ORTHOGRAPHIC KNOWLEDGE AND WORD RECOGNITION II

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1. THE PREVIOUS STUDY

The previous study (Yanase, 1987) found no effect of orthographic knowledge on word recognition. The 10th graders in Hiroshima University High School participated in a word-likness judgement test, in which they judged whether 52 target words (orthographically correct pseudowords and orthographically incorrect nonwords) looked like English words. Of the 42 students involved, 5 students with lowest scores (26–33) and other 5 students with highest scores (45–48) were chosen for the next word recognition task experiment.

These ten students were asked to press a button as soon as they thought they recognized a target word on a computer screen. Target words were taken from the Basic Monbusho 490 words and consisted of 10 short words and 10 long words (See Appendix). They appeared randomly with no context. Their word recognition speeds were compared and no group difference was found ($F(1, 8) = .47$, *n.s.*), although there was Length Factor difference ($F(1, 8) = 21.02$, $p. < .01$). The interaction was not observed, either ($F(1, 1) = .10$ *n.s.*).

Six possibilities were suggested to explain why there was no effect of the orthographic knowledge on the word recognition task: (1) Some subject s did not really 'recognized' the word but responded on an appearance of the word; (2) As the subjects were scarce, individual variations unduly cancelled the group difference out; (3) Possession of orthographic knowledge does not necessarily enhance word recognition speed; (4) Orthographic knowledge is 'developmentally limitied', thus do not emerge at an intermediate level; (5) The target word were too easy for the subjects to recognize; (6) The task were too easy for the subjects. The first posaibility is of practical nature. This will be briefly dealt with later. The next one is of statistical nature and is not the topic of this paper.

Thus, the purpose of this paper is explore the remaining four possibilities. Models of word recognition will be reviewed in the following section and the four possibillities will be integrated in and explained with one theory.

2. MODELS OF WORD RECOGNITION

Occurance of the word superiority effect made it necerssary to build some models that are of interactive nautre. Models must take account of ways how the long-term memory interact with word recognition. Obviously, we need to abandon a purely bottom-up model of word recognition as well as a purely top-down one because both are absurd indeed; a purely top-down model predicts that the blind can read a visual text as well as the normal can and a purely bottom-up model is against our daily experience that we read a text much easier the second time. Therefore, the issue is how bottom-up or top-douwn oriented a model should be.

Since Goodman proposed that reading is a "psycholinguistic guessing game", many studies have been influenced by his claim and predicted that reading is maily top-down oriented activity. Smith (1982, 1985), for example, asserted that skilled readers rely on visual information less than unskilled readers do since the former are actively engaged in hypothesis-testing as they proceed through the text. It follows that redundancy such as orthographic structure or context effect is utilized in reading especially by skilled readers.

However, not a few empirical researches proved otherwise. One of the most prominent one is Perfetti and Hogaboam (1975). They found that less skilled readers significantly improved their vocalization

latency when target letter strings changed from nonwords to highly frequent words, while skilled readers did not improve so much. Thus it was not skilled readers but less skilled readers that utilized the redundancy of orthographic structure more in word recognition. Also, Krueger *et. al.* (1974) obtained the result that both fourth-graders and adults searched for a letter faster through word than through nonword displays but that magnitude of the effect was the same for both age groups. (For comprehensive review, see Stanovich 1980, Perfetti 1985).

Theoretical criticism against the top-down model is offered, too. Stanovich (1980; 34) argues that if the generation of hypotheses about a subsequent word, or words, is indeed necessary and actually occuring, then the hypothesis generation must take less time than is necessary to recognize the words on the basis of purely visual information. He states, "However, it seems unlikely that a hypothesis based on complex syntactic and semantic analyses can be formed in less than the few hundred miliseconds that is required for a fluent reader to recognize most words".

Stanovich (*ibid.*) cautions that we should distinguish two types of top-down flow of information (especially, the use of contextual redundancy); the use to facilitate *ongoing* word recognition, which works in quite a limited time and the use to facilitate comprehension of text, which works in virtually unlimited time. He says that these two types should not be confused and that the type he mainly deals with in his paper is the first one. Obviously, the type we are discussiong is the first one, too.

