Relationship of Main Ideas With Subordinate and Superordinate Text Information in EFL Readers’ Mental Representations

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Abstract

Main idea comprehension is an important aspect of successful reading (Grabe & Stoller, 2011). Readers understand the main idea of a paragraph based on the subordinate details (e.g., Ushiro, Nakagawa, Kai, Watanabe, & Shimizu, 2008) and a superordinate main idea summarizing the whole text (e.g., Murray & McGlone, 1997). Although readers are not likely to rely on either of these types of comprehension alone, few previous studies have examined them simultaneously. Therefore, the present study investigates how EFL readers’ representations reflected these types of main idea comprehension, comparing complete texts. Seventy Japanese EFL university students read six texts, each including a text-level main idea, paragraph-level main ideas, and details. They then completed an immediate recall task with either a detail (micro cue), a text-level main idea (macro cue), or no cue (control). Two weeks later, 40 of them recalled the texts on the basis of the same cues. The micro and macro cues improved (a) total recall rate in the delayed task and (b) recall rate of the paragraph-level main ideas regardless of recall time. The macro cues were more effective than the micro cues in these cases. The results demonstrate that both subordinate and superordinate comprehension, especially the latter, contributed to representations in the delayed task and representations of paragraph-level main ideas.

1. Background

Successful reading comprehension requires understanding important information such as main ideas. Grabe and Stoller (2011) stated that main idea comprehension is at the heart of text comprehension. At the same time, previous studies reported that readers had difficulty with main idea comprehension particularly in second language (L2) reading (Miller & Keenan, 2011). However, there has not been enough research on the causes of such difficulty. To resolve readers’ difficulty in this matter, it is necessary to clarify how readers’ representations are structured. Previous studies have shown that readers understand main ideas in each paragraph on the basis of supporting details (e.g., Ushiro, Nakagawa, Kai, Watanabe, & Shimizu, 2008) and on a main idea summarizing the whole text (Murray & McGlone, 1997). Although many previous studies have investigated these kinds of text comprehension separately, main idea comprehension is likely to be
accomplished through both approaches. Thus, the present study explored whether L2 learners’ main idea representations were structured on the basis of subordinate and superordinate text ideas.

1.1 Text Information Hierarchy

In the text comprehension model proposed by van Dijk and Kintsch (1983) text information has a hierarchical structure, as illustrated in Figure 1. A text has subordinate details and main ideas that summarize the details. Further, the main ideas are summarized into superordinate main ideas. The summarization of lower-level main ideas into higher-level main ideas is repeated recursively until a single main idea that integrates the whole text is constructed. The repeated summarization creates several hierarchical levels of main ideas from a main idea that integrates details in a paragraph (labeled a paragraph-level main idea in this study) to a main idea that integrates the overall text (a text-level main idea). An ideal reader constructs text representations reflecting this text information hierarchy.

Although the model assumes readers of a first language (L1) who do not have trouble understanding the text, the above hypothesis also applies to L2 reading (Kim, 2001; Ushiro, Nakagawa et al., 2008). Ushiro, Nakagawa et al. (2008) examined the comprehension of text information hierarchy among Japanese undergraduate readers of English as a foreign language (EFL). Their importance ratings reflected the text information hierarchy: That is, they tended to give higher importance ratings to the text-level main idea than to the paragraph-level main ideas, which in turn they rated as more important than the supporting details. This result shows that proficient (e.g., university level) EFL readers can also figure out a text information hierarchy.

1.2 Text Comprehension Based on Details and a Text-Level Main Idea

Readers understand paragraph-level main ideas based on subordinate details and a text-level main idea. The text comprehension model hypothesizes that readers integrate details into main ideas during reading (van Dijk & Kintsch, 1983). Past studies demonstrated that this hypothesis applied to L1 and L2 reading. In Ritchey (2011), L1 undergraduates read the last sentence of a paragraph faster when it was a paragraph-level main idea than when it was not. Afflerbach’s (1990) think-aloud protocols specified L1 graduate students’ strategy for main idea comprehension during reading: They searched for connections between details related to paragraph-level main ideas. These findings denoted that L1 readers integrated details to
comprehend paragraph-level main ideas. In L2 reading, Kimura (2013) suggested that Japanese EFL undergraduates constructed understandings of *theme* (i.e., the overall message of a narrative) from story information in a paragraph-length narrative.

