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JAPANESE UNIVERSITY STUDENTS' BEHAVIOR WHEN READING ENGLISH: A QUESTIONNAIRE SURVEY AND FACTOR ANALYSIS

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ABSTRACT

This paper reports on a specific cognitive behavior often found when trying to understand a text not written in readers' native language. Our research group conducted a questionnaire survey to examine Japanese readers' cognitive behavior and awareness when reading English texts. We also conducted a factor analysis on this questionnaire to identify the behaviors often found when reading English. Participants were 56 Japanese students studying engineering at Chuo University. After reading the texts, a questionnaire consisting of 43 items was applied to the participants. We used exploratory factor analysis to identify the primary factors related to readers' cognitive behavior and awareness when reading a non-native language. As a result of the analysis, mainly based on the highest contributing factors, it was suggested that readers may have made substitutions into Japanese, their own words, when reading the English texts. In other words, when reading a non-native language, the reader may read the texts by replacing them with their native language rather than comprehending it in that language. Based on the results of our experiment, it is expected that the research on the cognitive supporting systems may help readers to understand non-native languages quickly and smoothly.

Keywords: validating factor analysis, exploratory factor analysis, non-native language, second language, L2

1   INTRODUCTION

This study examines cognitive behavior and attitudes during English reading comprehension to identify what Japanese students are doing and aware of when reading English as a non-native language. Characters and sentence structure are very different between Japanese and English. Due to the difference, almost all Japanese university students learn English as a second language (L2). However, they rarely use it daily, and few are proficient in reading English. So it is necessary to clarify how Japanese readers understand English texts. Furthermore, Japanese university students' cognitive behavior and attitudes when reading English texts have not been investigated. In contrast, the cognitive behavior and attitudes of Japanese university students when reading explanatory texts in Japanese have already been studied.

Our research group used a questionnaire survey and exploratory factor analysis to analyze cognitive behavior and attitudes when reading English. Inuzuka (2002) already utilized these methods. Therefore, we also adopted his research procedures in this study. Inuzuka (2002) clarified the factors comprising reading comprehension strategies through factor analysis of the results from a questionnaire on behavior and awareness while reading Japanese explanatory documents. Results of the questionnaire were classified into seven categories and summarized into three factors: *partial comprehension strategies*, *content learning strategies*, and *comprehension deepening strategies*.

We also referred to the following studies: Hsiao & Oxford (2002) and Yüksel & Yüksel (2012).

Hsiao & Oxford (2002) systematically reviewed the classification of L2 learning strategies and theories concerning their application. They conducted a confirmatory factor analysis of the data collected from 517 college learners who learned English as a foreign language. They revealed that Oxford's six-factor reading strategies and classification were the most consistent with learners' strategy use. The six factors used in this study were *memory*, *cognitive*, *compensation*, *metacognitive*, *affective*, and *social*.

Yüksel & Yüksel (2012) studied academic reading strategies among Turkish university students. Their study focused on the students' metacognitive awareness of three strategies used in academic reading: *global reading strategies*, *problem-solving strategies*, and *support strategies*. Their results showed that the participants usually used these strategies and were often aware of them.

2   METHOD

2.1   Participants

A questionnaire survey was conducted with 56 undergraduate and graduate students aged 20 to 29. The 56 participants included 39 males and 17 females, and no one was excluded from the analysis.

2.2 Procedure

This study chose the questionnaire reported in Inuzuka (2002) because it was written in Japanese. In addition, it was selected because Inuzuka assumed an explanatory document. The questionnaire contained 43 items concerning cognitive behavior and attitudes while reading English, rated on a 5-point scale, with 1 = *applicable* and 5 = *not applicable*. Table 1 displays the questionnaire item details.