To solve the discrepancy between these top-down oriented models (the Interactive Model) and the empirical findings, Stanovich (*ibid.*) proposes the Interactive-Compensatory Model. He maintains that, in word recognition, higher knowledge such as orthographic structure or contextual information is utilized only when the bottom-up processes are inefficient for some reasons. Therefore less skilled readres are more sensitive to orthographic structure or context; skilled readers do not have to rely on these higher knowledge because of their efficient bottom-up processes. It follows that effect of orthographic knowledge emerge only when the task is difficult in proportion to the ability of the subjects.

The Interactive-Compensatory Model is in line with other bottom-up (oriented) models of reading. LaBerge and Samuels (1974) cliam that reading is multicomponent, complex skills and that if each component process requires attention, performance of the complex skill will be impossible, because the capacity of attention will be exceeded. Thus, they maintain that 'automatic' (requiring little or no attention) processing is important for basic processes. Their 'good readers' are ones who automatically process basic reading skills. The implication is that highly cognitive activity such as predicting a subsequent word is undesireble for basic reading processes to be fluent.

There are, however, a few criticism of the Interactive-Compensatory Model. Taylor and Taylor (1983), for example, criticize the model, saying, "Stanovich's position is perverse, surely. Good readers are skilled both at using context and at context-free word recogniciton; the two skills work together, not in opposition". However, theis is exactly what Stanovich is claiming. Taylor and Taylor seems to have failed to notice the distinction Stanovich made of the two types of the use of context. Stanovich's theory is mainly on the ongoing word recognition and what he maintains is that in the ongoing word recognition good readers read better even without depending on the context and that in comprehension of the text good readers comprehend better, too, thanks to the remaining attention which would have been wasted if the basic botom-up process had been inefficient (i.e., if they were poor readers). In fact, Stanovich never maintains that these two types of contextual use work in opposition.

Thompson (1981: 596), too, critiszed Stanovich's theory and tried to defend Smith's theory. He states," In Smith's account this 'prediction' is the reader's (preconscious) use of prior information, or, in more technical terms, the reduction of alternatives through the use of redundancy. Such 'prediction' does not require any form of hypothesis-testing by the reader". However, Thompson did not give any account of why the prediction does not require any form of hypothesis-testing. It seems to me, at least, that to predict improbable words as the next word and confirm that prediction is nothing but hypothesis-testing. It obviously needs syntactic and semantic analyses and hypothesis generation. Again, Stanovich's point is that such a complex prediction is

unnecessary or undersireble for fluent basic reading processes. After all, in order to reject the Interactive-Compensatory Model and assert the Top-Down Model, Smith or Thompson or any other adovocates of the Top-Down theory must provide empirical evidence. Therefore the Interactive-Compensatory seems to be the best among models that are available now.

Granting that the Interactive-Compensatory Model is true, or the best accont of reading (especially of word recognition), it is reasonable to try to examine the result of the previous study from this theory's perspective. Unfortunately, a direct comparison between the previous study and the studies of the Interactive-Compensatory Model is impossible. Like other studies, the studies of the Interactive-Compensatory Model classified subjects into good readers and poor readers by the use of a standartised reading comprehension test. The previous study, on the other hand, classified subjects into those who had orthographic knowledge and those who do not, in an attempt to find whether the posession of orthographic knowledge would be a sign of fluent reading. If it had been proven to be the case, a relatively easy paper and pensil test of orthography should be encouraged in order to predict the success or the opposite of EFL learning. As a matter of fact, this unusual classification was the reason why the previous study was added to the preexsitent literature.

However, in the following section, the author combines the orthograhically knowledgeable subjects and the others and examine the relationship between the whole subjects and the task. In this way, the Interactive-Compensatory Model will be safely applied to account for why there was no effect of orthography in the previous study.

3. REEMAMiNATION OF THE PREVIOUS STUDY

The purpose of this section is to see whether the task was difficult in proportion to the subjects' ability in the previous study. As we have seen, the Interactive-Compensatory Model predicts that this is the necessary condition of the non-occurance of effect of orthography. To do that, we have to examine the task and the subjects' ability simultaneously because our focus is their mutual relationship. The author will first examine the relationship from the viewpoint of the task and then examine it again from the viewpoint of the subjects' ability.