Such process for main idea comprehension is reflected in readers’ representations constructed through reading. Guindon and Kintsch (1984) demonstrated that paragraph-level main ideas were activated in the minds of L1 undergraduates. In Williams, Taylor, and Ganger (1981), L1 children as well as university students performed well in comprehension tasks that required the integration of details into paragraph-level main ideas. With regard to L2 learners, undergraduates’ representations reflected the integration of details into paragraph-level main ideas (Ushiro, Nakagawa et al., 2008). In these previous studies, not only L1 proficient readers (i.e., university students) but also less proficient readers (i.e., L1 children and L2 learners) had representations of paragraph-level main ideas that were structured by the integration of details.

L1 studies have also revealed that readers understood paragraph-level main ideas based on a text-level main idea. L1 undergraduates’ processing of paragraph-level main ideas was prompted by headings (Hyōnā & Lorch, 2004) and text overview (Murray & McGlone, 1997), both of which represented superordinate text information (corresponding to a text-level main idea). On the other hand, however, few L2 studies have addressed this kind of reading process.

Although previous studies have not investigated whether readers have representations of paragraph-level main ideas based on a text-level main idea, L1 studies have demonstrated that their representations of the whole text were structured based on a text-level main idea. Text-level main ideas prompted undergraduates’ production of supporting details (Chambliss, 1995). Moreover, text overviews elicited the topics of each paragraph from readers’ representations, or the number of the paragraph topics for which readers comprehended any information (Hyōnā & Lorch, 2004; Lorch, Lorch, Ritchey, McGovern, & Coleman, 2001). However, these studies did not focus on representations of main ideas in other text information. Furthermore, only a few studies have explored this issue in L2 reading. Thus, the present study dealt with L2 readers’ comprehension of paragraph-level main ideas based on a text-level main idea. Although such comprehension has not been investigated directly, previous studies suggested that paragraph-level main ideas were understood based on a text-level main idea. Prompted production of information about paragraph topics may have included paragraph-level main ideas in Hyōnā and Lorch (2004) and Lorch et al. (2001), and a text-level main idea may have enhanced participants’ understanding of paragraph-level main ideas before lower hierarchical level information in Chambliss’s study (i.e., subordinate details).

1.3 Simultaneous Investigation of Two Types of Text Comprehension

As reviewed in the previous sections, the past studies explored text comprehension separately based on details and a text-level main idea. In reading within the educational environment, however, learners are likely to engage in both types of comprehension instead of
relaying on either of them. Few studies have dealt with both types of comprehension at the same time, and the findings of these studies have not reached agreement. Lorch (1993) showed that L1 undergraduates processed text information based on preceding details and a paragraph-level main idea. In Ushiro, Hijikata et al. (2007), in contrast, cues representing details and paragraph-level main ideas did not improve the total recall rate for Japanese EFL undergraduates. To examine whether representations were structured on the basis of details and paragraph-level main ideas, this previous study adopted the cued recall task. In this task, cues prompt access to relevant information in readers' representations when content overlap between the cues and a text is constructed through reading (Rawson & Kintsch, 2004; Wolfe, Magliano, & Larsen, 2005). When readers succeed in constructing well-structured representations, cue redundancy was caused (Rawson & Kintsch, 2004). That is, readers have spontaneous access to cue information in their representations without having cues. Lorch (1993) and Ushiro, Hijikata et al. (2007) considered two types of text comprehension as reviewed above. However, these studies did not focus on main idea comprehension as one of the main aspects of reading comprehension (Grabe & Stoller, 2011). Thus, this study examines text comprehension based on details and a text-level main idea, focusing on main idea comprehension in paragraphs.

1.4 Overview of the Present Study

The purpose of the present study was to examine whether EFL learners understood paragraph-level main ideas based on details and text-level main ideas in comparison with their understandings of complete texts. Specifically, this study adapted the cued recall task in Ushiro, Hijikata et al. (2007). This study presented a supporting detail as the micro cue condition, a text-level main idea as the macro cue condition, or no cue as the control condition. This study investigated whether and how these retrieval cues affected recall production of the whole text and paragraph-level main ideas. As cue redundancy was observed in the total recall rate right after reading in Ushiro, Hijikata et al., the following hypothesis (H) was constructed:

H Macro and micro cues do not improve immediate recall of the whole text.

