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Generation of Local and Global Bridging Inferences in L2 Reading Comprehension

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Abstract

In second language (L2) reading comprehension, a bridging inference fills the gaps between sentences and establishes coherence in the text. The present study examined the online generation of local and global bridging inferences from two perspectives: the allocation of cognitive resources and the co-occurrence of bridging inferences with other reading processes. Forty-four Japanese learners of English as a foreign language (EFL) engaged in a think-aloud task while reading narrative or expository texts, and the collected verbal protocols were then categorized into 11 categories. The result of the allocation of cognitive resources showed the effect of L2 reading proficiency between text types. Also, the overall results of co-occurrence implied that proficient EFL readers used more processes simultaneously in understanding information than the less proficient readers did. Further analyses revealed that Japanese EFL readers generated local bridging inferences using processes that were partly similar to those of native readers, though not as well-established. On the other hand, global bridging inferences co-occurred with several processes, which made it hard to generalize the results and determine the different roles of the two types of bridging inferences in L2 reading comprehension. The limitations of the study and future research direction are also discussed in the conclusion.

Keywords: reading, bridging inference, think-aloud task, allocation of cognitive resources

Introduction

Reading comprehension in a second language (L2) involves complex underlying processes that are activated during reading (Grabe & Stoller, 2002). A number of studies have investigated the extent to which these processes contribute to L2 reading performance (e.g., Harrington & Sawyer, 1992; Nassaji, 2003; Qian, 2002; Shiotsu & Weir, 2007). The present study is interested in the inferential process, which is one of the higher-level processes. According to van den Broek (1994), an inference refers to "information that is activated during reading yet not explicitly stated in the text" (p. 556). Over the past decades, there have been a considerable number of studies on inferences; these studies have recognized the important role of inferences in first language (L1) reading comprehension (e.g., Graesser, Singer, & Trabasso, 1994; Schmalhofer, McDaniel, & Keefe, 2002; van Dijk & Kintsch, 1983). However, compared to the inferential research that has been conducted on L1, relatively little attention has been given to L2 reading. One of the reasons is that researchers have been more interested in the lower-level processes, such as word recognition, syntactic analysis, and meaning construction, which are fundamental to L2 reading comprehension. Because of the complex interaction between many factors under a dual-language system (i.e., L1 and L2) (Bernhardt, 2000), more careful examination is needed to clarify the inferential process in L2 and how this interacts with other processes.

Background

Although many types of inferences have been proposed in previous research (e.g., Graesser et al., 1994; van den Broek, Fletcher, & Risden, 1993; van Dijk & Kintsch, 1983), the present study focuses on the bridging inference, which is needed to connect the focal statement (the statement that is currently being read) with previous text and establish coherence of comprehension. For example, when reading the sentences "The spy quickly threw his report in the fire. The ashes floated up the chimney" (Singer, 1994, p. 488), readers generate the following inferred proposition: "The report burned to ashes." In L1 reading comprehension research, it is well known that bridging inferences are essential to construct a coherent mental representation and readers actually fill in the gaps between sentences by generating these inferences (Duffy, Shinjo, & Myers, 1990; Keenan, Baillet, & Brown, 1984; Myers, Shinjo, & Duffy, 1987).

Some L2 studies have also shown that since learners need to devote more cognitive resources than native language readers to lower-level processes such as word recognition, syntactic analysis, and meaning construction, their inference generation is inhibited compared to that of native readers (e.g., Horiba, 1996, 2000; Stevenson, Schoonen, & de Glopper, 2007). Moreover, the results of these studies have shown that this process is influenced by many factors, such as L2 readers' proficiency, text type, reading purpose, and task. Focusing on bridging inference generation, a few studies have suggested that L2 readers are likely to generate bridging inferences during reading but that these are still influenced by L2 proficiency level (e.g., Shimizu, 2009).

However, most of the previous studies in this area have targeted local bridging inferences, which are based on a focal statement and one or two preceding sentences. In a few other cases, the bridging inference has not been clearly defined in terms of the distance between sentences in a text. According to McKoon and Ratcliff (1992), information that "is no farther apart in the text than one or two sentences" (p. 441) is easily available in the working memory (WM); however, if the distance between a focal statement and the previous text is farther away than two sentences, readers need to reactivate previously processed information. Given these cognitive conditions, recent studies have begun to subcategorize bridging inferences as local or global, terms that reflect the coherence of a text (e.g., Diakidoy, Mouskounti, & Ioannides, 2011; Ozuru, Briner, Best, & McNamara, 2010). For example, Morishima (2013) is one of the few L2 studies to have investigated the construction of mental representations while controlling evidently local and global coherence conditions. He showed that Japanese EFL readers constructed the local coherence of a text similar to native language readers but were unable to construct its global coherence. However, because most inference research has rarely distinguished between local and global bridging inferences, the difference between these two types of inferences and the reason why EFL readers fail in global coherence construction have not been clarified.

Thus, the main goal of the present study is to examine the online process of generating bridging inferences, focusing on the difference between the local and global types. Because the author is especially interested in how these bridging inferences are generated during L2 reading and how they interact with other reading processes, the present study investigates these questions from two perspectives: the allocation of cognitive resources and co-occurrence of processing. Since studies have already examined L2 readers' online reading process from the first perspective (e.g., Horiba, 1996, 2000), it would be useful to compare their results with those of this study to examine the difference between local and global bridging inferences. The allocation of cognitive resources is measured by collecting verbal protocols during reading (i.e., a think-aloud task) and categorizing them into reading processes (e.g., word recognition, paraphrasing, inference generation, and comprehension monitoring). The proportion of each reading process to the total serves as the index of how much of a reader's cognitive resources are allocated. However, this approach is unable to show how a reader uses multiple reading processes to understand some information at some point (i.e., the co-occurrence of processing). Because reading is incremental, we need to clarify both the overall allocation of cognitive resources and the momentary combination of processes during reading. Since a bridging inference connects the information currently being processed to what had been previously processed, it is assumed that a reader needs to understand the meaning of the premised statements and fill the gap between them. Furthermore, in the event that the premises are far away from each other, s/he needs to reactivate the statement that had been processed earlier. As a result, some differences between local and global bridging inferences would be elicited.

Thus, using the co-occurrence of processing and allocation of cognitive resources, we can examine what processes occur during reading and understand more precisely how EFL readers generate bridging inferences. Finally, two research questions were formulated based on the goal of the present study:

RQ1: Does the allocation of cognitive resources to local and global bridging inferences change according to text type and L2 reading proficiency?

RQ2: What reading processes co-occur when bridging inferences are generated? Further, is there a difference in co-occurrence between local and global bridging inferences?

