行政院國家科學委員會專題研究計畫成果報告

失語症患者之閱讀障礙

Reading Disorders In Aphasic Patients

個別型計劃

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一、中文摘要

閱讀是一般成人相當重要的生活技能。牽涉到一連串複雜的認知過程，常在失語症時一併受損。本研究針對各種類型失語症患者,施予各種與閱讀能力有關之測驗，包括相似字形的分辨、簡繁字體的配對、同音字的配對、單字的命名、單字及句子的理解等測試。結果發現幾乎所有的失語症患者皆有閱讀能力之障礙。一般而言前區患者雖常有文字命名的困難，但多仍保有單字甚或句子的部分理解能力；而後區病患單字理解能力的個人差異則較大。

在閱讀的認知歷程分析方面，本研究中之失語症患者仍能正確的區分出外形相近的不同文字，顯示其字形之視覺分析過程正常。且大多數患者仍能從事簡繁字體之配對, 尤其是前區的失語症患者；反之，幾乎所有失語症患者都無法症從事同音異字的配對，這顯示他們在字的語音存取上有障礙。上述結果可以支持形音直接轉換在中文的閱讀並非主要途徑之理論。

關鍵詞：閱讀障礙、失語症、失讀症

Abstract

Reading competence is an important prerequisite for many adult functional activities. It is a learned skill that engages a complex set of cognitive procedures. By virtue of its complexity, it is vulnerable to disruption with many different kinds of brain damage, especially aphasia. This study investigated the reading disabilities in Chinese aphasic patients by giving them a series of reading related tasks, including discrimination between visually similar words, matching between different scripts of single words, homophone matching task, single word naming task, single word and sentence comprehension tasks.

The results showed that almost all aphasic patients had some degree of reading disabilities. In general, although anterior or Broca's aphasic patients often had difficulty in naming single words (alexia), they often preserved the ability to understand single words or even simple sentences. While posterior or Wernicke's aphasic patients had more variable ability in terms of their ability in single word comprehension.

In the aspect of analysis of the cognitive processes in the reading disability, it was found that all aphasic patients in this study could distinguish between different characters with similar orthography, which suggested that they retained normal ability in orthographic visual analysis. Furthermore, most aphasic patients, especially those of anterior lesions, could match the simplified script form of a single character with its visually dissimilar, complex script form. In contrast, none could perform the homophone matching task. These findings might be able to support the hypothesis that direct grapheme-phonetic conversion is not an important route in Chinese character or word reading.

Keywords: Reading disorder, Alexia, Aphasia

II. Background and Purpose

Reading is a learned skill that engages a complex set of cognitive procedures. By virtue of its complexity, it is vulnerable to disruption with many different kinds of brain damage. Reading competence is a prerequisite for many adult functional activities. Its competence is of special importance for patients with aphasia who can not communicate with others smoothly by oral-auditory route. Hence, comprehensive assessment of reading capabilities in aphasic patients is important for predicting functional living skills.

Early work on acquired reading disorder, or alexia, had been focused on simple clinico-anatomical correlation and distinguished alexia into two categories: alexia with and without agraphia (acquired writing disorder) (Dejerine,1891). However, following the influential paper of Marshall & Newcombe (1973), numerous researches have emerged to study alexia by cognitive or information-processing analysis against the background of models of normal reading processes. In this approach, alexia is analysed as different types of breakdown within the subcomponents of the complex reading processes. Several different types of alexias have been noted with this approach, including surface alexia, phonological alexia, and deep alexia. On the other hand, evidences from patients with readings disorder have also been used to constrain or modify the functional models of normal reading processing.

Up to now, studies of acquired disorders of reading Chinese have been scarce (Tang, 1978, Hu, Zhu & Liu, 1986; Wang & Tang, 1959; Hu, 1986) and they all come from mainland China. Thus, a more comprehensive study of alexia in Chinese is necessary. It would be also interesting to see what is the manifestation of Chinese alexias in terms of cognitive information-analysis. Thus, a series of reading tests were designed to examine the performance of aphasic alexic patients systematically.

III. Material and Methods

Aphasic patients coming into the Speech Therapy Division, Department of Physical Medicine and Rehabilitation of the National Taiwan University Hospital in the period of September 1997 to September 1998 were screened for this study. Patients with general intellectual impairment, severe dysarthria so as to affect speech intelligibility, and education level of 6 years or less were excluded. They were further screened on their visual acuity and visual scanning ability. A total of 24 aphasic patients were included in this study. They were 15 males and 9 females, with mean age of 56.8 and education of 11.5 years. There were 5 nonfluent or Broca's aphasics, 7 Wernicke's aphasics and 12 global aphasics.

The following reading tasks were given to each subjects:

1. Character(**單字**) discrimination task

In this task, the subjects are requested to choose from 5 orthographically (visually) similar characters that is identical with the stimulus ones

2. Character matching task

In this task, the subjects were requested to identify, among orthographic foils, character that is either a simplified form(**簡體**) or complicated form(**繁體**) of the tested one.

3. Homophone matching task

Identifying characters with the same pronunciation but different orthography. Visually similar foils were used.

4. Single word reading out task

Oral reading of sinlge words with varying regularity and oral reading of pseudowords.