Although cue redundancy was observed in Ushiro, Hijikata et al. (2007), cue effect is likely to appear more noticeably in comprehension of paragraph-level main ideas, because readers have to construct a close relationship of paragraph-level main ideas with details (e.g., Ushiro, Nakagawa et al., 2008) and a text-level main idea (e.g., Murray & McGlone, 1997). When readers succeed in constructing these content overlap, their recall of paragraph-level main ideas would be expected to increase. Moreover, this study investigated not only text comprehension in the immediate recall task but also in the delayed recall task. Ushiro, Nahatame et al. (2014) suggested that cue redundancy was mitigated in the delayed recall task. The content overlap between cue and other
text information is likely to play a more crucial role in the delayed task. The research questions (RQs) in this study are presented as follows:

RQ1  How do macro and micro cues improve delayed recall of the whole text?
RQ2  How do macro and micro cues improve immediate recall of paragraph-level main ideas?
RQ3  How do macro and micro cues improve delayed recall of paragraph-level main ideas?

2. Method

2.1 Participants

Seventy Japanese EFL undergraduate and graduate students participated in the immediate session. Forty of the students participated in the delayed session as well, and they were available for data analyses. All of the students had received EFL education in Japan for more than six years. They were all available for full analyses in the immediate and delayed sessions. Their majors were English Education, Health and Physical Education, and Humanities and Culture.

2.2 Materials

2.2.1 Collecting and revising reading texts

The present study prepared reading texts that represented text information hierarchy among a text-level main idea, paragraph-level main ideas, and details (see Table 1). A total of 14 texts were collected or extracted from previous studies as candidates for the experimental materials. Because most of the texts were written for L1 readers, they were revised for EFL learners. Specifically, they were made easier in terms of vocabulary and syntax difficulty, as the focus of the present study was not literal understandings. Low-frequency words (Level 5 and over) were paraphrased with high-frequency words (Level 4 and below) based on the JACET 8000 list (JACET, 2003), except proper nouns and words that were difficult to replace because of the context. To prepare homogenous texts, the texts were revised to have similar difficulty levels as much as possible within a scope which did not cause lack of consistency. In terms of text structure, all the texts consisted of three paragraphs, included a text-level main idea in the first sentence, and had a paragraph-level main idea in the first sentence of each paragraph except the first paragraph. That is, in the first paragraph, the text-level main idea was written in the first sentence and the paragraph-level main idea was in the second sentence. After revising the texts, a native English speaker checked whether the texts included unnatural English expressions, and such expressions were replaced with natural ones. To verify the validity of the text information hierarchy, two graduate students who were majoring in English Education identified which sentences were the text-level main ideas or paragraph-level main ideas, based on Goldman, Saul, and Coté (1995), who identified such main ideas. The inter-rater agreement rate was 97.72%, and all disagreements were resolved through discussion. The other text information was regarded as details.
Table 1

An Example Text From “Distance”

<table>
<thead>
<tr>
<th>There are elements for measuring distance. <strong>Economic distance is changed by the cost of movement from one place to another.</strong> Money and energy are related to any movement. Sending something by water is usually less expensive than sending over land. This holds true even when land routes are shorter.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distance can be measured on the basis of time.</strong> Some maps use travel time instead of mile signals. This is because the measuring unit influences the usual relations among locations. It may take the same time to go from a single point to a location 10 miles north as going to a location 30 miles south.</td>
</tr>
<tr>
<td><strong>Distance measuring varies with individual feelings.</strong> What may seem like a long trip to some individuals may seem short to other people. Even the same route going and coming can seem different to a single traveler. It depends on whether road conditions are good, and whether the trip is near the end.</td>
</tr>
</tbody>
</table>

*Note. A text main idea was underlined, and paragraph main ideas were boldfaced.*

2.2.2 Pilot study

A pilot study was conducted to (a) measure the time for text reading and the recall task, (b) compose homogenous material sets for the experimental study, and (c) check unknown words. The participants were 12 Japanese EFL undergraduate and graduate students, who did not participate in the experimental study. All of them had received EFL education in Japan for more than six years. Their majors were the following: Medicine and Medical Sciences, Humanities and Culture, Human Sciences, Informatics, Pure and Applied Sciences, Science and Engineering, Social and International Studies, and Systems and Information Engineering.