Method

Participants

There were 44 paid participants (30 males and 14 females), all of whom were Japanese undergraduates majoring in engineering, international studies, social sciences, etc. Two participants were excluded from the analysis: one had studied in the US for more than a year, while the other hardly made utterances in a think-aloud task.

Materials

L2 reading proficiency test. The TOEFL-PBT Practice Test (ETS, 2002) was used to measure the participants' general English reading proficiency. A regular TOEFL-PBT test has

50 multiple-choice questions that must be answered in 55 minutes; however, for the sake of ecological validity, this study used 30 questions that had to be completed in 35 minutes.

Reading materials. Four short passages were used—two narratives and two expository texts. The narratives were taken from *100 free short English stories for ESL learners* (http://www.rong-chang.com/qa2/) and the expository texts, from Eiken Grade Pre-2nd (STEP, 2008). The lengths of the four passages were adjusted, and words and phrases that were not familiar to the participants were modified. Thus, the number of words and idea units (IUs), and their readability (calculated by the Flesch Reading Ease [FRE]) were almost equal: Narrative Text A: 291 words, 51 IUs, FRE 68.4 and Text B: 297 words, 61 IUs, FRE 66.6; Expository Text C: 295 words, 51 IUs, FRE 56.1 and Text D: 296 words, 49 IUs, FRE 58.7.

Procedure

Four tasks were conducted one-on-one in a quiet room: (a) the TOEFL, (b) reading and think-aloud, (c) a summary, and (d) a questionnaire.

First, the participants completed the reading section of the TOEFL-PBT within 35 minutes. After a short break, they did the reading and think-aloud task. The participants were randomly assigned to either a narrative or expository group; that is, half of them read two narratives and the other half, two expository texts. The order of presentation of the two texts was changed from participant to participant.

Each reading passage was presented to the participant one sentence at a time on a computer screen using Microsoft Office PowerPoint 2003. They were asked to read each sentence and report what they were thinking about it (i.e., a think-aloud task). They could read the sentences at their own pace by pressing the space key. When a new sentence was presented, the old sentences stayed on the computer screen so that the participants could refer to them whenever they liked. Since the participants were likely unfamiliar with a think-aloud task, the examiner explained how to perform it, demonstrated sample think-aloud protocols with a short prerecorded passage, and then asked if they had any questions about the procedure. Afterwards, the participants practiced thinking aloud with a short practice passage. All protocols were recorded with an IC recorder (OLYMPUS Voice Trek V-72).

After the reading and think-aloud period, the participants were asked to write a summary of the passage they had just read—a maximum of 150 Japanese characters (their L1)—to ensure a reading goal. They were instructed to do the summary without reference to the passage. Finally, the participants completed simple questionnaires about such things as their period of stay in a foreign country and whether they had read a story similar to the one used in the present study. The total duration of the experiment was about 90 minutes.

Scoring and Coding

Think-aloud protocols. Although many researchers have used a think-aloud task with several coding systems (e.g., Tang, 1997; Trabasso & Magliano, 1996; Whitney, Ritchie, & Clark, 1991; Zwaan & Brown, 1996), the present study applied the coding systems of Horiba (1996) and McNamara (2004). Horiba's 10-category[1] coding system was adopted to examine how native and nonnative readers allocated their cognitive resources during reading. Since some of Horiba's participants were L2 readers (Japanese as a foreign language [JFL] readers), her coding system was suitable for the present study in that it included a variety of lower-level processes that were said to receive much attention in L2 reading. However, two categories, *graphomorphemic/graphophonemic analysis* and *general knowledge and associations*, were excluded because the participants and focus of the present study were different (i.e., JFL readers vs. EFL readers and overall inferences vs. bridging inferences, respectively).

McNamara's (2004) seven-category[2] coding system investigated which two strategy pairs were likely to co-occur in reading comprehension and showed that bridging inferences were more likely to occur with rereading and paraphrasing. Furthermore, in research that followed, she and her colleagues modified the system by dividing the bridging inference category into two: local and global bridging (Ozuru et al., 2010). Thus, this coding system was favorable to this study in that it emphasized the process of generating bridging inferences during reading.

As stated in the Background section, McKoon and Ratcliff (1992) predicted that local inferences would be established from text information activated in WM. Thus, the current study defined local bridging inference as an inference that is generated based on one or two preceding sentences and global bridging inference, as an inference that is based on previous text that is farther away than two sentences. The coding system presented in Table 1 was then constructed; it has 11 categories: *rereading* (RR), *word recognition* (WR), *syntactic analysis* (SA), *paraphrasing* (PP), *local bridging* (LB), *global bridging* (GB), *elaborating* (E), *predictive inference* (PI), *comments on text structure* (TS), *comprehension monitoring* (CM), and *others* (O). Three categories (WR, SA, and PP) are lower-level processes and six categories (LB, GB, E, PI, TS, and CM), higher-level. The remaining two categories (RR and O) are not included in either classification because the former is a strategy that supports lower-level processing (Stevenson et al., 2007) and the latter contains the comments that were not listed under any of the 10 categories, such as the reactions to a think-aloud task. The definitions and examples of each category are detailed in Table 1.

[1] (1) graphomorphemic/graphophonemic analysis, (2) word recognition, (3) syntactic/semantic analysis of a sentence, (4) backward inference, (5) elaborative inference, (6) predictive inference, (7) general knowledge and associations, (8) comments on text structure, (9) comments on own behavior, and (10) other comments.

[2] (1) rereading the sentence, (2) paraphrasing the sentence, (3) bridging to previous text, (4) elaborating the text with prior knowledge, (5) using logic or common sense to elaborate the text, (6) making predictions about what the text will say next, and (7) comprehension monitoring.

Table 1
Definitions of Each Category in Think-Aloud Protocols and Their Examples

	Category	Definition	Examples
1	Rereading (RR)	To read previous sentences again	—
2	Word recognition (WR)	To analyze the meaning of a word or phrase	The word "booked" may mean "make a reservation."
3	Syntactic analysis (SA)	To analyze the syntactic features of an idea unit or sentence	"*Who*" is used as a relative pronoun in this sentence.
4	Paraphrasing (PP)	Translating the text or restating it in different words	—
5	Local bridging (LB)	An inference that is based on one or two preceding sentences	*They stood there*...where is *there*? I think it is at the front desk.
6	Global bridging (GB)	An inference that is based on previous text that is farther away than one or two sentences	I understand that the hotel that Miller suggested to the couple was the hospital.
7	Elaboration (E)	Using prior knowledge or experiences to understand the sentence (i.e., domain-specific knowledge-based inferences)	The couple must be sticklers for cleanliness!
8	Predictive inference (PI)	Predicting what the text will say next	Maybe Miller will drive the couple to the new hotel.
9	Comments on text structure (TS)	The informational structure of the text or the role of the information in the text	I think this sentence is the punch line of the story.
10	Comprehension monitoring (CM)	Being aware of understanding	I see. / I don't think I understand.
11	Others (O)	Comments on other things, such as the task or the text context	I move on to the next sentence. / I have the same opinion as Miller.

