Chapter 15

Eye-Movement and Performance during Reading by Cerebral Palsy Patients

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ABSTRACT

This chapter introduced the characteristics of CP patients reading Japanese documents in comparison with fully abled students through two experiments. Experiment 1 was designed to study the characteristics in reading Japanese still documents and Experiment 2 was designed to study the characteristics in reading Japanese scrolling documents. The results of Experiment 1 revealed that the CP patients needed more time to read the documents than the students regardless of the difficulty of the documents. The eye fixation duration of the CP patients was generally the same as the students, although slightly longer with the most difficult documents. The frequency of eye fixation of the CP patients was greater than the students regardless of the difficulty. The distribution map of the intervals between the eye fixations revealed that the CP patients performed more eye movements. The results of Experiment 2 revealed that the most comfortable scrolling speed of CP patients was slower than that of the students regardless of the size of the scrolling window. The most comfortable scrolling speed of CP patients was stable regardless of the window size, while the most comfortable scrolling speed of the students increased as the window size increased from 3 to 5 characters and the scrolling speed was stable in 5 characters or more. Further discussions of the occurrence of the characteristics of CP patients reading both the still document and the scrolling document were done.

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INTRODUCTION

The characteristics of the fully abled people reading alphabetical text have been studied in many researches. The characteristics in reading alphabetical text were clarified by using the saccade length, the eye fixation duration, and the frequency of eye fixation. Taylor (1960) revealed the average collage student read 280 words per a minute. Rayner and Inhoff (1981) revealed that the distribution of the fixation duration had the range between 100 and 450 msec, and that the peak of the distribution was between 200 and 250 msec. They also revealed that the distribution of the saccade length has the range between 1 and 20 characters, and that the peak of the distribution was between 6 and 9 characters.

The characteristics of the fully abled people reading Japanese text have been also studied in many researches. Many researches clarified the characteristics in reading Japanese text by using the saccade length, the eye fixation duration, and the frequency of eye fixation; these were obtained by measuring eye movements during reading text. (Kanbe, 1986, Konosu, 1998) Osaka (1992) revealed that the averaged saccade length in reading Japanese text was 7.8 characters. Osaka (1989) also revealed that the averaged saccade length in reading vertical Japanese text was 5.8 characters. Kanbe revealed that the distribution of the fixation duration had the range between 100 and 400 msec, and that the peak of the distribution was between 150 and 250 msec. Generally speaking, if the document is difficult to read or the text consists of only Japanese KANA characters, the saccade length is short, the eye fixation duration slightly long, and the frequency of eye fixation is greater in comparison with easy text or text that consists of Japanese KANA and KANJI characters (Osaka, 1987, 1992).

The characteristics in reading scrolling text have been also studied in many researches. Sekey and Tietz (1982) revealed that reading scrolling text took three times longer, 96 words per a minute, than reading still text, 278 words per a minute. Chujyo (1993) revealed that the scrolling speed, which the participants liked most, increased as the size of scrolling window increased, but that the scrolling speed was stable when the size of the window was 5 characters or more and the stable speed was 190 msec per character. Shina (2004) revealed the different results from Chujyo by using a different scrolling method. His method was that the text was moved pixel by pixel while Chujyo’s method was that the text was moved character by character. Shina’s results were that the scrolling speed quickly increased with the window size up to 5 characters and gradually increased from 5 up to 15 characters. The speed in 7-15 characters was 150 msec per character.

However the characteristics of the disabled reading text have rarely been studied except in low vision disabilities (Ahn and Legge, 1995). The characteristics of cerebral palsy (CP) patients reading text have also rarely been studied. This study
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