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Generation of Predictive Inference during L2 Reading: Effects of Reading Purpose

Fuyumi WATANABE

1. Introduction

Predictive inferences are predictions about the likely outcome of a described event. For example, "the ship sank" could be a predictive inference made after reading that "the ship ran into an iceberg." Predictive inferences are generated by connecting explicit text information with background knowledge. Previous studies indicated that the generation of predictive inferences eases the processing of incoming sentences (e.g., van den Broek, 1990).

Many researchers have revealed that readers often make predictive inferences automatically during their first language (L1) reading (Allbritton, 2004; Calvo, Castillo, & Schmalhofer, 2006; Calvo, Castillo, & Estevez, 1999; Magliano, Trabasso, & Graesser, 1999). On the other hand, some researchers have not found such evidence (Bloom, Fletchre, van den Broek, Reitz, & Shapiro, 1990; McKoon & Ratcliff, 1986, 1989).

In these studies, the generation of predictive inferences was investigated by measuring reading time. That is, it can be said that readers made predictive inferences when their reading time of highly predictable targets was shorter than that for targets of low predictability. Calvo, Castillo, and Estevez reported that English native speakers read highly predictable targets (e.g., The woman prayed) faster than targets of low predictability (e.g., The woman wrote), after reading prior contexts (e.g., The woman went into the church, spoke with the priest for a few minutes, and afterwards she knelt down in front of the altar), which encouraged them to make predictive inferences, and, from that result, they concluded that their participants had generated predictive inferences.

Many studies have begun to explore factors that may influence predictive inference making. Some of the factors that have been examined are (a) individual differences in working memory capacity (Estevez & Calvo, 2000; Linderholm, 2002; Whitney, Ritchie, & Clark, 1991), (b) text characteristics such as the degree to which the inferences are constrained by context and whether the necessary information is foregrounded in the text (Calvo, 2000; Cook, Limber, & O'Brien,

2001; Klin, Guzman, & Levine, 1999; Murray, Klin, & Myers, 1993; Whitney, Ritchie, & Crane, 1992), (c) individual differences in personal relevance of the information, and (d) readers' purposes. Linderholm, for instance, showed that readers who had high-working memory capacity made predictive inferences, whereas readers with low-working memory capacity did not.

The inference generation is also influenced by reading purpose. Van den Broek, Lorch, Linderholm, and Gustafson (2001) examined the effect of readers' purposes and reported that readers made more predictive inferences when reading for "studying" than when reading for "entertainment" in L1 reading.

Whereas many studies have examined factors which affect predictive inference making in L1 reading, there are very limited data that inform us about predictive inference making in second language (L2) reading. In particular, the effect of reading purpose has not been investigated sufficiently. Horiba (2000) investigated the effects of reading purpose on L2 reading processes and did not find any influences on predictive inference making. However, in her experiment she adopted the think-aloud method, which asked participants to report what they were thinking. It is generally believed that predictive inferences are generated automatically (unconsciously); therefore, it seems very difficult to investigate using such a method.

Given the lack of empirical data, the present study attempted to explore whether or not the purpose affects the generation of predictive inferences during L2 reading by measuring reading time. If the effects were revealed, it would contribute to clarifying the mechanisms of the predictive inference generation in L2 reading and give some hints to finding the best way to teach effective reading in L2.

2. Method

2.1 Participants

Forty-eight Japanese learners participated in this study. All participants were undergraduate students at a Chinese university, majoring in Japanese and had passed the first level of the Japanese Proficiency Test.

2.2 Material

The text used in the study was a Japanese essay in a newspaper article about Moscow. It was 560 letters in length and described the author's experiences of receiving wrong number phone calls frequently in Moscow.

Before the experiment, a preliminary study was administered to identify highly predictable targets and targets of low predictability. Two native speakers of Japanese read sentences one at a time, and every time they had finished reading one sentence, they were told to predict what the next sentence would be and write the sentence. The sentences were identified as highly predictable if both native speakers could predict successfully. On the other hand, targets of low predictability were the sentences which neither of them could predict. In the result, six highly predictable targets and seven targets of low predictability were identified. The following examples were part of the text used in this research.

1. *ロシアの間違い電話の多さは異常だ。*
   Strangely many people dial wrong numbers in Moscow.
2. *「今日こそゆっくり寝るぞ」と布団にもぐりこんだ日に限って*
   When I get into bed, thinking "I will sleep in today",
3. *早朝から間違い電話に泣かされる。*
   I often receive wrong number phone calls early in the morning.

