuckle; Taylor)

Like Japanese, Korean is taught with the phonetic system first followed by the ideographic characters. (Park and Arbuckle)

LEARNING TO READ IN DIFFERENT ORTHOGRAPHIES

The different writing systems raise questions about the incidence of disability in learning to read in different orthographies. The Koreans report a very low rate of reading disability which is attributed to the rational design of its alphabet and its ease of acquisition. (Taylor) Like the Koreans, the Japanese report a very low incidence of reading disability. In a study conducted by Makita who surveyed 247 primary teachers of 9,195 children in Tokyo, teachers were asked to report on the number of children in their classes who had difficulty reading kana and kanji scripts. Only .98% or 89 children were reported as having reading difficulty. There was a decrease in the number of children experiencing difficulty with kana or syllabic scripts by grade level with none reported beyond fourth grade. There were children who had trouble with kanji ideographic characters all through elementary school, though only .4% of the children had difficulty at fourth grade and above. Remedial reading classes and dyslexia are virtually non-existant in Japan. (Sakamoto and Makita)

The only available information regarding the incidence of reading disability in the People's Republic of China (PRC) are reports that "most" people in the PRC are now literate. (Foreign Broadcast Information Service) Those not literate are reported to include some of the elderly and people living in remote mountainous areas. (Ong) Essentially the reason for simplifying characters was to make learning to read easier. In fact the President of the Chinese Academy of Science asserted that learning to read Chinese characters took about two more years to achieve the same level of literacy than reading in a phonetic script. (Mills)

In the Latin-based alphabet used to read English, each letter represents a phoneme or speech sound. As the smallest unit of sound, the phoneme has the ability to combine in a variety of ways with other phonemes. There are a number of studies to suggest that although 5 and 6 year-old children are able to count the number of syllables in a word fairly easily, some are not able to count the number of phonological segments of a word or even rhyme. (Foss and Hakes) Given the nature of beginning instruction in reading in the United States, they experience great difficulty in learning to read. Those involved in the teaching of remedial reading sometimes encounter students unable to learn phonics effectively as a means of pronouncing unknown words. The emphasis on phonics as a beginning or remedial method of reading instruction requires a metalinguistic ability to reflect on the isolated sounds of the language. For some young learners this task is apparently beyond their developmental or conceptual capacities.

DIFFERENCES IN INFORMATION PROCESSING

The different writing systems lead one to question whether there are differences in the basic way information is processed through different orthographies. The basic research question is whether there is a phonemic or sounding stage in the processing of characters. Both Japanese and Korean are excellent languages to use to conduct research on this question because they both contain dual scripts -- characters and a syllable and/or alphabetic script. Thus cross-cultural research involving bilingual or oriental students is highly relevant in determining whether there is any phonemic stage in the processing of characters. Much research has also been

done with aphasic adults in Japan to investigate whether there were differences in loss of ability in either kana or kanji, and what area of the brain had been damaged. Lastly, a few studies have been conducted to teach American children to read English using Chinese characters.

There is some evidence that the phonological character or sound of words affect the ways in which they are processed by the reader. In an experiment with oriental foreign students studying in Hawaii, Erickson, Nattingly and Turvey had the subjects read lists of words written in kanji characters. The words on the different lists were either phonetically similar, semantically similar, orthographically similar, or had no similarity. Based on the significant difference in reaction time between the probability of recall of phonetically similar and control items, the experimenters concluded that the subjects resorted to a phonetic strategy although they were not aware they did so. The experimenters made a distinction between primary linguistic activities -- speaking and hearing -- and secondary linguistic activities such as reading and writing. They suggested that phonetic short-term storage may be a place where kanji characters are stored while linguistic processing goes on, with linguistic awareness of this storage during reading and writing dependent on the degree of stress for that reader. They concluded that phonetic short-term storage was not dependent on the nature of the writing system, but on the linguistic nature of the task.

Tzeng, Hung, and Wang conducted two experiments with words written in Chinese characters to determine whether phonemic similarity affected visual information processing. The experimenters

measured the reaction time in processing lists of words and sentences in Chinese, some of which were phonemically similar.

In both experiments the longer reaction time for the phonemically similar characters suggested phonetic recoding of the characters presented as a way of prolonging storage for some further linguistic parsing. Tzeng, Hung and Wang discussed the debate on speech recoding in reading as a stage in learning to read and as a strategy of human information processing stating "the problem is to localize where in these subprocesses speech recoding may occur and why." (p. 629) These results support the finding of the Erickson et. al. study.

Biederman and Tsao conducted a study using Chinese subjects who were asked to give the oral equivalent of a character which was printed in a different color. These subjects required a much longer reaction time than English subjects performing with English alphabetic symbols on the same task. The experimenters cited other studies as well as their own findings to suggest the view that reading in kanji characters as well as accessing information about color may both be right hemispheric activities which in this particular case competed for the same perceptual capacities. They contrasted this to the left hemispheric activity of phonetic reading where different impairments affecting either kana or kanji would be based on the localization of the injury.

Sasanuma and Fujimura conducted the most significant studies in the localization of particular brain damage and its effect on the reading and writing of kana and kanji words. The experimenters drew their subjects from a population in a large rehabilitation

hospital in Tokyo. Their first experiment included aphasic subjects some of whom had apraxia of speech or speech defects. (1971) Sasanuma (1974) defined aphasia as a disorder in the expression and reception of spoken and/or written speech resulting from a cerebral lesion. Those aphasics who had apraxia of speech made significantly more errors in the reading and writing of kana, or syllabic scripts, than in kanji characters.