Note. The examples of think-aloud protocols were translated from Japanese to English by the author. All of the examples listed here were included in the think-aloud protocols when reading one of the narrative texts.

Table 2
A Sample of the Think-Aloud Protocols Produced

IU	Text	Comments	Coding
1	Miller was the manager of Paradise Hotel.	Well, Miller, Miller was...yes, *was* is the past tense. So, this may be an old story. Well, he was Paradise Hotel's manager. That is, he was *keieisha* of Paradise Hotel.	SA TS PP WR
2 3	He was proud of his job / and always treated guests graciously.	*Proud* means *hokori ni omotteita* and *always treated guests graciously*. What is *graciously*? I don't understand the word but I'll move on to the next sentence.	WR WR CM, O
4 5 6	One day, a couple / from Texas / had booked a room for eight nights.	This sentence has a participle construction. It means that the couple came from Texas and they made a reservation for eight days. I think they planned to stay here for a long period.	SA PP E
7 8 9 10 11	On the very first day, / the couple brought all the sheets, pillowcases, and bedspreads / down to the main lobby / and just dropped them / next to the front desk.	On their first day, well...I see the sentence structure. *The couple brought all the sheets, pillowcases, and bedspreads down to the main lobby*...OK, they were in the lobby. *Brought* is the past tense of "bring." Then, they put all the sheets, pillowcases, and bedspreads next to the front desk.	CM PP RR, SA PP, LB

Note. The slash (/) indicates the division of IUs. The comments were translated from Japanese to English by the author.

The participants' think-aloud protocols were transcribed by two paid volunteers. They listened to the voice sounds and typed the protocols. Each verbal protocol was divided into IUs, and each IU was classified under one of the 11 categories. Two raters, including the examiner, independently rated 30% of the think-aloud protocols. The inter-rater agreement rate was 82.38%. All disagreements about scoring were resolved through discussion. Afterwards, the remaining 70% were scored by the examiner on the basis of the scoring criteria established in the two raters' discussion. Table 2 illustrates a sample of the think-aloud protocols that were produced from one of the narratives.

Data Analyses

L2 reading proficiency test. To check the reliability of the TOEFL test, the Cronbach's alpha of the test and item discrimination indexes were calculated. Then, a two-way analysis of variance (ANOVA) was run, with L2 reading proficiency (2: Upper, Lower) and text type (2: Narrative, Expository) as between-subject factors, to verify whether there was a significant difference between the two proficiency groups and no significant difference between text types in the scores.

Think-aloud protocols. To examine the allocation of cognitive resources to the levels of processing, a repeated three-way ANOVA was used, with L2 reading proficiency (2: Upper, Lower) and text type (2: Narrative, Expository) as between-subject factors, and the level of processing (2: Lower-level, Higher-level) as a within-subject factor. Then, to clarify the differences between text types and L2 proficiency groups in more detail, a Mann-Whitney *U* test was conducted on each category.

In addition, the frequency with which the two strategies co-occurred in think-aloud protocols was calculated. Take the sample of think-aloud protocols in Table 2. When the participant read IU1 ("*Miller was the manager of Paradise Hotel.*"), he reported four categories of comments: (a) SA – "*was* is the past tense"; (b) TS – "this may be an old story"; (c) PP – "Well, he was Paradise Hotel's manager"; and (d) WR – "he was *keieisha* of Paradise Hotel. In this case, it was considered that in IU1, six pairs of strategies co-occurred: SA-TS, SA-PP, SA-WR, TS-PP, TS-WR, and PP-WR. On the other hand, when reading IU2 ("*He was proud of his job*"), the participant simply reported the meaning of the word *proud* ("*Proud* means *hokori ni omotteita*"), which was categorized as WR. Thus, in IU2, the WR did not co-occur with any other strategies.

Following McNamara (2004), a 2 × 2 cross tabulation was constructed for each strategy pair to depict four kinds of frequency: two strategies simultaneously occurred in a particular IU (i.e., Strategy A and Strategy B co-occurred); neither strategy occurred at all (i.e., neither Strategy A nor Strategy B occurred); one strategy occurred, but the other did not (i.e., Strategy A occurred but not Strategy B); and vice versa (i.e., Strategy B occurred but not Strategy A). Lastly, 2 × 2 chi-square tests (χ^2) of independence for all strategy pairs were conducted for each L2 proficiency group.

Results

L2 Reading Proficiency Test

Since the initial 30 items of the TOEFL-PBT Practice Test showed low reliability (α = .61), the 10 lowest discrimination items were eliminated, resulting in moderate reliability (α = .71). The scores of the 20 items were the basis in dividing the participants into two L2 reading proficiency groups: Upper and Lower. Table 3 shows the descriptive statistics of the TOEFL test; the score of the Upper group was about 1.5 times as high as that of the Lower group.

Table 3
Descriptive Statistics for the Reading Section in the TOEFL Practice Test

	Expository			Narrative		
	n	*M*	*SD*	*n*	*M*	*SD*
Lower	9	11.00	1.73	12	9.92	2.54
Upper	12	15.42	1.38	9	16.11	1.45
Total	21	13.52	2.69	21	12.57	3.78

Note. Full marks = 20.

The result of a two-way ANOVA showed a significant main effect of proficiency, F (1, 38) = 82.90, p = .000, η_p^2 = .69, but no interaction between proficiency and text type, and no main effect of the text type; Proficiency x Text Type: F (1, 38) = 2.33, p = .135, η_p^2 = .06 and Text Type: F (1, 38) = .11, p = .740, η_p^2 = .00, respectively. These results confirmed that the scores of the Upper group were statistically higher than those of the Lower group. Moreover, it was hypothesized that the participants who read the narrative and expository texts had equal L2 reading proficiency.

Think-Aloud Protocols

Allocation of cognitive resources. To examine how participants assigned their cognitive resources to lower- and higher-level processing during reading, the proportions of these two processes were calculated. Table 4 shows the descriptive statistics for the percentage of each category. It can be seen that both the Lower and Upper proficiency groups devoted most of their cognitive resources to lower-level processing (above 70%); the percentage for higher-level processing was below 30%.

A three-way ANOVA showed a significant three-way interaction between Proficiency, Text Type, and Processing Level, F (1, 38) = 4.87, p = .033, η_p^2 = .11; a significant two-way interaction between Processing Level and Text Type, F (1, 38) = 8.44, p = .006, η_p^2 = .18; and a significant main effect of Processing Level, F (1, 38) = 346.07, p = .000, η_p^2 = .90. However, none of the other interactions and main effects were statistically significant.