The experimenter randomly gave the participants one of the four booklets that counterbalanced text order. In advance, the students had been informed that there would be a free recall task after they read each text. They read the text and checked for unknown words. Next, they did the free recall task. This procedure was repeated for 14 texts, with a 15-minute rest halfway through the procedure. For each text, all the participants finished reading within three minutes and performed the recall task within six minutes for each text.

After the pilot study, two graduate students majoring in English Education divided 30% of the texts (i.e., five texts) into idea units (IUs) based on the criteria of Ikeno (1996) (inter-rater agreement rate = 98.17%), and all disagreements were resolved through discussion. In accordance with the criteria, one of the raters divided the rest of the texts into IUs. In addition, the two raters scored the recall protocols from 30% of the participants (four participants) who were randomly selected. When two-thirds of the IU content were written in a recall protocol, one point was given to each IU (inter-rater agreement rate = 91.76%). All discrepancies were resolved through discussion, and one rater scored the rest of the protocols based on the criteria.
To minimize the possible effects of different texts in the experimental study, two texts were selected for each of the three cue conditions. Three material sets for these conditions were composed of six texts so that the sets had an equal recall rate of the text-level main ideas, paragraph-level main ideas, details, and whole information (see Table 2). Moreover, it was confirmed that the selected texts did not have similar topics (e.g., chimpanzee and orangutan). This was because memory of such texts was likely to be mixed in the delayed recall task in the experimental study. As a result, material set 1 was made up of “Distance” from Côté, Goldman, and Saul (1998) and “Argentina” from Kintsch (1990); set 2 contained “Environment” from Taylor and Samuels (1983) and “Support” from Kobayashi (2002); and set 3 consisted of “Energy” from Lorch et al. (2001) and “Three Mile Island” from Carrell (1992). Because three cue conditions were allocated for the three material sets in the experimental study, the homogenous material sets ensured that difference in recall rate was due to cue effects and not to text difference. In the experimental study, set 1 was recalled with micro cues, set 2 with macro cues, and set 3 with no cues (free recall).

Table 2  
**Recall Rates of Each Material Set in the Pilot Study**

<table>
<thead>
<tr>
<th>Material set 1</th>
<th>Material set 2</th>
<th>Material set 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Text main idea</td>
<td>0.67</td>
<td>0.24</td>
</tr>
<tr>
<td>Paragraph main idea</td>
<td>0.33</td>
<td>0.18</td>
</tr>
<tr>
<td>Detail</td>
<td>0.24</td>
<td>0.09</td>
</tr>
<tr>
<td>Total</td>
<td>0.27</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Table 3  
**Length and Readability of the Material Sets for the Experimental Study**

<table>
<thead>
<tr>
<th>Material set</th>
<th>Reading text</th>
<th>FKGL</th>
<th>Words</th>
<th>Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set 1</td>
<td>Distance</td>
<td>7.0</td>
<td>157</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Argentina</td>
<td>7.3</td>
<td>154</td>
<td>14</td>
</tr>
<tr>
<td>Set 2</td>
<td>Environment</td>
<td>7.0</td>
<td>157</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Support</td>
<td>8.2</td>
<td>154</td>
<td>17</td>
</tr>
<tr>
<td>Set 3</td>
<td>Energy</td>
<td>8.7</td>
<td>149</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Three Mile Island</td>
<td>8.6</td>
<td>149</td>
<td>14</td>
</tr>
</tbody>
</table>

*Note.* FKGL (Flesch-Kincaid Grade Level) was provided by Microsoft Word 2010's readability measurement tools.
Unknown words in the material sets reported in the pilot study were paraphrased with high-frequency words (Level 4 and below) of JACET 8000 (JACET, 2003). For proper nouns and words that were difficult to paraphrase given the context, a synonym was inserted in the text near the unknown word, or a gloss in Japanese was provided. Table 3 shows the details of the final version of the material sets for the experimental study. After the revisions, a native English speaker checked the materials sets.