In a subsequent study, Sasanuma and Fujimura (1972) investigated the writing of Japanese adult aphasics and non-aphasics. Both groups made the highest proportion of errors in graphical confusions in kanji character transcripts. The same thing was reported for Chinese first graders who, in writing new characters, make the most errors in the visual aspect of characters. (Taylor) For aphasic subjects most errors with kana words occurred in phonological confusion.

Sasanuma (1974) stated that difficulties with kana processing was found primarily with patients who experienced damage to Broca's area of the frontal lobe of the brain in the left hemisphere. These people had difficulty particularly with speech production. He reported that those people who had sustained damage to the Wernicke's area of the temporal lobe of the left hemisphere had particular problems in auditory comprehension of lexical and semantic content, a condition referred to as Gogi's aphasia.

Sasanuma concluded that some phonological processing might occur with kanji processing depending on the familiarity of the characters as well as the speed and depth of linguistic processing. He stated that this was a strategy which depended on the situation.

These findings support the previously cited studies.

Park and Arbuckle conducted a series of experiments to examine the memory of Korean subjects in words written in either the Korean alphabetic system or in the Chinese character loan-words. The results did not support the idea of different processing for different writing systems, though the subjects remembered the characters somewhat better. The experimenters attributed this to a greater trace effect for characters and the ability of characters to encode more visual and semantic information. In this sense they regarded Chinese characters as "weak pictures." (p. 641)

Rozin et. al. conducted a novel experiment which was later replicated by Harrigan. In the Rozin et. al. experiment, children having difficulty in learning to read in English were given instruction in reading using 30 different Chinese characters to represent English words. The amount of improvement in learning was attributed to the novelty of learning the Chinese characters and also to the fact that the characters bypassed learning the abstract relations between symbol and phoneme. What Rozin et. al. failed to realize is that learning 30 characters in several months adds up to quite less than the 500-600 characters a year Chinese children in the PRC are required to learn. (Ong)

In a study of Chinese children in Vancouver, British Columbia, who were learning to read simultaneously in both English and Chinese, the surprising finding was that by the end of the third grade, such a small percentage of the children were having reading problems. Of the children in the study, only 3% had problems with English, 5% with Chinese, and 2% in both languages. (Kline and Lee)

This study and the Makita study suggest that reading disability may not be based as much on orthography as would be apparent at first glance. Kline and Lee speculate that the low incidance of reading difficulty found in their study might be attributed to the multisensory training received in the Chinese language class. This approach is also used in the PRC and heavily integrates reading and writing with many practice drills, similar to the Fernald approach.

These last two studies of Chinese-Canadian and Japanese children might also be reflecting differences based more on social class, values and culture than orthography. Both Japanese and Chinese societies are more traditional ones where the role of the teacher as an authority to be respected is still very much ingrained. Reportedly in Japan "excessive reading" as opposed to lack of interest in reading is the more widely regarded problem. (Sakamoto and Makita) This author's observations in schools in the PRC suggest that simply the opportunity of attending school, while now compulsory for elementary school-age children, is still regarded as a privilege.

CONCLUSION

In answer to the question, "Is it easier to learn to read in an ideographic, syllabic or alphabetic system?", the research to date presents more questions than answers.

As far as whether there are information processing differences, between readers of different orthographies, most research has concerned itself primarily with the mature adult reader as opposed to beginning readers. For the adult reader, processing differences seem dependent on a number of factors--familiarity with the script,

the nature of the reading task, and the level of linguistic processing. Differences in processing from research conducted to date seem to reflect these considerations as opposed to reflecting differences in the modes of processing or differences based on the characteristics of the script itself.

Would there be less incidence of reading failure with some "ideal" orthography? There is some evidence that at least for some young children in the United States the way in which beginning reading instruction takes place requires them to reflect on the phonemes in English in a way simply beyond their capacity to do so. The alphabetic nature of the English writing system as well as the lack of consistent phoneme-grapheme regularity add to this. No doubt the Initial Teaching Alphabet (ITA) proponents of the recent past were the closest thing to modern day reformers the English language has had for some time. While the First Grade Studies of the Office of Education (Bond and Dykstra, 1967) indicated that students learned to read easier in ITA the advantage disappeared after the transition back to traditional orthography, making it of questionable practicality as far as feasibility was concerned.

There is no doubt that no other nation is as preoccupied with reading achievement and disability as the United States if one looks just at the amount of resources devoted to assessment, instruction and materials. Downing points out that a significant factor in addition to a particular culture's anxiety about reading and the phoneme-grapheme regularity of its language is the age at which reading instruction is begun. He points out that the United States simply begins instruction in reading earlier than some

other countries. Yet a comparable beginning age in Japan results in significantly less failure. (Sakamoto and Makita)

Current research is providing a fascinating insight into brain hemispheric capacities regarding the way in which written language is processed. No more convincing argument for the existence of learning disabilities relating to reading and language exists than the work being done with seriously brain damaged people, particularly the aphasic studies from Japan.

The most interesting aspect of the research on cross-cultural differences in learning to read and information processing in different orthographies are the findings of linguistic universals across scripts in reading. These combined with the intangibles of cultural expectations and motivation and their affect on achievement in reading provide much more room for future research.

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