To examine the three-way interaction in more detail, firstly, further analyses by text type were conducted. In regard to the expository texts, both the Lower and Upper groups devoted their cognitive resources to lower-level processing: Lower, t (8) = 15.92, p = .000; Upper, t (11) = 11.23, p = .000. However, the Lower group tended to allocate more cognitive resources to lower-level processing than the Upper group did, t (19) = 1.87, p = .077, and the Upper group

Table 4

Descriptive Statistics for the Percentage of Each Category in Think-Aloud Protocols

	Expository				Narrative			
	Lower (*n* = 9)		Upper (*n* = 12)		Lower (*n* = 12)		Upper (*n* = 9)	
Category	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lower-Level Processes	83.49	9.22	72.41	15.78	68.32	13.03	74.44	10.97
WR	5.78	6.42	6.31	4.15	7.99	5.23	6.44	5.57
SA	1.09	1.55	1.19	1.55	0.92	2.10	1.18	2.09
PP	76.63	13.21	64.91	16.03	59.40	13.78	66.82	14.83
Higher-Level Processes	12.49	4.89	17.11	4.11	27.34	9.87	23.24	9.14
LB	4.23	2.48	6.92	2.64	7.54	3.93	6.35	2.68
GB	1.42	1.09	2.03	1.27	3.37	2.57	4.00	2.20
E	2.86	2.09	2.84	2.53	2.67	2.19	3.60	2.99
PI	0.00	0.00	0.19	0.46	0.15	0.52	0.73	1.27
TS	0.11	0.33	0.25	0.69	0.70	0.87	0.99	1.20
CM	3.86	3.92	4.89	3.60	12.90	6.32	7.57	2.83
Others (O)	4.02	6.21	10.48	15.53	4.35	4.77	2.32	2.46

Note. A category, *Rereading*, was not included because it was regarded as one of the strategies that aids lower-level processing.

allocated significantly more cognitive resources to higher-level processing than the Lower group did, t (19) = -2.35, p = .030. This tendency was not observed in the narrative texts, showing that both groups simply devoted their cognitive resources to lower-level processing in narrative reading, F (1, 19) = 93.88, p = .000, η_p^2 = .83.

Next, analyses by proficiency group were run. As a result, in the Upper group, only the main effect of Processing Level was significant, F (1, 19) = 172.75, p = .000, η_p^2 = .90, and there was no significant interaction between Processing Level and Text Type, F (1, 19) = .26, p = .618. This means that the allotment of cognitive resources to lower- and higher-level processing did not vary between text types in the Upper group. On the other hand, in the Lower group, the interaction between Processing Level and Text Type was significant, F (1, 19) = 12.47, p = .002, η_p^2 = .40, and there was also a main effect of Processing Level, F (1, 19) = 173.50, p = .000, η_p^2 = .90. Specifically, like the Upper group, the Lower group devoted more cognitive resources to lower-level processing than to higher-level processing: Narrative: t (11) = 6.28, p = .000 and Expository: t (8) = 15.92, p = .000. However, Lower group members were more likely to assign their resources to lower-level processing when reading expository texts, t (19) = 2.97, p = .008, than when reading narrative texts.

To clarify what types of categories were changed according to the readers' proficiency and text type, more detailed analyses were conducted on each category. The percentages of each category that were produced in think-aloud protocols are indicated in Table 4. It was clear that learners were likely to engage in paraphrasing (about 65%) when reading a text. Since normality was not assumed, Mann-Whitney's *U* tests were employed.

Firstly, the differences between proficiency groups were examined for each text type. The results of the Mann-Whitney's U tests showed that in expository text, the percentage of LB in the Upper group (6.92%) was significantly higher than in the Lower group (4.23%), $U = 25.00$, $p = .041$. However, no significant differences were found for the remaining nine categories. In narrative texts, although the percentage of CM in the Lower group (12.90%) was significantly higher than in the Upper group (7.57%), $U = 23.00$, $p = .028$, no significant differences were found in the remaining nine categories.

Next, the differences between text types were examined in each proficiency group. The percentage of GB in the narrative texts (4.00%) of the Upper group was significantly higher than in the expository texts (2.03%), $U = 24.00$, $p = .034$; however, no significant differences were found in the remaining nine categories. For the Lower group, the percentage of PP in the expository texts (76.63%) was significantly higher than that in the narrative texts (59.40%), whereas the proportions of LB, GB, and CM in expository texts (4.23%, 1.42%, and 3.86%, respectively) were significantly lower than those in the narrative texts (7.54%, 3.37%, and 12.90%, respectively). These results suggested that in expository reading, less proficient readers were likely to devote their cognitive resources to semantic analysis (i.e., paraphrasing) and less likely to devote them to higher-level processing.

Co-occurrence of two strategies during reading comprehension. The numbers of think-aloud protocols in which two strategies co-occurred are summarized in Table 5 for the narrative texts and Table 6, for the expository texts. The bottom half of the matrix represents the number of co-occurrences of the strategy pairs for the Upper group, while the top half represents the number for the Lower group. In each of these cells, the chi-square value is shown for the test of independence ($df = 1$). The number preceding the parentheses is the observed co-occurrences of the two strategies, and the number in parentheses is the expected co-occurrence under the chi-square assumption of independence. When the observed value is significantly higher than the expected value, the occurrence of the two strategies is not statistically independent; meaning, the two strategies have a greater than average chance of co-occurring in readers' think-aloud protocols (representing squares in Tables 5 and 6).

For example, let us consider the WR-RR strategy pair in the Lower group in Table 5. In this case, the observed value was 24, which was significantly higher than the expected value 13.3, χ^2 (1) = 10.99, $p < .001$. Thus, the occurrence of these two strategies was not statistically independent, meaning that these were likely to co-occur in the think-aloud protocols of readers with lower proficiency. As for the WR-RR pair in the Upper group, the observed value was 6, which was not significantly higher than the expected value 3.2, χ^2 (1) = 2.62, $p > .05$. Thus, these two strategies occurred independently.

Because the results were complicated, the author first reports the overall results, then moves on to the results that are related to bridging inference generation, the focus of the present study.