Table 1. Questionnaire reading strategy items

1	Write down the important parts
2	Write comments and a summary of the content
3	Read with a paragraph-by-paragraph summary in mind
4	Read with a clear understanding of what is meant
5	Read while anticipating what is written next
6	Read while thinking about the important parts
7	Read with a concrete image in mind
8	Read while thinking about the text structure
9	Underline important text
10	Read by comparing the text with what you already know
11	Read while thinking about what each sentence simply means
12	Try to remember important words
13	Think about the title
14	Look for unfamiliar letters and words when reading
15	Repeat reading where you don't understand the meaning or where it is difficult to understand what is meant
16	Read while thinking about what kind of questions a teacher would ask
17	Skim the whole book quickly to get a general idea of the meaning, and then re-read it
18	Write a paragraph-by-paragraph summary
19	Read slowly through the parts you don't understand
20	Restate difficult phrases in your own words
21	Distinguish between what is important and what is not while reading
22	Take periodic breaks to recall what you have read
23	Adjust your reading speed based on how difficult the material is
24	Ask yourself questions to check how much you know
25	If you don't understand something, think about where the meaning became unclear to you and start reading again
26	Think about whether the content is correct while reading
27	If you don't understand something after reading it once, re-read it and try to understand it again
28	Concentrate on reading
29	When you find an unknown word, skip it and continue reading
30	After reading, ask yourself questions to check how much you understand

31	Read difficult sentences while rephrasing them in your own words
32	Think of specific situations to help you remember new words
33	Read while trying to connect what you are reading with what you already know
34	Memorize difficult words and content without understanding them
35	Draw simple tables and diagrams to summarize the content
36	Read while thinking about the meaning of each paragraph
37	Reading while thinking about where the words correspond to each other
38	Reading while paying attention to conjunctions (words like "but," "and," "that is," etc.)
39	Read with concrete examples
40	Read repeatedly to memorize
41	Try to memorize important sentences without thinking about them
42	Predicting the whole picture from the context
43	Trying to read quickly

3   RESULT

We conducted an exploratory factor analysis and clarified what the respondents' cognitive behavior and awareness when reading English texts. First, the number of factors was determined by parallel analysis using a screen plot, a graph of the eigenvalues of factors (Figure 1).
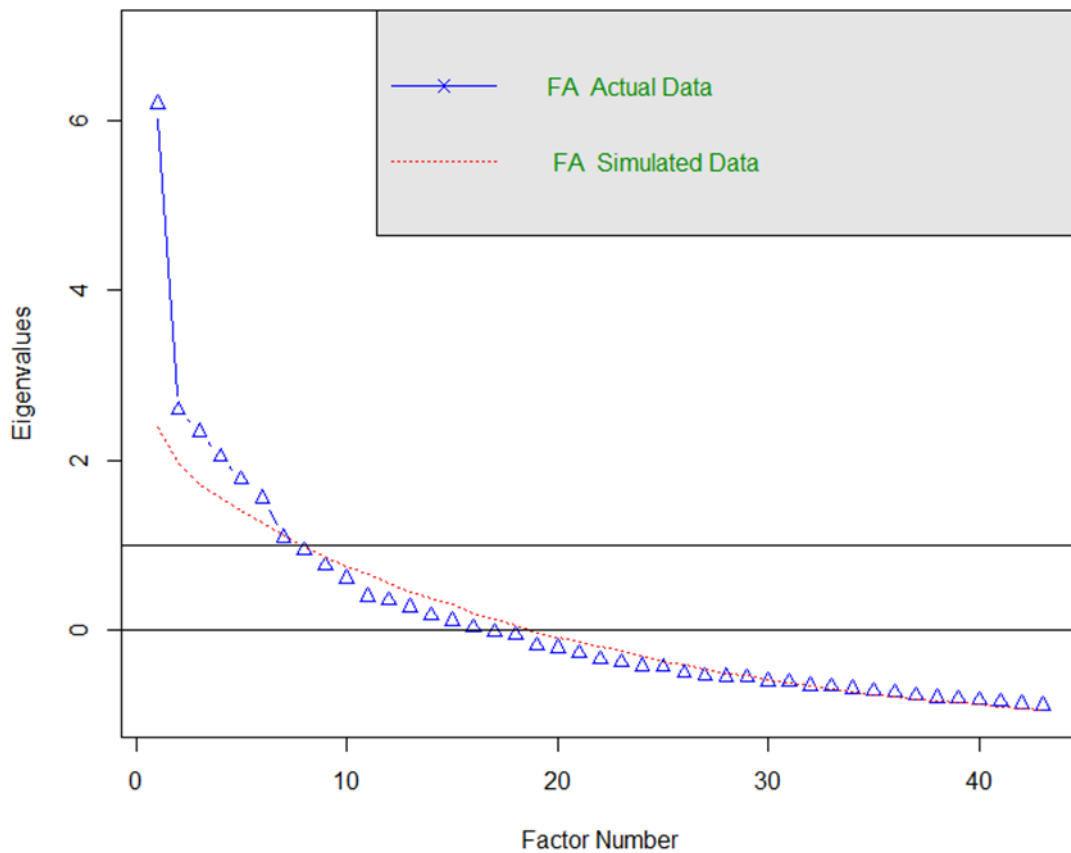

Figure 1. Graph of a screen plot

From the screen plot shown above, the number of selected factors is 6, which is larger than the eigenvalues of the randomly generated data.

