



MECHANISMS PRODUCING RECURRING UTTERANCES IN A PATIENT
 WITH SLOWLY PROGRESSIVE APHASIA

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ABSTRACT

This paper discusses mechanisms of recurring utterances in a female patient with slowly progressive aphasia. The patient, TO, produced a meaningless recurring utterance [ko-no-shi:-no] in her spontaneous speech, but her ability to rewrite words written in kanji(Japanese ideograms) to kana(Japanese phonograms representing syllables or moras) sequences was relatively preserved. It was speculated that the production of spontaneous speech and writing kana sequences from kanji words share the phoneme level from speech output lexicon based on the cognitive model. Thus, The relatively preserved ability to rewrite kanji words to kana strongly suggests that the recurring utterance in this case was produced below the phoneme level as described by Blanken.

I .INTRODUCTION

Recently, it has been reported that a number of aphasic patients with recurring utterances retained modality specific language abilities, such as good performance in writing to dictation, while demonstrating a poor abilities in other modalities[1].

Blanken[2] examined the written ability of a 61-year-old male patient with non-semantic recurring utterances, and his study further advanced the framework of language information processing model (cognitive model) proposed by Ellis and Young[4]. To investigate modality specificity between speech output and written output, Blanken used the three-route model of writing to dictation in Ellis' cognitive model as follows (Fig.1):

(a) The lexical-semantic route (auditory analysis, auditory input lexicon, semantic system, graphemic output lexicon and grapheme level): This route does not require a level of representing phonological output.

(b) The lexical non-semantic route (auditory analysis, auditory input lexicon, speech output lexicon, graphemic

output lexicon and grapheme level): This route requires phonological output process on the lexical level.

(c) The phonological or non-lexical route (auditory analysis, phoneme level, phoneme-grapheme conversion and grapheme level): This route supposes the production of a written character as a grapheme corresponding to the phoneme on a segmental level.

Speech output in the case reported by Blanken showed recurring utterances every time, but written output was relatively maintained in writing to dictation at the single word level. On the supposition that the ability to respond to dictation is comparatively intact, it was proposed that

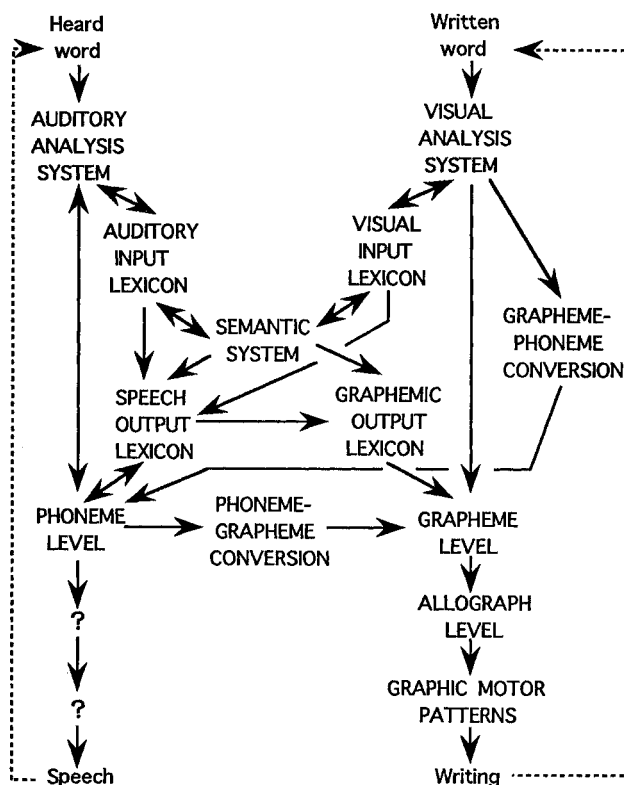


Fig.1 Ellis' cognitive model for the recognition and production of spoken and written words. (Ellis and Young,1988)

disturbances at the phoneme level and speech output lexicon could not be recognized from the cognitive model.

Indeed, Blanken's case was able to write non-words or irregular words practically, but it was not observed that written automatisms corresponded to recurring utterances occurred in writing. Thus, it was supposed that the writings of non-words mainly used route (c) and irregular words mainly used route (b). That is, the writing process in the case was able to use route (b) and (c). Since the phoneme level and speech output lexicon were intact, FL should be able to speak some semantic words. Accordingly, Blanken reported that recurring utterances are produced below the phoneme level.