Table 5

Strategy Co-Occurrence of Narrative Reading Within Think-Aloud Protocols

Strategy	RR	WR	SA	PP	LB	GB	E	PI	TS	CM	O
Rereading	-	χ^2 = 10.99**	χ^2 = 15.42**	χ^2 = 39.35**	χ^2 = .78	χ^2 = .24	χ^2 = .17	χ^2 = .33	χ^2 = .18	χ^2 = 31.69**	χ^2 = .05
		24 (13.3)	6 (1.5)	73 (102.0)	10 (12.9)	5 (6.1)	4 (4.8)	0 (.3)	1 (1.5)	41 (19.3)	8 (8.6)
Word Recognition	χ^2 = 2.62	-	χ^2 = .20	χ^2 = .04	χ^2 = .44	χ^2 = .87	χ^2 = .81	χ^2 = 1.85	χ^2 = 1.66	χ^2 = 23.53**	χ^2 = .27
	6 (3.2)		2 (1.5)	103 (102.0)	15 (12.9)	4 (6.1)	3 (4.8)	1 (.3)	0 (1.5)	38 (19.3)	10 (8.6)
Syntactic Analysis	χ^2 = .44	χ^2 = 13.73**	-	χ^2 = 4.64*	χ^2 = .16	χ^2 = .73	χ^2 = .39	χ^2 = .03	χ^2 = .17	χ^2 = 1.81	χ^2 = 1.18
	2 (1.3)	6 (1.6)		8 (11.5)	1 (1.5)	0 (.7)	1 (.5)	0 (0)	0 (.2)	4 (2.2)	2 (1.0)
Paraphrasing	χ^2 = 22.42**	χ^2 = 1.79	χ^2 = 4.61*	-	χ^2 = 7.18*	χ^2 = .56	χ^2 = .04	χ^2 = .91	χ^2 = .86	χ^2 = 131.56**	χ^2 = 5.25*
	34 (46.0)	60 (56.3)	26 (22.2)		112 (99.7)	50 (47.6)	37 (37.6)	3 (2.3)	10 (11.5)	87 (149.6)	58 (66.7)
Local Bridging	χ^2 = .10	χ^2 = 3.67	χ^2 = .14	χ^2 = 2.88	-	χ^2 = .77	χ^2 = 2.58	χ^2 = 1.93	χ^2 = 33.10**	χ^2 = 2.23	χ^2 = .94
	6 (5.3)	2 (6.5)	2 (2.6)	98 (92.1)		8 (6.0)	8 (4.7)	1 (.3)	8 (1.5)	12 (18.9)	11 (8.4)
Global Bridging	χ^2 = 6.78*	χ^2 = 4.20*	χ^2 = 8.32*	χ^2 = .11	χ^2 = .56	-	χ^2 = 6.73*	χ^2 = .15	χ^2 = 8.16*	χ^2 = 4.92*	χ^2 = 17.82**
	6 (2.3)	6 (2.8)	4 (1.1)	40 (39.2)	6 (4.5)		6 (2.3)	0 (.1)	3 (.7)	15 (9.0)	12 (4.0)
Elaborations	χ^2 = .54	χ^2 = 1.18	χ^2 = 4.14*	χ^2 = 8.75*	χ^2 = .41	χ^2 = .61	-	χ^2 = .11	χ^2 = .57	χ^2 = .00	χ^2 = .01
	2 (3.2)	6 (4.0)	4 (1.6)	48 (56.3)	8 (6.5)	4 (2.8)		0 (.1)	0 (.5)	7 (7.1)	3 (3.2)
Predictive Inferences	χ^2 = .73	χ^2 = 1.72	χ^2 = 8.71*	χ^2 = .00	χ^2 = .32	χ^2 = .62	χ^2 = 12.78**	-	χ^2 = .03	χ^2 = .51	χ^2 = .21
	0 (.7)	2 (.8)	2 (.3)	12 (11.9)	2 (1.4)	0 (.6)	4 (.8)		0 (0)	0 (.4)	0 (.2)
Text Structures	χ^2 = 1.05	χ^2 = 7.06*	χ^2 = 5.13*	χ^2 = 3.53	χ^2 = 20.90**	χ^2 = .89	χ^2 = .57	χ^2 = 12.32**	-	χ^2 = .75	χ^2 = .00
	0 (1.0)	4 (1.2)	2 (.5)	20 (17.0)	8 (2.0)	0 (.8)	2 (1.2)	2 (.3)		1 (2.2)	1 (1.0)
Comprehension Monitoring	χ^2 = .47	χ^2 = 76.63**	χ^2 = 14.43**	χ^2 = 20.80**	χ^2 = 7.41*	χ^2 = 4.55*	χ^2 = 1.36	χ^2 = 1.85	χ^2 = .65	-	χ^2 = 15.18**
	2 (3.1)	20 (3.8)	6 (1.5)	42 (54.6)	0 (6.3)	6 (2.7)	6 (3.8)	2 (.8)	2 (1.2)		25 (12.6)
Others	χ^2 = 9.02*	χ^2 = 5.94*	χ^2 = 10.46**	χ^2 = .00	χ^2 = 1.10	χ^2 = .07	χ^2 = 14.38**	χ^2 = .54	χ^2 = 2.35	χ^2 = 44.19**	-
	6 (2.0)	6 (2.4)	4 (.9)	34 (34.1)	2 (3.9)	2 (1.7)	8 (2.4)	0 (.5)	2 (.7)	12 (2.3)	

Note. * $p < .05$, ** $p < .001$. The bottom portion of the matrix represents the number of co-occurrences of the strategy pairs of the Upper group and the top portion, that of the Lower group. In each of these cells, the chi-square value is shown for the test of independence ($df = 1$). The number preceding the parentheses is the observed co-occurrence of the two strategies, while the number in parentheses is the expected co-occurrence.

