A Study on the Eye Movement of Mongolian Bilinguals in Chinese Reading

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Abstract. In this study, the Mongolian college students were selected as the subjects, and the internal discourse of the Mongolian college students in Chinese reading was discussed. This paper chooses the Chinese text style as the expository and prose. The study found that the Mongolian bilinguals were not significantly different in reading the expository and prose, but the processing of the expository was faster than the prose. The conclusion is that the expository is clear and easy to understand for Mongolian bilinguals. The prose for Mongolian bilinguals is more difficult to grasp the article center when reading. Therefore, the reading level of Chinese prose is lower than expository.

Introduction
A bilingual person refers to a person who is proficient in applying two languages. In his daily life, he can use a foreign language and native language to be used for listening, speaking, reading and writing. With the expansion of social interaction and language communication, bilingual people become common. The study of bilingual people not only can promote the construction of language cognitive processing model, but also can provide some theoretical basis for the teaching of second language in realistic situation, so the study of bilingual people has good social value. Eye movement technology, also known as eye movement recording technology or eye tracking technology, refers to the use of eye movement recorder to record the visual information in dealing with eye trajectory characteristics, commonly used for attention, visual perception, reading and other areas of research.

The use of eye movement technology to solve the bilingual language awareness has a unique advantage, you can examine the reader in the reading of the eye movement mode and reading characteristics. For example, the study of eye movement characteristics of Chinese reading, is conducive to improving the mother tongue is not Chinese people's Chinese reading level, and can also provide some reference for the preparation and typesetting of Chinese teaching materials. At present, the domestic eye movement research of bilinguals reading Chinese mainly focused on foreign students and minority students reading Chinese two aspects. At Eye movement technology research these two aspects, can be very intuitive to show the reader's eye movement mode, but also to promote language teaching and artificial intelligence development. In this study, Mongolian bilinguals (Mongolian native speakers) were selected as subjects, and eye movement techniques were used to record the eye movements of Mongolian bilinguals in reading Chinese text of different styles. This paper examines the characteristics of Mongolian bilinguals in reading Chinese characters, and can provide some reference for Chinese language teaching of Mongolian native speakers.
The Research Method

Subjects

Selected nine Mongolian students whose mother tongue is Mongolian and Chinese Mandarin level is more than Test 2. There were 5 boys and 4 girls. Their naked or corrected visual acuity of 1.0 or more, no color blindness and weak symptoms, no obstacles to read.

Experimental Instrument

The Hi-speed high-precision eye movement used in this experiment was produced by SMI Germany. The sampling rate of the instrument is 1250 Hz, that is, 1250 times per second speed record the eye movement data when the subjects read the text, which ensures a higher accuracy. The eye tracker consists of an iView PC test computer and a Stimulus PC image display computer. The iView PC test computer controls the entire experiment, and the Stimulus PC image display computer is as a material presentation screen.

Experimental Design

This experiment uses a single factor design. The experimental material is three articles of different styles, one of which is the preparation of materials for the practice. The two articles are formal experimental materials. These two articles are expository and prose.

Experimental Materials

Two formal experimental articles have not been exposed to the subjects. Two articles were evaluated by modern Chinese teachers, and the difficulty was close to the equivalent. Each article structure is complete, and the number of words in the control between 550-600 (including punctuation). The time of presentation of the experimental material is not limited, and the subjects' reading ends are judged according to the eye movement track of the subjects. This is closer to the actual reading situation.

Eye Movement Indexes

1. Reading time (sec): the time it takes to read the article. The two papers used in this study vary in the number of words, so use the reading time of hundred words as a reading time indicators ( The reading time of hundred words = reading time / the total number of words * 100 ).
2. Reading speed (word / sec): number of words read per unit of time ( reading speed = reading words / reading time ).
3. Fixation count (times / hundred words): the number of fixes when reading an article. The two papers used in the study have different numbers of words, so use the word as a survey indicator ( hundred times = total number of reading points / total number of words * 100 ).
4. Fixation duration times (sec): average for each fixation point
5. Fixation frequency (count / sec): the fixation point of subjects in the unit time ( fixation frequency = fixation point / Fixation duration times ).
6. Saccade amplitude ( degree ): reflecting the reading efficiency, processing difficulty and reading awareness of the breadth of the indicators.

A Comparative Study of the Expository and Prose

Reading Time

The reading time of Mongolian bilinguals read the expository and prose for paired samples T test, the results shows in Table 3.
Table 3. Reading Time.

<table>
<thead>
<tr>
<th></th>
<th>Chinese expository</th>
<th>Chinese prose</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N average value</td>
<td>standard deviation</td>
<td>N average value</td>
<td>standard deviation</td>
</tr>
<tr>
<td>Reading time (sec)</td>
<td>9 20.101 4.403</td>
<td>-1.597 0.149</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the results of the data analysis, we can see that in the reading time of different styles, the average reading time of Chinese expository is 20.101 seconds and prose is 21.740 seconds. The average reading time used in expository is shorter than prose, but the difference is not significant (p > 0.05). It can be concluded that Mongolian college students are more familiar with Chinese text. They accept Chinese education from an early age, so there is no significant difference in the reading time of Chinese different styles. The reading time of the narrative is shorter than the prose, indicating that the prose has a certain degree of difficulty for Mongolian bilinguals, but this difficulty is relative.

Reading Speed

The reading speed of Mongolian bilinguals read the expository and prose for paired samples T test, the results shows in Table 4.