In the Japanese writing system, kana characters are able to represent Japanese syllables, and the Japanese syllabary is formed by each kana character. The kana writing process differs from that of kanji; a kana character corresponds to a mora or a syllable of individual speech sound, but a kanji does not necessarily. It is a well-known fact that a kana character corresponds to a syllable of spoken Japanese [4][5].

Among other things, Furigana is a better task for demonstrating the ability to rewrite words in written kanji to kana sequences to specify the pronunciation of an unfamiliar-kanji word.

Furigana is represented by kana characters written in a horizontal line above a kanji word or to the right of a kanji in a vertical line to specify pronunciation of unfamiliar kanji (Table I). Furigana represents a one-to-one correspondence between kana characters and syllables.

Table I. Examples of the relative positions of kanji word and Furigana.

[horizontal writing]	[vertical writing]
Furigana: てがみ kanji: 手紙 [tegami] "letter"	kanji: 手 紙が :Furigana 紙み

Though Blanken's study presents the task by way of an auditory input system, this study used Furigana writing task by visual input. Thus, there is a difference in that our study does not intentionally present any speech sound in the Furigana writing task. According to Ellis's model, the process of Furigana Writing passes the phoneme level by way of the speech output lexicon.

This paper investigated Furigana writing ability in a slowly progressive aphasic patient who showed modality specificity in language, and discusses the level at which recurring utterances are produced based on Ellis' cognitive model from the consequence of the Furigana writing task.

II. MATERIAL AND METHOD

The patient

The patient, TO, was a 68-year-old, right-handed female who showed slowly progressive aphasia approximately after six years after the onset, with meaningless recurring utterances such as [ko-no-shi:-no]. On the WAIS intelligence test, she scored 79 for performance IQ and 97 on the Kohs Block Design Test for Kohs' IQ. On the Raven Coloured Progressive Matrices Test, the score was 20/36. On confrontation naming, reading kanji words aloud and reading kana aloud, she occasionally pronounced the initial sounds of the target words correctly. She was able to write Furigana to specify pronunciation of unfamiliar, however, writing of kanji and word comprehension were severely impaired. Her spontaneous writing in sentences exhibited an agrammatic tendency showing difficulty in processing grammatical morphemes. As a whole, she showed mainly atypical aphasia; however, her language comprehension at the word level was somewhat similar to moderate sensory aphasia.

Experiment

We tested her abilities in written naming, confrontation naming, reading kana aloud and reading kanji aloud using the 100 most commonly used Japanese words. Then we examined Furigana writing ability using kanji words that consisted of 1588 kanji words with 2 characters and 135 kanji words with 4 characters (Table II).

Results

On the 100 Japanese words test using written naming, the score was 63/100, but she totally failed speech output modalities, such as confrontation naming and reading aloud. However, she was occasionally able to pronounce the initial sounds of target words. Especially, concerning the initial sounds, she read approximately 57% of kana words, approximately 44% of kanji, and approximately 16% of confrontation naming.

The accuracy of Furigana for 1588 kanji words with 2 characters was 76%, and for 135 words with 4 characters

was 63%. She wrote Furigana against all kanji words, and the majority of her writing errors were literal paraphasias of all errors. Furthermore, she was unable to convert written Furigana into kanji word used in the above task.

Table II. Examples of tasks in the Furigana writing ability test.

kanji words with 2 characters			
kanji	Furigana		
苦勞	くろう	[kuroo]	"suffering"
田舎	いなか	[inaka]	"the country"
預金	よきん	[yokin]	"money on deposit"
弁当	べんとう	[bentoo]	"a box lunch"

kanji words with 4 characters			
kanji	Furigana		
試行錯誤	しこうさくご	[sikou-sakugo]	"trial and error"
臨機応変	りんきおうへん	[rinki-oohen]	"adaptation to circumstances"
優柔不断	ゆうじゅうふだん	[juudzuu-fudan]	"lack of decision"
利害得失	りがいとくしつ	[rigai-tokusitsu]	"advantage and disadvantage"

III. DISCUSSION

In the Japanese writing system, the process of Furigana writing is distinctive in that all kana characters pass through the phoneme level; it is known as the phonological route (visual analysis, visual input lexicon, speech output lexicon, phoneme level, phoneme-grapheme conversion and grapheme level). This route has a common process with oral reading at the phoneme level.