Table 6

Strategy Co-Occurrence of Expository Reading Within Think-Aloud Protocols

Strategy	RR	WR	SA	PP	LB	GB	E	PI	TS	CM	O
Rereading	-	χ^2 = 6.24*	χ^2 = 6.59*	χ^2 = 3.59	χ^2 = 11.30**	χ^2 = 5.29*	χ^2 = .01	-	χ^2 = .03	χ^2 = 15.09**	χ^2 = .61
		5 (1.8)	2 (.4)	21 (24.3)	5 (1.3)	2 (.5)	1 (.9)		0 (.0)	5 (1.1)	2 (1.2)
Word Recognition	χ^2 = .88	-	χ^2 = .03	χ^2 = .32	χ^2 = 1.21	χ^2 = 1.05	χ^2 = .76	-	χ^2 = .07	χ^2 = 16.27**	χ^2 = .09
	4 (2.6)		1 (.8)	49 (50.4)	1 (2.7)	0 (1.0)	3 (1.9)		0 (.1)	8 (2.3)	2 (2.4)
Syntactic Analysis	χ^2 = 10.46**	χ^2 = 3.02	-	χ^2 = .06	χ^2 = 3.40	χ^2 = .22	χ^2 = .85	-	χ^2 = .02	χ^2 = .51	χ^2 = .39
	3 (.6)	3 (1.2)		11 (11.3)	2 (.6)	0 (.2)	1 (.4)		0 (.0)	1 (.5)	1 (.5)
Paraphrasing	χ^2 = .43	χ^2 = .55	χ^2 = 3.69	-	χ^2 = 2.70	χ^2 = .56	χ^2 = .01	-	χ^2 = .15	χ^2 = 54.19**	χ^2 = .00
	31 (29.3)	62 (59.3)	17 (13.5)		40 (36.5)	14 (13.0)	25 (25.2)		1 (.9)	16 (30.4)	33 (33.0)
Local Bridging	χ^2 = 9.40*	χ^2 = 1.66	χ^2 = 5.47*	χ^2 = 7.60*	-	χ^2 = .14	χ^2 = .10	-	χ^2 = .05	χ^2 = .27	χ^2 = 1.94
	8 (3.0)	9 (6.1)	4 (1.4)	80 (69.0)		1 (.7)	1 (1.4)		0 (.0)	1 (1.6)	0 (1.8)
Global Bridging	χ^2 = .01	χ^2 = .80	χ^2 = .44	χ^2 = 3.12	χ^2 = .38	-	χ^2 = .58	-	χ^2 = .02	χ^2 = .32	χ^2 = 3.13
	1 (.9)	3 (1.8)	0 (.4)	25 (21.0)	3 (2.1)		1 (.5)		0 (.0)	1 (.6)	2 (.6)
Elaborations	χ^2 = .63	χ^2 = 2.62	χ^2 = .57	χ^2 = .15	χ^2 = 1.25	χ^2 = .89	-	-	χ^2 = .03	χ^2 = 1.21	χ^2 = .53
	2 (1.2)	0 (2.4)	0 (.5)	28 (27.0)	1 (2.8)	0 (.8)			0 (.0)	0 (1.1)	2 (1.2)
Predictive Inferences	χ^2 = .10	χ^2 = .21	χ^2 = .05	χ^2 = 1.00	χ^2 = 2.80	χ^2 = 12.68**	χ^2 = .09	-	-	-	-
	0 (.1)	0 (.2)	0 (.0)	3 (2.3)	1 (.2)	1 (.1)	0 (.1)				
Text Structures	χ^2 = .14	χ^2 = 2.21	χ^2 = .06	χ^2 = .00	χ^2 = 1.70	χ^2 = .10	χ^2 = .12	χ^2 = .01	-	χ^2 = .04	χ^2 = .04
	0 (.1)	1 (.3)	0 (.1)	3 (3.0)	1 (.3)	0 (.1)	0 (.1)	0 (.0)		0 (.0)	0 (.0)
Comprehension Monitoring	χ^2 = 9.45*	χ^2 = 24.09**	χ^2 = 11.71**	χ^2 = 2.62	χ^2 = .07	χ^2 = 2.06	χ^2 = .36	χ^2 = .16	χ^2 = .21	-	χ^2 = 9.12*
	6 (1.9)	13 (3.9)	4 (.9)	39 (44.3)	4 (4.5)	3 (1.4)	1 (1.8)	0 (.1)	0 (.2)		5 (1.5)
Others	χ^2 = 6.69*	χ^2 = 1.56	χ^2 = .38	χ^2 = 16.74**	χ^2 = .01	χ^2 = 2.27	χ^2 = 29.45**	χ^2 = 2.99	χ^2 = .32	χ^2 = 2.90	-
	7 (2.9)	3 (5.8)	2 (1.3)	50 (66.0)	7 (6.7)	0 (2.1)	11 (2.6)	1 (.2)	0 (.3)	1 (4.3)	

Note. * $p < .05$, ** $p < .001$. Predictive inferences were not observed in the Lower group. The bottom portion of the matrix represents the number of co-occurrences of the strategy pairs of the Upper group and the top portion, that of the Lower group. In each of these cells, the chi-square value is shown for the test of independence ($df = 1$). The number preceding the parentheses is the observed co-occurrence of the two strategies, while the number in parentheses is the expected co-occurrence.

Overall results of co-occurrence. As Tables 5 and 6 show, in both the narrative and expository texts, two strategies were more likely to co-occur in the Upper group than in the Lower group. In other words, in the Upper group, 20 pairs of strategies co-occurred in the narrative texts and 10 pairs, in the expository texts; in the Lower group, 11 pairs co-occurred in the narrative texts and seven pairs, in the expository texts. These results implied that proficient readers understood information using more processes simultaneously than less proficient readers did.

Results of co-occurrence related to bridging inferences. Since many strategy pairs co-occurred, the results related to the main focus of the present study are reported.

Rereading. Rereading itself, one of the lower-level strategies, does not directly enhance reading comprehension, but it helps readers hold the previous information of a text in their WM. Thus, it is likely to occur with paraphrasing and bridging inferences (McNamara, 2004). In the present study, the Lower group reread some information for word recognition, syntactic analysis, and comprehension monitoring in both the narrative and expository texts: RR-WR χ^2 (1) = 10.99, p = .001, RR-SA χ^2 (1) = 15.42, p = .000, and RR-CM χ^2 (1) = 31.69, p = .000 in the narrative texts; and RR-WR χ^2 (1) = 6.24, p = .012, RR-SA χ^2 (1) = 6.59, p = .010, and RR-CM χ^2 (1) = 15.09, p = .000 in the expository texts. In addition, they reread when they generated local and global bridging in the expository texts: RR-LB χ^2 (1) = 11.30, p = .001 and RR-GB χ^2 (1) = 5.29, p = .021. In the Upper group, rereading strategy was employed in global bridging and others in the narrative texts: RR-GB χ^2 (1) = 6.78, p = .009 and RR-O χ^2 (1) = 9.02, p = .003; and in syntactic analysis, local bridging, comprehension monitoring, and others in the expository texts: RR-SA χ^2 (1) = 10.46, p = .001, RR-LB χ^2 (1) = 9.40, p = .002, RR-CM χ^2 (1) = 9.45, p = .002, and RR-O χ^2 (1) = 6.69, p = .010. These results confirmed that the participants used rereading when generating bridging inferences and processing lower-level language information, such as the meaning of textual information, or analyzing syntactic information.

In L1 reading comprehension, it is said that rereading functioned positively in that it helped readers hold the previously processed information in their WM. This enabled them to process the two premises simultaneously, which was essential in generating a bridging inference. However, the present study found that rereading contributed not only to the generation of a bridging inference, but also to lower-level processing. This result seemed to have both positive and negative aspects. A positive aspect was that rereading helped lower-level processing in EFL reading comprehension. Because language proficiency of most EFL readers was not yet sufficiently developed to process L2 information automatically, they could compensate for their inadequacy by looking back at the points that they felt were difficult. On the other hand, a negative aspect was that rereading would increase the attention given to lower-level processing and thereby possibly reduce the attention given to higher-level processing. Since the present study did not impose a limit on reading time, the participants could reread the text as many times as they liked. As a result, both lower- and higher-level processing occurred with rereading. If there had been a time limit, however, the participants would have used the rereading strategy for the lower-level processing more frequently because they depended heavily on it and could not devote their attention to higher-level inferential processing.