In these examples, they could predict the content of sentence 3 after they had finished reading sentence 2. Therefore, sentence 3 was identified as a highly predictable target. On the other hand, sentence 2 was a target of low predictability because no one could predict it after reading sentence 1.

As stated above, generation of predictive inferences was investigated by comparing reading time. It can be said that predictive inferences occurred when the highly predictable targets were read faster than the targets of low predictability.

2.3 Procedure

Participants were randomly assigned to either a Specific Purpose group or a General Purpose group, seated facing a computer screen and tested individually. In the Specific Purpose group, the participants read the text to answer one question shown before reading, whereas the participants in the General Purpose group read the text just for understanding. Specifically, one multiple choice question was shown to the participants in the Specific Purpose condition before reading and they were told "after reading, you will answer this question, so please read the text to answer correctly". Therefore, the participants in this group would read the text to answer that question. On the other hand, the participants in the General Purpose condition were told "after reading, you will answer the questions about

the text you have read". Therefore, in this condition, they knew neither the question form nor the number of questions.

Before reading, the reading span test and a word translation task were administered. In the word translation task, the participants were asked to translate Japanese words which appeared in the text into Chinese. This task was administered to identify words they did not know, because these influence their cognitive process and reading time. After the instructions were given, all the participants read the text at their own pace. The text was presented on the computer screen sentence by sentence. However, some long sentences were divided into two parts and each part was presented separately. The participants were asked to read the sentences or the parts of the sentences one by one and press the button on the button box placed in front of them as quickly as possible every time they finished reading. After they pressed the button, the next sentence or the next part was presented automatically and the reading time of each sentence or part was recorded on the computer.

After reading, all the participants answered the same questions about the text on the paper. There were seven true or false questions. The comprehension questions were administered to confirm they had not pressed the button without reading the sentence. The multiple choice question shown before reading to the participants in the Specific Purpose condition was used only to give them the specific purpose, and not included in the comprehension questions.

3. Results

3.1 Working Memory Capacity

In the previous research, it was suggested that working memory capacity influenced the generation of predictive inferences. Therefore, prior to the reading session, a reading span test was conducted.

The reading span of the participants in both groups was calculated. A *t*-test showed that the difference in reading span between the Specific Purpose group (M＝2.0, SD＝0.49) and the General Purpose group (M＝2.1, SD＝0.38) was not significant, $t(46)$＝ 1.175, p＝.25. Therefore, it may be possible to consider that working memory capacity did not affect the generation of predictive inferences in this study.

3.2 Word Translation Task

Table 1 shows the mean number of unknown words of each group, and Table

Table 1. Mean number of unknown words for each group

	M	*SD*
Specific Purpose	8.30	2.12
General Purpose	7.91	2.02

Table 2. Mean number of unknown words for each condition

	Predictability			
	High		Low	
	M	*SD*	*M*	*SD*
Specific Purpose	0.41	0.63	0.17	1.91
General Purpose	0.38	0.59	0.19	1.83

2 shows the mean number of unknown words for each condition. A *t*-test was administered and revealed that there was no significant difference between the two groups, $t\,(46)=1.175$, $p=.25$, or the two conditions, $t\,(46)=1.117$, $p=.20$.

3.3 Comprehension Questions

The percentage of correct answers in the comprehension questions for each participant was calculated to confirm that they had not pressed the button without reading. As a result, the percentages of each participant were higher than at least 85％; therefore, it can be said that they had indeed read the sentences.

3.4 Reading Time

This is the main analysis of this study. Figure 1 shows the mean reading time in each condition. A 2 (group) × 2 (predictability) ANOVA was applied to reading time. As stated above, in this study it will be considered that predictive inferences occurred when the highly predictable targets were read faster than the targets of low predictability.

There was a significant interaction between these two factors, $F(1, 46)=4.25$, $p<.05$. The participants in the Specific Purpose group read the highly predictable targets significantly faster than the targets of low predictability. On the other hand, in the General Purpose group, the difference in the mean reading time between both conditions was not significant. These results suggest that whether or not learners had a specific purpose influenced their generation of predictive inferences.