2.3 Procedure

The experimental study consisted of immediate and delayed sessions. The participants were tested together during the sessions. In the immediate session, the experimenter provided participants with a general explanation of the experiment and one of the six booklets that counterbalanced the order of the material sets, texts within each material set, and cue conditions. The experimenter announced in advance that there would be a recall task so that the participants would read all the texts for the purpose of comprehension. Without the announcement the participants would not have known about the recall task while they were reading the first text. When they read the rest of the texts, on the other hand, they could prepare for the task. This might result in a lower recall rate of the first text due to whether or not the participants knew about the task, and not to the cues.

On the basis of the pilot study, the participants were asked to read a text in three minutes and then finish the recall task in six minutes. This procedure was repeated for the six texts. The students had a five-minute break after finishing the reading and recall task of the third text. In the recall task, material set 1 was recalled with a sentence representing a detail in the first paragraph (micro cue condition), set 2 with a text-level main idea in the first paragraph (macro cue condition), and set 3 with no cues (free recall as control condition). The micro and macro cues were given in Japanese. At the end of the immediate session, the participants were recruited for the delayed session.

In consideration of the participants' schedules, the delayed session was conducted two weeks after the immediate session so that as many of the students could participate as possible. In the delayed session, they were asked to address the cued recall task of all texts at once within 36 minutes. The same cues were provided for the recall task of each text. They tackled the task for the text they could remember.

2.4 Scoring and Data Analyses

Since the texts were revised after the pilot study, two graduate students majoring English Education divided the revised part of the texts into IUs on the basis of Ikeno's (1996) criteria (inter-rater agreement rate = 99.07%). All disagreements were resolved through discussion. The two raters scored the recall protocols from 30% of the participants randomly selected (inter-rater agreement rate = 92.09% and 93.47% for the immediate and delayed recall, respectively). All
discrepancies were resolved through discussion, and one of the raters scored the rest of the protocols. For each material set, the recall rates of the whole text information and paragraph-level main ideas were calculated. However, as the participants were required to remember and write down as much text information as possible without referring to the texts, IUs representing the contents of the micro and macro cues were excluded from the total recall rate. Specifically, IUs corresponding to the details presented as the micro cues were removed from the total recall rate of material set 1, and IUs describing the text-level main ideas presented as the macro cues were removed from the total recall rate of material set 2. Moreover, IUs representing the text-level main ideas were excluded from the total recall rate of material sets 1 and 3. It would be unequal if the total recall rate of material sets 1 and 3 included the text-level main ideas, while that of material set 2 did not because its text-level main ideas were presented as the macro cues.

To address the H and RQs, 3 (Cue: Micro, Macro, and Control) × 2 (Recall: Immediate and Delayed) two-way repeated measures analyses of variance (ANOVAs) were conducted for the total recall rate and the recall rate of the paragraph-level main ideas. Cue and Recall were within-participant factors. Because recall rate of the whole text information and paragraph-level main ideas was significantly correlated in most of the cue conditions in the immediate and delayed recall tasks \((r = .740, p < .001; r = .303, p = .057; \text{and } r = .659, p < .001)\) respectively, for the micro, macro, and control conditions in the immediate recall task; and \(r = .832, p < .001; r = .462, p = .003; \text{and } r = .616, p < .001\) respectively, for the micro, macro, and control conditions in the delayed recall task, this study adopted ANOVAs, not a multivariate analysis of variance. As the number of IUs was different across the texts, the recall rate was normalized with arcsine transformation prior to the analyses.

3. Results

To confirm that recall rate of the whole texts and paragraph-level main ideas was not different among the six booklets in the immediate session, one-way ANOVAs were conducted on the normalized recall rates, with Booklet as a between-participant variable. The ANOVAs did not show significant effects of Booklet on the total recall rate in the micro cue condition, \(F(5, 39) = 1.20, p = .695, \eta^2 = .02\); the macro cue condition, \(F(5, 39) = 1.21, p = .325, \eta^2 = .02\); or the control condition, \(F(5, 39) = 1.15, p = .355, \eta^2 = .02\). These results also confirmed that Booklet did not significantly influence the recall rate of the paragraph-level main ideas in the micro cue condition, \(F(5, 39) = 0.61, p = .695, \eta^2 = .01\); the macro cue condition, \(F(5, 39) = 0.50, p = .772, \eta^2 = .01\); or the control condition, \(F(5, 39) = 0.35, p = .880, \eta^2 < .01\).