Paraphrasing. In the Lower group, paraphrasing co-occurred with local bridging inferences in the narrative passage, χ^2 (1) = 7.18, p = .007, but not in the expository text, χ^2 (1) = 2.70, p = .101. On the other hand, in the Upper group, paraphrasing co-occurred with syntactic analysis in the narrative passage, χ^2 (1) = 4.61, p = .032, and with local bridging inferences in the expository passage, χ^2 (1) =7.60, p = .006. These results implied that Japanese EFL readers were as likely to use paraphrasing concurrently with local bridging inferences as native readers do, but their co-occurrences were limited in that they were significant only in the Lower group's narrative reading and Upper group's expository reading.

Moreover, unlike local bridging inferences, global bridging inferences did not occur with paraphrasing, which showed different tendencies for the two kinds of bridging inferences.

Local and global bridging inferences. As shown in Tables 5 and 6, the results of bridging inferences were quite complicated. First, in the Lower group, local bridging inferences were likely to co-occur with paraphrasing in the narratives, χ^2 (1) = 7.18, p = .007, and with rereading in the expository texts, χ^2 (1) = 11.30, p = .001. In the Upper group, local bridging inferences co-occurred with text structure in the narrative texts, χ^2 (1) = 20.90, p = .000, and with rereading, syntactic analysis, and paraphrasing in the expository texts: LB-RR χ^2 (1) = 9.40, p = .002; LB-SA χ^2 (1) = 5.47, p = .019; and LB-PP χ^2 (1) = 7.60, p = .006, respectively.

Second, global bridging inferences in the Lower group were likely to co-occur with elaboration, text structure, comprehension monitoring, and others in the narrative texts: GB-E χ^2 (1) = 6.73, p = .009; GB-TS χ^2 (1) = 8.16, p = .004; GB-CM χ^2 (1) = 4.92, p = .027; and GB-O χ^2 (1) = 17.82, p = .000, respectively; and with rereading in the expository texts, χ^2 (1) = 5.29, p = .021. In the Upper group, global bridging inferences were likely to co-occur with rereading, word recognition, syntactic analysis, and comprehension monitoring in the narrative texts: GB-RR χ^2 (1) = 6.78, p = .009; GB-WR χ^2 (1) = 4.20, p = .040; GB-SA χ^2 (1) = 8.32, p = .004; and GB-CM χ^2 (1) = 4.55, p = .033, respectively; and with prediction in the expository texts, χ^2 (1) = 12.68, p = .000.

Consequently, like native readers, the EFL readers in the present study generated local bridging inferences while paraphrasing text information and rereading previous sentences. On the other hand, this tendency was not clearly observed in global bridging inferences, which co-occurred with several processes. Although it was difficult to generalize the results of global bridging inferences, they were likely to co-occur with higher-level processes such as comprehension monitoring, elaboration, and prediction; and lower-level processes such as word recognition and syntactic analysis.

Discussion and Conclusion

The present study divided bridging inferences into two subcategories, local and global, and examined the online process of generating bridging inferences using a think-aloud method. Two RQs were tested from two perspectives: the allocation of cognitive resources and the co-occurrence of processes.

RQ1 was addressed by examining the allocation of cognitive resources. The results showed that both proficient and less proficient readers devoted more cognitive resources to lower-level processes than to higher-level processes. However, proficient readers did not change their cognitive allocation according to the text type, whereas less proficient readers assigned more cognitive resources to the lower-level processes in expository reading than in narrative reading. Further analyses revealed that when less proficient learners read expository texts, the proportion of paraphrasing increased, while that of higher-level processes (e.g., local bridging inference, global bridging inference, and comprehension monitoring) decreased, suggesting that there was a trade-off between lower- and higher-level processes. According to Horiba (2000), who compared the reading processes of native Japanese and JFL readers, there was no significant difference between the text types (except for elaborative inferences, comments on text structure, and comments on own behavior) in L2 reading, and readers in narrative and expository reading conditions devoted more cognitive resources to processing textual information. The results of the present study were consistent with those of Horiba in that Japanese EFL readers also devoted greater cognitive resources to lower-level processing, especially in analyzing the meaning of textual information (i.e., paraphrasing). More importantly, the present study suggested the effect of L2 reading proficiency on the allocation of cognitive resources between text types. Similar to Horiba's results, the allocations to higher- and lower-level processing did not change between text types for proficient readers. On the other hand, less proficient readers needed to assign more cognitive resources to lower-level processing in expository reading than in narrative reading. This meant that in expository reading, less proficient readers had to rely more heavily on lower-level processing than proficient readers did because their language competence was limited. As a result, they had to inhibit higher-level processes, such as bridging inferences and comprehension monitoring.

In fact, Coté, Goldman, and Saul (1998) pointed out that expository texts are descriptive and informational, and are intended to express new information or knowledge for readers, so that they tend to depend on textual information in expository text. On the other hand, narrative texts are based on daily life experiences, and readers gain knowledge of what a narrative is (called a narrative schema) while growing up, as they repeatedly encounter it in their reading. The present study showed that proficient readers produced global bridging inferences more frequently in narrative texts than in expository texts. Consequently, although the reading process of Japanese EFL learners tended to depend on lower-level processing, the extent of their dependence was likely to be influenced by L2 reading proficiency. The lower a learner's L2 reading proficiency, the more heavily s/he depends on lower-level language processing. This is especially true in expository reading, wherein they cannot utilize their background knowledge as they would in narrative reading.

Next, RQ2 was addressed by examining the co-occurrence of two processes during reading. When generating bridging inferences, a reader needs to connect the information currently being processed to information that was processed earlier. Thus, McNamara (2004) reported that bridging inferences are likely to occur with paraphrasing and rereading, and less likely to occur with higher-level processing. However, compared to McNamara's study in L1, the results of the present study were quite complicated. First, regarding the co-occurrence of bridging inference with paraphrasing, Japanese EFL readers were likely to generate local bridging inferences when paraphrasing, but these co-occurrences were found in limited situations (e.g., in the Lower group's narrative reading and the Upper group's expository reading). On the other hand, the co-occurrence of global bridging inferences with paraphrasing was not observed. Second, regarding the co-occurrence of bridging inferences with rereading, Japanese EFL readers appropriately reread when they generated local and global bridging inferences. Again, however, the co-occurrences were limited: (a) in the Lower group, the local and global bridging categories in the expository texts, and (b) in the Upper group, the local bridging category in the expository texts and global bridging category in the narrative texts. Therefore, Japanese EFL readers generated local bridging inferences while paraphrasing and reread the previous sentences simultaneously during reading. However, this process does not seem to be as well-established among L2 readers as it is among L1 readers. For example, when generating local bridging inferences, students made comments on the text structure or syntactic analysis, as well as paraphrasing and rereading. Also, they reread not only for generating bridging inferences, but also for processing semantic or syntactic information. Although the results varied with the interaction between L2 reading proficiency and text type, which made the results more difficult to generalize, it seems that unlike native readers, Japanese EFL readers did not use rereading and paraphrasing only to generate bridging inferences. They used rereading and paraphrasing with other processes as well to construct a coherent mental representation (e.g., syntactic analysis, comments about text structure) because of the inefficiency of their lower-level processes.