The factor structure is represented in Figure 2, and the results of the factor loadings are summarized in Table 2.
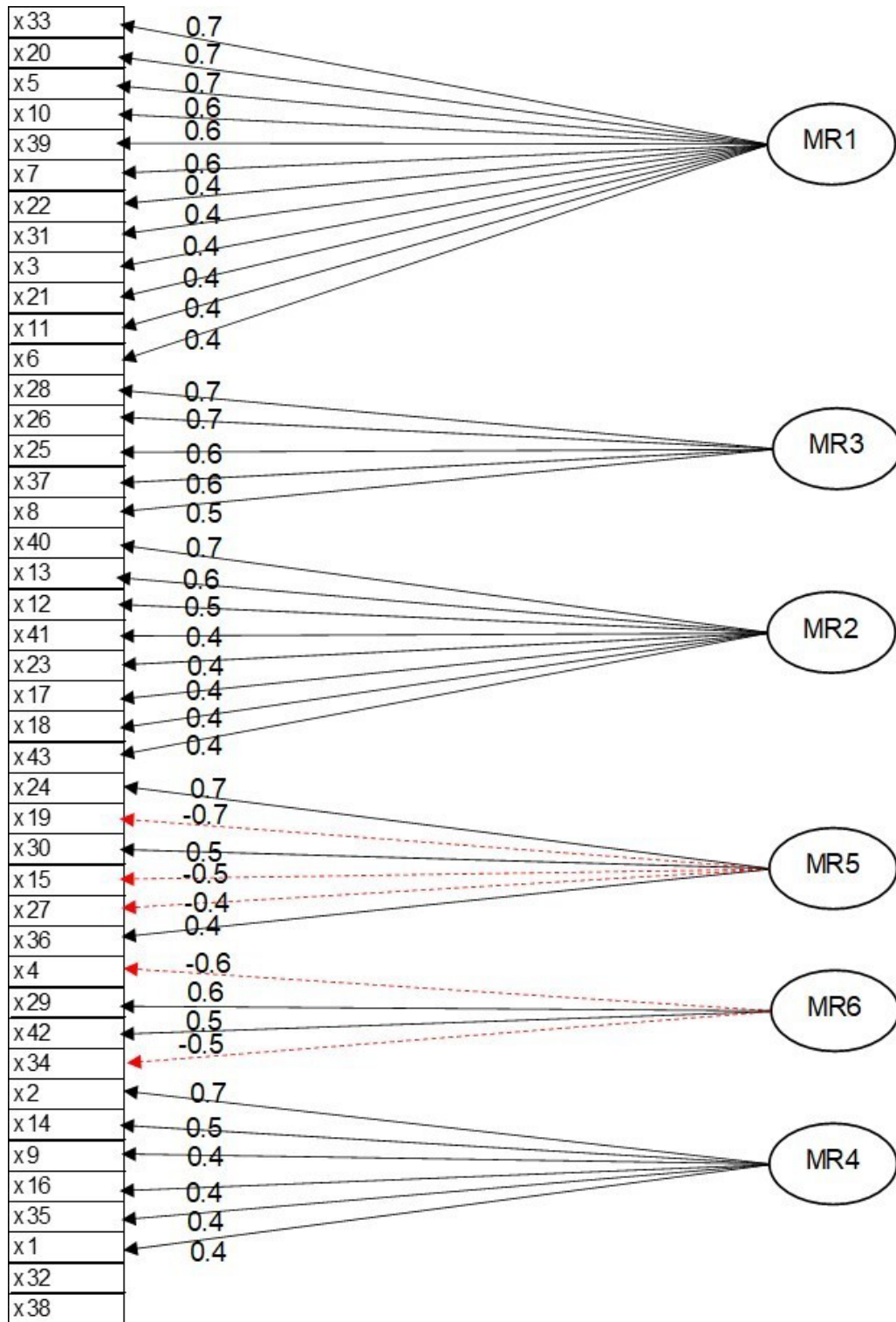

