KANJI VERSUS KANA PROCESSINGS IN ALEXIA AND AGRAPHIA: A PRELIMINARY CASE REPORT

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A 43 year old high-school teacher had a sudden attack of numbness affecting the right half of his body on the morning of November 23, 1971. A few minutes afterwards, he was able to move around again, but found himself unable to read the newspaper.

At the time of admission to a rehabilitation hospital three weeks later, he had a blood pressure of 220/120, and a right homonymous hemianopsia. The cranial nerves were essentially normal, but there was a slight weakness of the right extremities. The EEG evaluation disclosed irregular spike discharges in the left parieto-occipital region, which were interpreted as indicating a relatively circumscribed lesion in this area. The etiology was suspected to be an infarction of the posterior cerebral artery.

Speech and Language Symptoms

A comprehensive language examination given four weeks after the attack disclosed major disabilities confined to reading and writing with almost all functions of other modalities, i. e., the perception and production of spoken language (including spontaneous speech, the repetition of sentences, and auditory comprehension) intact.

On the naming test, however, he did exhibit some difficulties. Out of 20 test items (covering high-frequency as well as low-frequency words), he made two semantic errors (said 'chair' for 'desk' and 'gloves' for 'socks'), and two delayed responses (responses not made within five seconds after the presentation of the stimulus).

In striking contrast to the well preserved abilities in processing spoken language in general, he exhibited a marked difficulty in handling written language, i. e., in particular in reading (and to a lesser degree in writing) materials written in both kanji and kana. Observations of his behaviors in handl-

ing these two types of written symbols disclosed, however, that there were some differences in the strategies he used with each of the two, which seem to merit special attention.

Reading

Except for a few words (or phrases) which he could read (recognize) at a glance, he showed a marked impediment in reading words and sentences whether they were written in kana or kanji.

When the difficult word (which he could not understand the meaning of at a glance) happened to be written in kana, he would try to read (spell) aloud each kana character one by one, sometimes using his finger and tracing the outline of the character. When he could finally succeed in vocalizing every character of the word (with much trial-and-error) and thus obtain the sound sequence of the word as a whole, then he could immediately comprehend the meaning of the word. In other words, the sound-meaning association of the word seemed intact (whereas the graph-meaning association was clearly defective), and therefore as soon as the auditory pattern of the word was recalled, it was related to its meaning. Thus all he needed in order to comprehend the meaning of a kana transcribed word was to convert the visual pattern (graphic form) of the word into its auditory pattern by means of vocalizing (or spelling aloud) each constituent character, and this was not impossible for him, if allowed enough time to think and to move his right index finger in order to trace the characters. In other words, the graph-sound association was somewhat defective, but not completely impaired in the case of the kana transcriptions.

When the difficult word happened to be in kanji, on the other hand, he seemed to have much greater difficulty in converting the graphic form of the word into its sound pattern, or in recalling the graph-sound association. In other words, the probability was low that he would be able to recall the auditory pattern of the word directly from its graphic form when it was in kanji, and thus be able to retrieve in turn the meaning of the word through the use of the sound-meaning association. He would use his right index finger to trace the strokes of each character over and over (as if trying to activate the association between the kinesthetic pattern of the word and its meaning or its

sound pattern). On rare occasions this was helpful in actually retrieving the meaning or the sound pattern of the word, but when it was not he was completely at a loss.

Writing

His writing ability was much better preserved than his reading ability, and his performance in writing kana was clearly better than that in kanji. In both spontaneous writing and in taking dictation (of words and sentences), he would vocalize over and over the sound sequences which he was supposed to write. This seemed to be of much help in recalling the graphic pattern of kana characters but less helpful in recalling kanji characters. In the case of the latter, however, a verbal explanation of the meaning of the word he had difficulty with sometimes seemed to help. Thus, when the kanji character 木 (ki) meaning 'tree' was in the repertory of words which he had control over, but the character 森 (mori) meaning 'forest' was not, then a verbal hint such as "there is more than one tree in a forest, " given by the examiner, proved to be effective in helping him recall the correct form of the latter character (or the graph-meaning association).

Additional Symptoms

In the initial stage of recovery, he had some difficulty in complex calculation (i. e., had to take much longer time than before illness to arrive at correct answers); as well as some topographic memory disturbance (e. g., had difficulty in finding his way to his room in the hospital). These symptoms, however, cleared up rapidly after a few weeks. There were no other problems of agnostic or apraxic nature, including visual agnosia of objects or geometric forms, or constructional apraxia.

Remarks

The follow-up evaluation, made three months after onset, disclosed that most of the symptoms other than the impairment in reading and writing had cleared up. The pattern of impairment in reading and writing, however, remained essentially the same as that found in the initial evaluation, although there was some improvement in the overall level of severity.

The case reported here attracted our attention because (1) it was a rather rare case of a relatively isolated impairment in reading (alexia) and (to a much lesser degree) in writing (agraphia); and (2) the distinctively different pattern of impairment of the processing of kanji versus that of kana exhibited in this case seems to provide another piece of evidence in support of our hypotheses: i. e., that the processing of kana and kanji represents distinctively different modes of operations of linguistic behavior, and that either of them can be impaired independently of the other (Sasanuma and Fujimura, 1971).

It may be said that the pattern of impairment exhibited by the present case is in contrast to that shown by the aphasic patients with apraxia of speech as was reported in our previous study. In this alexic-agraphic patient, phonological processing was almost intact as compared with non-phonological processing which was clearly defective, while in the apraxic patients the former was impaired to a significantly greater degree than the latter. In fact, there were many occasions for the alexic-agraphic patient on which he was able to process graphic symbols only because he was allowed to make a detour and convert them into sound patterns (phonological mode) first, but was unable to process them (graphic symbols) in terms of the more direct graph-meaning association (non-phonological mode). Thus, the patient had much less difficulty in dealing with kana characters (which have comparatively direct correspondence to the sound pattern) than with kanji characters (which do not show exactly what the sound patterns are unless the lexical items are identified).