5. Word-picture matching task

Single word reading comprehension was assessed through word-picture matching tasks.

6. Sentence comprehension tasks

IV. Results and Discussion

1. Word discrimination task: all subjects except for one severely global aphasic patient performed the task well and correctly identified the target characters among visual foils in 10/10 test items. The one patient who made mistakes made 2/10 errors.
2. Character matching task: The overall average score in this task was 0.54, well above chance level (0.2) with the Broca's aphasics performed best (0.81).
3. Homophone matching task: the average score was 0.14, nearly chance level in all group of aphasic patients.
4. Single word reading out task: Almost all patients failed in this task. The nonfluent aphasics often had difficulty parallel to their oral speaking ability and made semantic errors sometimes. The Wernicke aphasics provided numerous paralexias instead.
5. Single word comprehension task: The nonfluent aphasia group performed well in this task(mean 0.89) and the other patients performed variably in this task. There were one Wernicke patient and two global aphasics who could recognize most words (>16/20) but there were also patients who performed by chance.
6. Sentence comprehension task: The result is similar to that in the single word comprehension task with anterior patients having better comprehension for sentences than the other group. However, they erred frequently too in syntactically complex sentences and in paragraph reading tests.

Discussion:

The finding that reading disabilities often coexist with aphasia supports the concept that both the visual (reading) route and the auditory-oral route of our language processing share many, if not most, of their neural substrates. Different subcomponents of the reading process may involve different parts of the brain instead. For example, reading comprehension, especially for single words, probably involves more on the posterior or temporal-parietal region of the brain. Thus, those with limited anterior or frontal lesion were relatively spared in the single word reading comprehension task. Further detail examination of the images for those Wernicke or global aphasic patients with relatively preserved single word comprehension showed that they had lesions more limited to the anterior or temporal region, with relative sparing of the temporal-occipital-parietal region. This is to some extent consistent with the traditional concept that angular gyrus and surrounding areas are important for word comprehension. Whereas reading more complex sentences or paragraphs requires more extensive areas along the sylvian fissure.

The finding that almost all patients performed well the the task of character discrimination task confirmed that they had normal ability in orthographic visual analysis. It is well known from the literature that early visual analysis is performed in the occipital lobe and lesions there might cause periphereal alexias such as attentional alexia or pure alexia. Since most aphasic patients have no or limited lesions in the occipital lobe, it is conceivable that these types of deficits was not present in our study.

The finding that most aphasic patients, especially those of anterior lesions, could match the simplified script form of a single character with its visually dissimilar, complex script form is interesting. This suggested orthographic lexical access in those patients. In contrast, all patients failed in the homophone matching task.

What can we infer from these findings? There had been long dispute about what kind of processes are involved in reading words in logographic system like Chinese. Studies in Japanese patients showed that the ability to read Kana, a script that represents syllables, can be selectively impaired with preservation of the ability to read Kanji, a script based on Chinese logographs (Sasanuma, 1980). This has been taken as an evidence that phonological mediation is not necessary in recognition of Kanji. Nevertheless, it is

important to note that Kanji is different from the characters used by Chinese readers. A character used by Chinese usually has one pronunciation, while a Japanese Kanji usually has two pronunciations: an On-reading which is based on Chinese sound, and a Japanese Kun-reading. As far as the phonetic component in Kanji is concerned, it is even more unreliable than that in Chinese characters(Yin, 1991).

Since Chinese characters are not translated into a phonological code "one phoneme at a time", it is easily conceivable that we can read with the lexical routine. But the case with sublexical routine is less clear. Although most Chinese characters contain a "phonetic radical" which can indicate how the character is to be pronounced, however, as compared to alphabetic languages like English, these radicals are often an unreliable guide to phonology. Thus, only about one-third of phonetic radicals completely represent the characters' sound (regular, e.g., 平 in 評) and one-sixth of radicals do not represent the sound at all (irregular, e.g., 秤)(Yin, 1991). On the other hand, there are also studies suggesting that phonological activation occurs automatically during reading Chinese characters (e.g., Cheng, 1992; Hung & Tseng, 1981; Lam, et al, 1991), suggesting reading Chinese words does not involve processes substantially different from those involved in reading words in alphabetic systems. If this is so, then one should find analogues of the alexias that result from the selective impairment of either the lexical or the sublexical routines to phonology.

The result of our study suggests that direct grapheme-phonetic conversion is not an important route in Chinese character or word reading.

However, we did see one Wernicke's aphasic patients who could read most characters loud correctly, even some phonetically plausible pseudowords, but who could not understand the meaning of those single words that he read out loud correctly. This finding is to some extent similar to the "surface alexia" reported in western language. (Marshall & Newcombe, 1973; Patterson, 1981; Coltheart, 1982). It has been proposed that those with surface alexia read through direct grapheme-phonemic conversion under impaired direct lexical access. It is not clear whether this patient read through similar sublexical grapheme-phonemic conversion route or, instead, through direct whole-word phoneme conversion without lexical or semantic access. Whichever the case, this also provided us an evidence that, at least in some people, these direct grapheme-phonemic conversion route did exist in Chinese readers.

V. References:

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