Only a few studies on global bridging inferences have been conducted to date, and not enough data have been collected to generalize the results on global bridging inferences. In the present study, however, EFL readers generated local bridging inferences while paraphrasing text information and rereading previous sentences, whereas they generated global bridging inferences using several co-occurring processes, at both the higher and lower levels. These differences might suggest the varied processes and cognitive roles involved in establishing a coherent mental representation.

Furthermore, it should be noted that while the think-aloud task used in the present study is well suited to identifying conscious, strategic processing, it is not sensitive to unconscious, automatic processing (Trabasso & Magliano, 1996). When the participants were asked to do a think-aloud task, they tended to engage in a more strategic reading process than that involved in normal reading, which allowed them to generate more global bridging inferences than would be usual for EFL readers. This would lead to the difference in the results between the present study and Morishima (2013), which used a reading time measure and showed failure in constructing global coherence in L2 reading. Thus, different results may be obtained if participants with different proficiency levels engage in different tasks under different reading conditions. In particular, since rereading would be a sort of strategy that happens unconsciously, it is likely that not all rereading was observed in the think-aloud task. To try and catch all rereading during reading, an eye-tracking method would be favorable. Although further research will be needed, the current research is still important in that it suggested (a) the effect of L2 reading proficiency between text types on the allocation of cognitive resources, (b) that L2 reading proficiency on online reading processes functioned simultaneously, and (c) the difference in the generation tendency of local and global bridging inferences.

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References

Bernhardt, E. B. (2000). Second-language reading as a case study of reading scholarship in the 20th century. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (vol. 3, pp. 791–811). Mahwah, NJ: Erlbaum.

Coté, N., Goldman, S. R., & Saul, E. U. (1998). Students making sense of informational text: Relations between processing and representation. *Discourse Processes, 25,* 1–53.

Diakidoy, I. A., Mouskounti, T., & Ioannides, C. (2011). Comprehension and learning from refutation and expository texts. *Reading Research Quarterly, 46,* 22–38.

Duffy, S. A., Shinjo, M., & Myers, J. L. (1990). The effect of encoding task on memory for sentence pairs varying in causal relatedness. *Journal of Memory and Language, 29,* 27–42.

Educational Testing Service [ETS]. (2002). *TOEFL test preparation kit workbook.* Princeton, NJ: ETS.

Grabe, W., & Stoller, F. L. (2002). *Teaching and researching reading.* New York, NY: Longman.

Graesser, A. C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review, 101,* 371–395.

Harrington, M., & Sawyer, M. (1992). L2 working memory capacity and L2 reading skill. *Studies in Second Language Acquisition, 14,* 25–38.

Horiba, Y. (1996). Comprehension processes in L2 reading: Language competence, textual coherence, and inferences. *Studies in Second Language Acquisition, 18,* 433–473.

Horiba, Y. (2000). Reader control in reading: Effects of language competence, text type, and task. *Discourse Processes, 29,* 223–267.

Keenan, J. M., Baillet, S. D., & Brown, P. (1984). The effects of causal cohesion on comprehension and memory. *Journal of Verbal Learning and Verbal Behavior, 23,* 115–126.

McKoon, G., & Ratcliff, R. (1992). Inference during reading. *Psychological Review, 99,* 440–466.

McNamara, D. S. (2004). SERT: Self-explanation reading training. *Discourse Processes, 38,* 1–30.

Morishima, Y. (2013). Allocation of limited cognitive resources during text comprehension in second language. *Discourse Processes, 50,* 577–597.

Myers, J. L., Shinjo, M., & Duffy, S. A. (1987). Degree of causal relatedness and memory. *Journal of Memory and Language, 26,* 453–465.

Nassaji, H. (2003). Higher-level and lower-level text processing skills in advanced ESL reading comprehension. *The Modern Language Journal, 87,* 261–276.

Ozuru, Y., Briner, S., Best, R., & McNamara, D. S. (2010). Contributions of self-explanation to comprehension of high- and low-cohesion texts. *Discourse Processes, 47,* 641–667.

Qian, D. D. (2002). Investigating the relationship between vocabulary knowledge and academic reading performance. *Language Learning, 52,* 513–536.

Schmalhofer, F., McDaniel, M. A., & Keefe, D. (2002). A unified model for predictive and bridging inferences. *Discourse Processes, 33,* 105–132.

Shimizu, H. (2009). The effects of causal relatedness on EFL learners' reading comprehension and inference generation. *Annual Review of English Language Education in Japan, 20,* 31–40.

Shiotsu, T., & Weir, C. J. (2007). The relative significance of syntactic knowledge and vocabulary breadth in the prediction of reading comprehension test performance. *Language Testing, 24,* 99–128.

Singer, M. (1994). Discourse inference processes. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 479–515). San Diego, SD: Academic Press.

Society for Testing English Proficiency [STEP]. (2008b). *STEP Grade pre-2 in the second and third tests.* Retrieved from http://www.eiken.or.jp/listening/grade_p2.html

Stevenson, M., Schoonen, R., & de Glopper, K. (2007). Inhibition or compensation? A multidimensional comparison of reading processes in Dutch and English. *Language Learning, 57,* 115–154.

Tang, H. (1997). The relationship between reading comprehension processes in L1 and L2. *Reading Psychology: An International Quarterly, 18,* 249–301.

Trabasso, T., & Magliano, J. P. (1996). Conscious understanding during comprehension. *Discourse Processes, 21,* 255–287.

van den Broek, P. (1994). Comprehension and memory of narrative texts. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 539–588). San Diego, SD: Academic Press.

van den Broek, P., Fletcher, C. R., & Risden, K. (1993). Investigations of inferential processes in reading: A theoretical and methodological integration. *Discourse Processes, 16,* 169–180.

van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension.* New York, NY: Academic Press.

Whitney, P., Ritchie, B. G., & Clark, M. B. (1991). Working-memory capacity and the use of elaborative inferences in text comprehension. *Discourse Processes, 14,* 133–145.

Zwaan, R. A., & Brown, C. M. (1996). The influence of language proficiency and comprehension skill on situation-model construction. *Discourse Processes, 21,* 289–327.