Table 4 shows the descriptive statistics of the recall task. To address the H and RQs, 3 (Cue: Micro, Macro, and Control) × 2 (Recall: Immediate and Delayed) two-way repeated measures ANOVAs were conducted for the total recall rate and the recall rate of the paragraph-level main ideas, with Cue and Recall as within-participant factors\(^1\). With regard to the total recall rate, the
results of a two-way ANOVA yielded significant main effects, $F(2, 78) = 35.16, p < .001, \eta^2 = .05$ for Cue; and $F(1, 39) = 273.87, p < .001, \eta^2 = .46$ for Recall, and a significant Cue $\times$ Recall interaction, $F(2, 78) = 29.19, p < .001, \eta^2 = .03$. Post hoc tests for the interaction showed significant simple main effect of Recall in each cue condition ($ps < .001$). The simple main effects indicated that the participants forgot text contents from the immediate to the delayed recall task. This was a kind of inevitable result because the delayed recall task was conducted two weeks after reading the texts to prioritize the participants’ schedule. On the other hand, simple main effect of Cue was not significant in the immediate recall task ($p = .137$) while it was significant in the delayed recall task ($p < .001$). Multiple comparison with Bonferroni correction suggested that the total recall rate in the delayed recall task was significantly higher in the macro cue condition than in the micro cue condition and it was significantly higher in the micro cue condition than in the control condition ($ps < .001$). In the immediate recall task, the micro and macro cues failed to improve the total recall rate, compared with the free recall in the control condition. In other words, the EFL learners remembered the whole text information regardless of whether the retrieval cues were presented and what kind of cue was provided. This result was consistent with the tendency observed in Rawson and Kintsch (2004) and Ushiro, Hijikata et al. (2007). In this study, the micro and macro cues might have also been redundant for the total recall rate in the immediate session. In the delayed recall task, two types of cues, especially the macro cues, significantly improved the total recall rate. This result suggested that the university students understood the text information based on the details and text-level main ideas.

### Table 4

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th></th>
<th></th>
<th>Paragraph main idea</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$95%$ CI</td>
<td>$SD$</td>
<td>$M$</td>
<td>$95%$ CI</td>
</tr>
<tr>
<td>Immediate recall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro</td>
<td>0.34</td>
<td>[0.29, 0.39]</td>
<td>0.16</td>
<td>0.43</td>
<td>[0.34, 0.52]</td>
</tr>
<tr>
<td>Macro</td>
<td>0.36</td>
<td>[0.32, 0.39]</td>
<td>0.12</td>
<td>0.60</td>
<td>[0.51, 0.68]</td>
</tr>
<tr>
<td>Control</td>
<td>0.33</td>
<td>[0.28, 0.38]</td>
<td>0.16</td>
<td>0.30</td>
<td>[0.23, 0.37]</td>
</tr>
<tr>
<td>Delayed recall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro</td>
<td>0.09</td>
<td>[0.06, 0.12]</td>
<td>0.09</td>
<td>0.16</td>
<td>[0.10, 0.21]</td>
</tr>
<tr>
<td>Macro</td>
<td>0.16</td>
<td>[0.14, 0.19]</td>
<td>0.09</td>
<td>0.28</td>
<td>[0.21, 0.35]</td>
</tr>
<tr>
<td>Control</td>
<td>0.05</td>
<td>[0.02, 0.08]</td>
<td>0.09</td>
<td>0.03</td>
<td>[0.00, 0.06]</td>
</tr>
</tbody>
</table>

Note. Cronbach’s $\alpha = .877$, .796, and .858, respectively, for the micro, macro, and control conditions in the immediate recall task; and .868, .740, and .795 for the micro, macro, and control conditions in the delayed recall task.
As for the recall rate of the paragraph-level main ideas, although a Cue × Recall interaction did not reach significance, $F(2, 78) = 1.00, p = .373, \eta^2 < .01$, significant main effects were observed, $F(1.51, 58.79) = 39.17, p < .001, \eta^2 = .17$ for Cue; and $F(1, 39) = 139.41, p < .001, \eta^2 = .27$ for Recall. Multiple comparison with Bonferroni correction revealed that the participants recalled significantly more paragraph-level main ideas in the micro cue condition than in the control condition, and they remembered significantly more paragraph-level main ideas in the macro cue condition than in the micro condition ($ps < .050$). The significant main effect of Recall indicated that the participants’ memory of the paragraph-level main ideas as well as the whole text information faded out in the delayed recall task compared with the immediate recall task. However, both cues were effective for remembering the paragraph-level main ideas compared with the free recall. The effect of the macro cues was more noticeable than that of the micro cues, which was a similar tendency to the total recall rate in the delayed recall task.