Figure 2. Factor analysis

Table 2. Factor loading

Factor	Questionnaire Item Number	MR1	MR3	MR2	MR5	MR6	MR4
MR1	x33	0.69		-0.13	0.11		0.22
	x20	0.68				-0.2	
	x5	0.67	-0.1			0.22	-0.22
	x10	0.6	0.16			-0.18	
	x39	0.6	-0.15				
	x7	0.58		0.23		0.15	-0.31
	x22	0.43					0.24
	x31	0.41	0.1	-0.11	0.11	0.22	
	x3	0.39	-0.15	0.17	0.28		-0.14
	x11	0.37	0.21		-0.11	0.33	
	x21	0.37	0.28			0.25	
	x6	0.36	0.22	0.11		0.12	-0.13
MR3	x28		0.72		0.13		
	x26		0.67				
	x25	0.3	0.56		-0.28	-0.37	
	x37	0.14	0.56	-0.17		0.35	0.27
	x8		0.54	0.3			-0.22
MR2	x40			0.75		-0.16	0.12
	x13		0.22	0.55		0.3	-0.12
	x12	-0.15	0.44	0.49			
	x41		-0.15	0.44		-0.15	
	x23		0.13	0.4	-0.17		-0.19
	x17		-0.13	0.39		0.29	0.35
	x18	0.1		0.36	0.35		-0.1
	x43	-0.17		0.35	0.32	0.29	

		MR1	MR3	MR2	MR5	MR6	MR4
MR5	x24	0.22	0.23		0.72	-0.12	
	x30	0.2	0.25	0.17	0.55		0.21
	x36		0.28		0.39	0.34	0.15
	x27		0.17	0.17	-0.44		0.24
	x15		0.12		-0.51		0.39
	x19		0.17	0.13	-0.68		
MR6	x29					0.59	
	x42	0.11	0.33			0.52	-0.32
	x34			0.32	0.2	-0.49	-0.31
	x4	-0.13	0.41			-0.59	
MR4	x2				0.14		0.69
	x14	0.29		0.22	-0.12	-0.1	0.49
	x9			0.41		0.33	0.41
	x16	0.31	-0.14	0.35		-0.1	0.39
	x35	0.37			0.21		0.38
	x1	-0.21			0.38	0.18	0.38
Non-assigned	x38	0.12			0.23	0.28	
Non-assigned	x32	0.26		0.2	-0.12	0.19	

Table 3 also shows that the factor contribution for this experiment was 41%. Finally, each factor is compared with Inuzuka's factors. Figure 3 examines the factors reported by Inuzuka (2002): (A) *grasping the gist*, (B) *paying attention to structure*, (C) *clarifying meaning*, (D) *utilizing existing knowledge*, (E) *memory*, (F) *monitoring*, (G) *control*.