The word-recognition task in the previous study was surely the most simple one. As it is impossible to extract and observe the process of word recognition *per se*, researches on word recoginition have put additional tasks to make the process observable. Among them are accuracy task, vocalization task and lexical decision task (Gough 1984). The previous study employed none of them for practical reasons. The accuracy task, in which subjects report what a target word is in a poor visual condition, is usually carried out with tachitoscope and difficult to conduct with a personal computer (at least with the author's programming knowledge). To conduct vocalization task, we need a special clock which coordinates with a microphone. And even with these devices, the result is subject to the sensitive nature of articulation. As the devices were not available, this additional task was abandoned. The last lexical decision task can be easily conducted with a personal computer. However, the subjects in the previous study were Japanese students of English and can not make a lexical decision because the possibility always remains that what seems to be nonword is simply a word the subject does not know. For all these reasons, the previous study simply asked the subject to press a button as soon as they thought they recognized a target word.

For this simplicity, some subjects may have responded carelessly; they may have pressed the button whenever something appeared on the screen. This possibility can not be detected with this method, and this might have cancelled the effect of orthography out. Stanovich *et al.* (1978) investegated the effect of the orthographic structure of the stimulus field on the visual search performance of third graders, sixth graders and adults. In Experiment 1, in which the subject searched one target word, no effect of orthographic structure was obserbed. In contrast, all subjects showed the effects in Experiment 2 and 3, where the subjects serched for instances of a semantic catrgory and for three target words respectively. Their speculation on Experiment 1 is that the subjects might have used only pre-linguistic visual memory for the search and thus failed to show the effects

of orthography, which is of linguistic nature. This might also be the case for the previous study.

Another example which failed to observe the effect of higher knowledge in a simpler task is Massaro *et al.* (1978)'s one. They found no priming effect (superordinate category name of the target word) in a visual search. But when they rotated the test word 180 degrees, they observed the effect. Again, simplicity of the task prevented the effect of higher knowledge from emerging.

The conclusion here is, then, that the task of the previous study was the simplest one. The visual condition was good, there was no need to correctly articulate the target word, they did not have to retrieve the meaning of the target words, and the target words were not, of course, rotated. From the viewpoint of the word-recognition task, the task was simple enough. So the next point is whether the task was easy (or too easy) for the subjects in the previous study, too. If they are premature for the task, the effect of orthography would apper, and if not, the orthographic knowledge is "developmentally limited" (Stanovich, 1986) for them and does not enhance their reading skills.

The subjects had been learning English for three and a half years when the experiment was conducted. They had 520 classes (50 minutes each) in the junior high school and approximately 100 classes in the senior high school and apparently studied more outside the classroom. They had learnt the target words in the previous study in the first year. The point is whether the target words were easy enough for them.

Guttentag and Haith (1978) investegated the intervention of embedded intracategory or extracategory words, pronounceable or nonpronounceable letter strings, and visual noise with a picture naming task. Their argument is that if the intervention occurs, it proves that the target word is "automatized" in that the meaning of the target word is unconsciously and necessarily retrieved and thus intervened with the picture naming task. Their conclusion is that "even children who are poor readers and normal children with only 9 months of formal reading instruction extract meaning from familiar printed words (the target words) automatically" (p. 707, parenthes mine).

To calculate roughly, the subjects in the previous study had been exposed to English for almost the same amount of time with the American children with 9 months of formal reading instruction providing the American children are exposed to writing of English 5 hours a day in school and had not been exposed to English before the schooling began. Of course, the materials that the American children and the Japanese students of English differ significantly, and this rough calculation never guarantees the exact comparison at all. However, this calculation at least suggests that it is not unreasonable to expect that the subjects in the previous study had developed a kind of "automaticity" for the target words. In fact, it is the author's belief that the target words were quite familiar to the subjects because they had repeatedly encountered them (only some 1000 kinds of words are used in their textbook, so the words, especially basic words such as the target words are repeatedly used in the textbook).

To summarize, we have seen that the task in the previous study was easy and the subjects have learnt English sufficiently enough for the task. If this is the case, the Interactive-Compensatory Model all explains why there was no effect of orthography; the task was not difficult at all for the subjects' ability. Of course this conclusion is a speculative kind and lacks empirical evidence; not validated at all. However, the model well explains the four possibilities. This theoretical account is the best one that is available to the author now.

Appendix

The following 20 words were used as the target words in the previous study; girl, not, what, can, ago, back, his, only, six, both, thousand, understand, yesterday, sometimes, everything, November, newspaper, Japanese, afternoo, breakfast.

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