Based on the above-mentioned results, it could be interpreted that the micro and macro cues, especially the macro cues, were helpful for the delayed recall or for retrieving the paragraph-level main ideas. In other words, the EFL learners’ representations were structured on the basis of the details and text-level main ideas.

4. Discussion

Figure 2 illustrates the overall tendency of the recall tasks. As demonstrated in Section 3, the micro and macro cues did not help participants retrieve the whole text information in the immediate recall rate, while the two types of cues, particularly the macro cues, enhanced the other three kinds of recall rate. The following part discusses two issues: (a) the difference between cases in which the micro and macro cues were effective or not, and (b) the reason the macro cues were more effective than the micro cues when the cues improve the recall rate.

4.1 The Null Effect of the Cues on the Total Recall Rate in the Immediate Recall Task (H)

The null effect of the cue conditions on the total recall rate in the immediate recall task supported the hypothesis of this study. Considering the participants and the texts, they were likely to be proficient enough to understand and recall the texts regardless of the cues immediately after reading. As the focus of the study was text comprehension, the texts were revised to be easy to
read with short length, easy readability, and simple text structure. Such texts might have been easy enough for the university students to sufficiently comprehend. It is possible to explain such sufficient understanding from content and literal comprehension. The first possible explanation for the null cue effect is cue redundancy (Rawson & Kintsch, 2004; Ushiro, Hijikata et al., 2007). In other words, the university students were likely to construct well-structured text representations and content overlap of the paragraph-level main ideas with the subordinate and superordinate information. They were able to spontaneously access cue information immediately after reading without the cues and retrieve text information based on the content overlap they constructed. Another possible reason may be the effects of surface memory. It is possible that surface memory was so strong immediately after reading that the effects of literal understandings might have mitigated the cue effects based on content overlap between the cue and the other information.

4.2 The Cue Enhancement of the Total Recall Rate in the Delayed Task and the Recall Rate of the Paragraph-Level Main Ideas (RQs 1–3)

In answer to the RQs of this study, the micro and macro cues improved the total recall rate in the delayed recall task and the recall rate of the paragraph-level main ideas regardless of the recall time. The results indicated that the cues functioned (a) in the delayed recall task or (b) in the recall rate of the paragraph-level main ideas. In both of these conditions, the readers were thought to understand the texts based on the details and text-level main ideas, and retained representations reflecting these types of comprehension. Thus, the cues based on content overlap among text ideas played a crucial role in the recall task. The first case indicated that readers retained the content overlap in their long-term memory, although their text memory faded out as time passed. The retained overlap led to noticeable cue effects on the delayed recall of the whole texts. Therefore, the retrieval cues improved recall from the readers’ representations on the basis of such content overlap constructed between the micro and macro cues and recalled information.

With regard to the second case, comprehension of the paragraph-level main ideas required constructing content connections with details and a text-level main idea. It was not enough just to understand the individual main ideas. For deep comprehension of main ideas, readers would have to understand the paragraph-level main ideas based on the details (e.g., Ushiro, Nakagawa et al., 2008) and on a text-level main idea (Murray & McGlone, 1997). These content connections of paragraph-level main ideas with details and a text-level main idea were important regardless of the immediate and delayed recall tasks. Thus, the learners could elicit their representations of the paragraph-level main ideas by their content connections with cue information (Rawson & Kintsch, 2004; Wolfe et al., 2005).