Moreover, writing kana words in visually familiar words especially has a common route and similar to the kanji writing process; this is known as the lexical route (visual analysis, visual input lexicon, semantic system, graphemic output lexicon and grapheme level).

It is supposed that these two routes can function in parallel in kana writing. However, the greater the number of characters in a kanji word, that is, as the combination of kanji characters increases, the more Furigana writing process passes through the phonological route only. Since kanji words with more letters can not be processed by the lexical route, the Furigana writing process must use the phonological route that translates phonology activated by pronunciation or inner speech of the target word to orthography. In other words,

Furigana writing tasks are expected to activate the phoneme level as an indispensable route. Therefore, Furigana activates the pathways of both the speech output lexicon and the phoneme level concurrently, while the task in Blanken's study examined the activation of the speech output lexicon and of the phoneme level respectively using separate tasks.

Our patient showed a higher accuracy in Furigana writing of kanji words with 4 characters, which have more difficult pronunciations in Japanese. Figure 2 presents the process of Furigana writing which was selected from Ellis' model (Fig.1). When our patient was shown 「試行錯誤」 written in kanji using 4 characters, she was able to write 「しこうさくご」 in Furigana writing, and for 「臨機応変」, she replied 「りんきおうへん」.

Since Furigana writing ability in this patient remained almost intact for kanji words with 4 characters, it is suggested that each syllable of the kanji word was activated mutually by way of the phoneme level.

However, she uttered [shi-ko-no-shi:-no] or

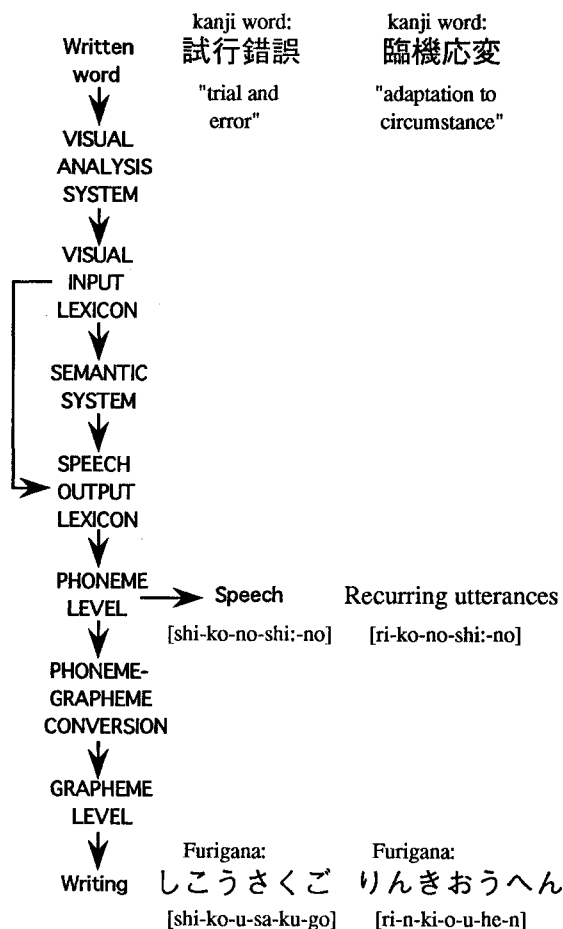


Fig.2 Process of Furigana writing based on Ellis' model.

[ri-ko-no-shi:-no] respectively as recurring utterances and was able to pronounce only the initial sounds of a target word. Thus, the accuracy of the initial sounds indicates the possibility of producing a phonological output of the target word correctly. It especially is inferred that since production of the initial sounds showed a high frequency on the test of reading kana for 100 Japanese words, the initial sounds of kana words indicate the activation of the phoneme level all the more since kana sequences correspond to each syllable of the target words.

Furthermore, the patient was unable to convert written Furigana to kanji. The activation of the semantic system is also necessary for kanji writing. That is to say; it is doubtful whether the semantic system in this patient can function without failure.

Eventually, both the Furigana writing process and kanji reading have a common route that passes through the phoneme level to produce results. On the supposition that the phoneme level in Furigana writing process remains intact, it is considered that the phoneme level in reading was not disturbed either. Hence, it was supposed that the functional level of disturbance was below the phoneme level and recurring utterances were produced between the phoneme level and speech output as Blanken proposed. However, determining the source of recurring utterances did not provide sufficient explanation of aphasic disturbance alone.

IV. REFERENCES

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