Table 4. Reading Speed.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N average value</td>
<td>standard deviation</td>
<td>N average value</td>
<td>standard deviation</td>
</tr>
<tr>
<td>Reading speed (word / sec)</td>
<td>9 5.181 1.111</td>
<td>1.782 0.113</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the results of the analysis of variance, we can see that the average reading speed of expository is 5.181 words per second, and the average reading speed of prose is 4.699 words per second. At the speed of reading, expository is faster than prose, which is proportional to reading time, but the difference is not significant (p > 0.05). It shows that the influence of Chinese style on the reading speed of Mongolian college students is not significant. It is also clear from the experimental data that the reading time and reading speed of the Mongolian college students are larger than those of the prose, which means that the expository is simpler and easier to understand than prose.

Fixation Count

The fixation Count can reflect how the subject is processing the text. The fixation count of Mongolian bilinguals read the expository and prose for paired samples T test, the results shows in Table 5.

Table 5. Fixation Count.

<table>
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<tbody>
<tr>
<td></td>
<td>N average value</td>
<td>standard deviation</td>
<td>N average value</td>
<td>standard deviation</td>
</tr>
<tr>
<td>Fixation count (times / hundred words)</td>
<td>9 52.698 5.769</td>
<td>-0.578 0.579</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis of the table can be learned that the average fixation count of the expository is 52.698 times/word, prose is 54.164 times/word, the fixation count of the expository is less than prose. However, there was no significant difference in Chinese reading for Mongolian bilinguals (p > 0.05). For Mongolian bilinguals, Mongolian is their mother tongue, and Chinese is their second language. But they accept Chinese education from an early age, and there is no significant difference in the cognitive processing of different Chinese text texts.
Fixation Duration Times

The fixation duration times can reflect the length and mode of the subject's processing time. The fixation duration times of Mongolian bilinguals read the expository and prose for paired samples T test, the results shows in Table 6.

<table>
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</thead>
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<tr>
<td></td>
<td>N</td>
<td>average value</td>
<td>standard deviation</td>
<td>N</td>
</tr>
<tr>
<td>Fixation duration times (sec)</td>
<td>9</td>
<td>0.337</td>
<td>0.038</td>
<td>9</td>
</tr>
</tbody>
</table>

From the results of the above analysis, we can see that the fixation duration times of the expository is 0.337 seconds and the prose is 0.363 seconds. The duration of the fixation of expository is less than prose, but the difference is not significant (p > 0.05). It is also clear from the data analysis that Mongolian bilinguals have short processing time for Chinese expository, but there is no significant difference with Chinese prose.

Fixation Frequency

The fixation frequency can reflect the processing speed of the subject's visual information. High rate of attention shows that the subjects can get more information in the same time, that is, the information processed in the unit time, indicating that the information processing efficiency of the subjects is relatively high. While the low frequency of attention shows that the subjects in the unit time to obtain less information, indicating that the subjects of information processing efficiency is relatively low. The fixation frequency of Mongolian bilinguals read the expository and prose for paired samples T test, the results shows in Table 7.

<table>
<thead>
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</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>average value</td>
<td>standard deviation</td>
<td>N</td>
</tr>
<tr>
<td>Fixation frequency (count / sec)</td>
<td>9</td>
<td>2.689</td>
<td>0.310</td>
<td>9</td>
</tr>
</tbody>
</table>

Analysis of the data on the table that the average fixation frequency of the expository is 2.689 times/sec, the prose is 2.550 times/sec. The fixation frequency of the expository is greater than the prose. It is shown that Mongolian college students can obtain more information when reading the expository in the same time, and the processing efficiency is higher than prose, but the difference is not significant (p > 0.05). From the analysis of the results can be seen that for the Mongolian bilinguals that expository is easier than prose.

Saccade Amplitude

Saccade amplitude is an indicator of reading efficiency, processing difficulty and reading consciousness. The saccade amplitude of Mongolian bilinguals read the expository and prose for paired samples T test, the results shows in Table 8.
From the above table data analysis can be learned that the saccade amplitude of expository is 2.744 degrees, prose is 2.783 degrees. It shows that the Mongolian bilinguals are more difficult to read expository than the prose, but the difference between the two is not significant (\(p> 0.05\)).

**Table 8. Saccade Amplitude**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>average value</td>
<td>standard deviation</td>
<td>N</td>
</tr>
<tr>
<td>Saccade amplitude (degree)</td>
<td>9</td>
<td>2.744</td>
<td>0.619</td>
<td>9</td>
</tr>
</tbody>
</table>

The **Research Method**

Yang Wenqin and Li Rongbao have found that there is a second language competition in the process of mother tongue processing in Chinese English learners, but its implementation is subject to conditional constraints. The study strongly argues that bilingual competition is prevalent in bilingual learning. Bilinguals can use two languages equally in their daily lives, but the ability of their mother tongue is stronger than the second language in the deep processing mechanism of the brain. Comparing the reading of different Chinese styles, whether the Mongolian and Chinese bilinguals have different eye movements. Mongolian bilinguals are Mongolian native speakers and Chinese is a second language. They are very familiar with Chinese language, but they are more flexible in their mother tongue than the use of language.

The results show that there is no significant difference between the Mongolian bilinguals in the reading of expository and prose, but the processing of the expository is faster than the prose, indicating that the expository is easier to understand than the prose. Compared with the expository and prose, the expository emphasizes the theory and logic, and the topic of the article is clear. The prose for Mongolian bilinguals is more difficult to grasp the article center when reading. Therefore, the reading level of Chinese prose is lower than expository.

**Acknowledgement**

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**References**