Table 3. Factor contribution

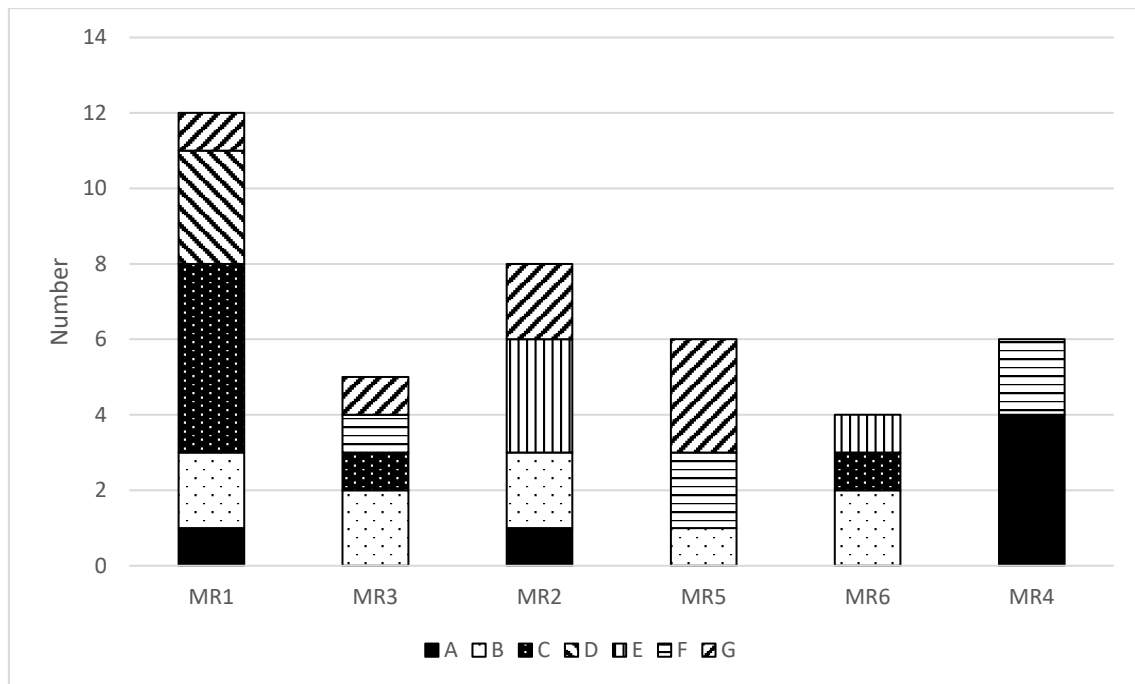|	MR1	MR3	MR2	MR5	MR6	MR4
SS loadings	4.11	3.05	2.73	2.74	2.6	2.46
Proportion Var	0.1	0.07	0.06	0.06	0.06	0.06
Cumulative Var	0.1	0.17	0.23	0.29	0.35	0.41

Figure 3. Breakdown of each factor

4   DISCUSSION

4.1   MR1

MR1 includes "putting words and sentences in the text into your own words" (clarifying meaning) and "using one's knowledge" (utilizing existing knowledge). In other words, the students read English while relating what is read to their terms and understanding.

4.2   MR3

While MR3 includes paying attention to structure, that is, to "read with attention to structure," it also contains items to check whether the user "understands the content." In other words, the participants are monitoring whether they know the text by focusing on the structure of the text.

4.3   MR2

MR2 includes memory for "important words and sentences in the text." The items related to the title summary and paragraphs indicate that the participants are trying to understand the text outline by focusing on the essential parts.

4.4   MR5

MR5 contains many metacognitive factors, such as monitoring and control. However, we found that the factor loadings for monitoring were positively correlated. In contrast, the loadings for control were negatively correlated. The idea is to keep reading without stopping on the parts that are not understood.

4.5   MR6

The factor loadings for "Read with a clear understanding of what is meant" were negative, while those for "Predicting the whole picture from the context" were positive. In other words,

the participants understand sentences, not in detail but try to understand a total image in the context structure.

4.6   MR4

MR4 contains the highest number of factors reported in Inuzuka (2002). These elements relate to grasping the main points. This factor may emphasize the importance of getting the gist. Inuzuka (2002) suggested that the factor of grasping the gist had the highest contribution rate. However, in the present study, its contribution rate was low. Japanese students seem to place more emphasis on word comprehension when reading English texts.

5   CONCLUSION

In the exploratory factor analysis, we considered each factor with the number of factors set at 6. MR1, the factor with the highest contribution rate, suggested the possibility that the participants read while substituting Japanese for English when comprehending English sentences. Contrarily, grasping the gist, which had the highest contribution rate in the Inuzuka's study, was low at 0.06 in the present study.

Although the present paper omits the details of another study on validated factor analysis using the survey by Inuzuka (2002), Figure 3 shows a part of the comparison with Inuzuka's study. The comparison results suggest that Inuzuka's model does not fit well with the present one. This discrepancy in the models may result from differences in the reading strategy used for Japanese and English documents. For proper validated factor analysis, it would be desirable to use Japanese explanatory texts and increase the number of Japanese participants tenfold.

The following are possible strategies for our near future research:
1.   The number of participants should be increased.
2.   We must verify whether the model proposed in this study is more accurate than previous ones.
3.   We must estimate the reader's state from eye movements during text reading.

We have the above plans to deeply clarify the reader's cognitive behavior and awareness during reading comprehension by studying the relationship between eye movements and the reader's state of comprehension. Furthermore, we believe such a study will contribute to developing the cognitive supporting systems that help readers to understand non-native languages quickly and smoothly. Through these studies, it is strongly expected to develop supporting technologies that will enable readers to continue reading texts easily.

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