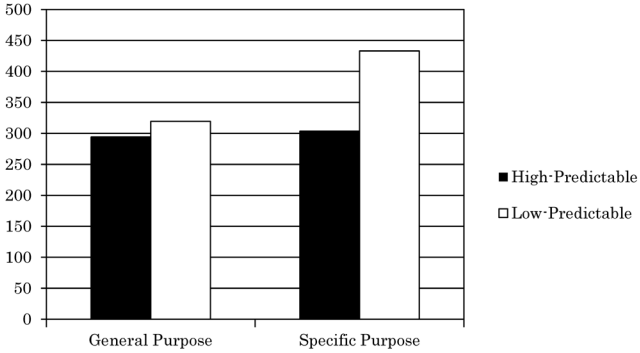

Figure 1. Mean reading time (ms/letter)

4. Discussion

The present research examined the influences of reading purpose on predictive inference generation in L2 reading by measuring reading time. In the experiment, readers in the Specific Purpose group read the highly predictable targets faster than the targets of low predictability, whereas readers in the General Purpose group did not. The results revealed that reading purpose influenced readers' inferential processing. That is, giving a Specific Purpose encouraged readers to make predictive inferences in L2 reading.

Previous studies have revealed that inference generation differs depending on the readers' purpose in L1 reading (e.g., Narvaez et al.1999; van den Broek et al. 2001); however, it is not clear whether the purpose also influences predictive inference making in L2 reading. By employing reading time as the measure, the present study added evidence that the purpose also affected the inferential processes in L2 reading.

The previous research indicated that in L2 reading, readers tended to allocate their cognitive resources to the lower-level processes, such as recognition of words. In this study, according to the results of the word translation tasks, the text included almost eight unknown words. Moreover, the L2 reading spans of the participants of this study were relatively low. Some studies have pointed out that working memory capacity influences inference making. Considering these facts, it was expected that the readers of this study would be likely to pay attention to the meanings of unknown words, thus the resources for the higher-level processes, such as inference generation, would be lacking. These expectations seemed to be

true in the General Purpose condition. Readers in this group appeared to allocate their cognitive resources to the low-level processes, thus they could not make predictive inferences. In contrast, the participants in the Specific Purpose condition generated predictive inferences, which is one of the higher-level processes. This seems to indicate that having the specific purpose changed the allocation of cognitive resources. Participants with the specific purpose seemed to pay less attention to word meaning; as a result, it became possible to distribute more resources to higher-level processes.

There are two limitations to the present research. The first limitation concerns the material. In this study, the text included almost eight unknown words. It is known that the number of unknown words included in texts influences the process of reading. Therefore, the study could not determine whether the effect of the purpose appeared or not when the participants read more difficult texts. Future research is necessary to examine the effects of purposes when using texts which differ in difficulty. The second limitation concerns the proficiency level of the readers. All the participants in this study were advanced-level students. Processing of the text will vary according to proficiency level. It seems to be necessary to collect data on readers of different levels.

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Appendix

Appendix A: Material

値上げ待つ心は

ロシアの間違い電話の多さは異常だ。「今日こそゆっくり寝るぞ」と布団に潜り込んだ日に限って、早朝から間違い電話に泣かされる。「あなた間違ってますよ」というロシア語だけが妙に流ちょうになった。なぜこんなに多いのか。電話局の答えはこうだ。ロシアでは今もダイヤル式の電話が多い。とくに高齢の人が間違う。指が太いので穴にうまくひっかからないかボールペンを穴に突っ込んで回すからダイヤルが十分に回りきらなかったりする…。ちょっと待ってくれ。間違い電話の主が高齢者だったためしはない。背景音から携帯であることが明白なケースもある。ならばと今度は間違い電話の主に尋ねる。「何番にお掛けでしたか」「×-××です」正しい。「どこからこの番号を？」「電話案内で聞いた」案内の間違いだけではないだろう。ある電話会社は交換機に異常が発生することをしぶしぶ認めた。なぜロシア人はこんなにも間違い電話に寛容なのか。ソ連時代。電話設置も行列で、モスクワなら十数年、地方なら一生待たされたという。間違い電話であれ、それは自由の満喫でもあるのだろうか。もう一つ。市内電話はいくら使おうが基本料金だけで済む。経済観念が必要ないことも、間違い電話への不感症を誘発しているに違いない。来春には料金に時間制が導入される。少しでも間違いが減れば、とすがる思いだ。(2000 年 4 月 22 日「特派員メモ」朝日新聞掲載)

Appendix B: Multiple choice question

問題　筆者は、ロシアの間違い電話の多さは、次のどれと関係があると考えていますか。

一つ選んで○をつけてください。

① 高齢者　　③ ダイヤル式の電話

② 市内電話の料金　　④ 指の太さ