4.3 Comparing the Effects of the Micro and Macro Cues (RQs 1–3)

Although both the micro and macro cues helped recall of the whole text information in the delayed recall task and the paragraph-level main ideas in the immediate and delayed recall tasks,
the macro cues were always more effective than the micro cues. Even in L2 reading, university students were able to understand text information hierarchy, and construct text representations reflecting the structure. In Ushiro, Nakagawa et al. (2008), whose participants were Japanese EFL undergraduates, as were those in this study, the learners’ importance ratings reflected text information hierarchy among a text-level main idea, paragraph-level main ideas, and details. They rated the text-level main ideas as more important and recalled them more than details. Therefore, L2 readers like the university students are more likely to pay attention to a text-level main idea than subordinate details, and to understand a text-level main idea better than the details. The greater attention and better understanding may invoke comprehension of paragraph-level main ideas based on a text-level main idea more than that based on details. This reading process is likely to be reflected in readers’ representations, and the paragraph-level main ideas were retrieved in a similar way as reading.

5. Conclusion

The present study explored L2 learners’ comprehension of paragraph-level main ideas based on details and a text-level main idea. The findings were summarized in three points: (a) L2 learners remembered the whole text information immediately after reading regardless of the retrieval cues, as reported in Ushiro, Hijikata et al. (2007), (b) the cues enhanced their recall of the whole text information in the delayed recall task and recall of the paragraph-level main ideas in the immediate and delayed recall tasks, and (c) the text-level main ideas were more effective as a cue than details. The cue enhancement was thought to depend on whether content connections among text information played a crucial role in the readers’ text representations. In the immediate session, the students may have constructed content connections between cue information and the other text information, which caused cue redundancy (Rawson & Kintsch, 2004; Ushiro, Hijikata et al., 2007). Another possible reason was that the effects of surface memory were so strong just after reading as to mitigate the cue effects based on content connections. On the other hand, content connections were very influential in the following cases: (a) the delayed recall in which the text memory faded away to some extent and (b) retrieval of the paragraph-level main ideas that needed the integration with the subordinate details (Ushiro, Nakagawa et al., 2008) and a text-level main idea (Murray & McGlone, 1997). Additionally, the learners were relying on the text-level main ideas more than the details. This tendency could be explained by the fact that readers regarded a text-level main idea as more important than details and understood better in accordance with text information hierarchy (Ushiro, Nakagawa et al., 2008).

The present study’s findings have educational implications. From the null effect on recalling the whole text information in the immediate recall task, cues would be unlikely to improve readers’ ability to remember the whole text information right after reading, when they were able to sufficiently understand the texts. As readers probably remember the whole text
information regardless of cues, L2 teachers can let their students remember on their own. However, details and a text-level main idea would be effective as cues to remember main ideas. For example, the cues can help L2 learners in production activities such as retelling in which learners say or write the outline of a text after reading so that those who have never read the text can understand its content. To tell about the text as clearly as possible, the readers needed to focus on its main ideas. This is why presenting details and a text-level main idea is likely to be effective. Furthermore, cues would also be useful for retrieving the text content in learners' long-term memory. Thus, cues are available for reviewing comprehension of a previously read text, such as the text content learned in the last class.

Finally, this study offers suggestions for further research. First, although this study investigated text comprehension and retrieval by university students, less proficient learners might show different tendencies in terms of whether the cues are effective and which cues are more helpful. Second, the present study carried out the delayed task two weeks after the immediate session. The cue effects were observed to change from the immediate to delayed session. Further study is needed to examine this transition of representations in more detail, such as by implementing a one-week delayed recall task between the immediate and delayed tasks. Third and finally, this study investigated comprehension of explicit main ideas. However, main ideas are not always written in a text (van Dijk & Kintsch, 1983). It is necessary to research whether the present study's findings also apply to implicit main ideas before generalizing the results. Future studies that tackle these issues would shed light on the mental representations of text comprehension.

Note

1. As many participants did not participate in the delayed session, one-way repeated measure ANOVAs were performed with Cue as a within-participant variable for (a) the total recall rate in the immediate recall (n = 70), (b) the total recall rate in the delayed recall (n = 40), (c) the recall rate of the paragraph-level main ideas in the immediate recall (n = 70), and (d) the recall rate of the paragraph-level main ideas in the delayed recall (n = 40). The results of one-way ANOVAs also suggested that Cue significantly affected the dependent variables (ps < .001) except the total recall rate in the immediate recall (p = 114). Multiple comparison revealed that the recall rates of the macro and control conditions were significantly higher and lower than that of the micro condition, respectively (ps < .050). In the analyses in the immediate task, Booklet did not affect the total recall rate or recall rate of the paragraph-level main ideas (ps > .050).

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References


