English Teaching, Vol. 73, No. 1, Spring 2018
DOI: 10.15858/engtea.73.1.201803.3

The Role of Reading Span in L2 Reading Comprehension and Eye Movements*

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Park, Hyangsook. (2018). The role of reading span in L2 reading comprehension and eye movements. *English Teaching*, *73*(1), 3-21.

The present study attempts to make a link between eye movement measures and reading comprehension (RC) to further examine how reading span (RS) differences contribute to differences in L2 reading performance. The variability of text processing was measured by duration and frequency of fixations using an eye tracker. Thus, it investigates the effects of RS in terms of processing as well as RC performance. To this end, forty-five Korean undergraduate students at an intermediate level participated in the experiment. Four types of eye movements were tracked: first-fixation time (FFT), total-fixation time (TFT), second-fixation time (SFT), and fixation count (FC). The results showed that the high-RS group received higher scores than the low-RS group on the RC test, suggesting a significant role of RS in RC performance. In addition, significant differences between the RS groups were found in TFT and SFT. RC performance is negatively correlated with the TFT and SFT. Due to their limited RS, the low-RS group needed more time for comprehension and left few resources available for integration of meaning in the text. The findings suggest that fast and efficient EMs are closely associated with a better RC performance. The present study shed light on how RS affects the students' text processing and that, in turn, leads them to different outcomes from the L2 reading comprehension tests.

Key words: reading comprehension, eye movements, reading span, L2 acquisition, working memory

1. INTRODUCTION

Reading comprehension (RC) is the process of constructing meaning from text. Successful processing of texts requires various linguistic skills and knowledge. Therefore,

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* This article is based on the author's (2015) doctoral dissertation completed at Kyungpook National University.

individual differences in reading performance can be explained by differences in text processing ability and cognitive resources. For instance, a reader who processes a text fast and efficiently will have more available resources that can be used to maintain information in memory. Accordingly, the reader is more likely to retain the content in memory. Reading span (RS) is one the most commonly used working memory test types in sentence-level processing since the RS test involves simultaneous processing and maintaining information (e.g., Alptekin & Erçetin, 2010). For RC performance, RS is considered a good predictor (e.g., Park, Nam, & Lee, 2016).

Various online measures were used to explain how written texts are cognitively processed, including think-aloud protocols and reading times. Think-aloud protocol, however, has its own limitations in that cognitive processing is less likely to be accessible at conscious level (Fox, 2009). In contrast, eye tracking is an appropriate method that observes how readers process written texts without interfering with their reading (e.g., Hyönä, Lorch, & Rinck, 2003; Just & Carpenter, 1980; Rayner, 1998). For instance, EMs provide temporal and spatial evidence about text processing, such as duration and frequency of fixations (Graesser, Millis, & Zwaan, 1997). Surprisingly few studies have incorporated eye movements (EMs) into reading and focused sentence-level comprehension, such as syntactic parsing (e.g., Hyönä et al., 2003; Jared, Levy, & Rayner, 1999). Taken together, the majority of studies on RS have focused on the end outcomes of reading process, namely RC scores (e.g., Park et al., 2016). Thus, the results cannot provide information how RS influences the reader's text processing while reading. Moreover, few studies have investigated the relationship of RS in L2 RC in discourse-level (e.g., Park et al., 2016). Therefore, the present study aims to provide converging evidence on the relationship of L2-RS and L2 RC performance by utilizing both online (eye-tracker) and offline (RC test) methodologies.

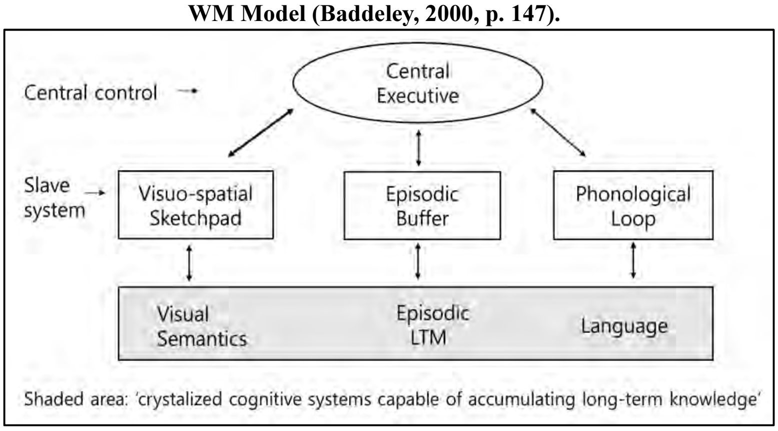
2. REVIEW OF THE LITERATURE

2.1. Working Memory

Baddeley (2003) defines working memory (WM) as "the temporary storage and manipulation of information that is assumed to be necessary for a wide range of complex cognitive activities" (p. 189). WM is similar to short-term memory (STM) in that it has limited capacity. WM, however, is different from STM in terms of information processing. For instance, STM requires simple storage, whereas WM involves processing and maintaining information concurrently (Conway et al., 2005). Specifically, WM is a combination of storage and processing of information consisting of four components: the central executive, phonological loop, visuospatial sketchpad, and episodic buffer (Baddeley, 2000, 2007). The development of the WM model is shown in Figure 1. The multicomponent system integrates new information with known information already encoded in long-term memory (LTM). The central executive has a limited capacity, so it manages the flow of information within the tightly confined processing system (Carroll, 2008). Thus, we humans are not good at doing several things simultaneously. Individuals, however, differ from one another in terms of the amount of information they can process at once.

WM can be measured by a variety of tests, including Digit Span, Reading Span (RS), Operation Span. Daneman and Carpenter (1980) argue that RS is good at explaining learner variation in reading since an RS test forces the participants to operate storage and processing functions simultaneously. It can be assumed that RS can be a good test that can explain individual differences in reading skills. Thus, the present study measured the students' WM by RS developed by Daneman and Carpenter (1980), and these two terms (WM & RS) will be interchangeably used later on.

FIGURE 1
WM Model (Baddeley, 2000, p. 147).



2.2. Reading Span and L2 Reading Comprehension

L2 Reading is a complex cognitive process, which requires various skills and knowledge, including word-decoding, syntactic skills, and vocabulary knowledge. Undoubtedly, L2 readers' sentence processing can be constrained by their limited linguistic competence. The availability of cognitive resources, for example RS, is closely associated with the speed and accuracy in reading comprehension (e.g., Engle, 2010). RS takes into account L2 learners' limited verbal ability in the L2. Thus, RS is considered a critical factor in explaining individual differences in overall reading skills (e.g., Daneman & Carpenter, 1980). For example, a reader with a large capacity in RS has more resources available for processing, which enables the reader to efficiently process and integrate information. The efficient processing leads to increases in accessibility of the information and subsequent processing (e.g., Alptekin & Erçetin, 2010; Cook, 1996).

The majority of RS research has recruited participants whose L1 and L2 share many similarities in syntactic and semantic features and focused on L2 comprehension at the sentence-level (syntactic comprehension). These studies, however, have led only to mixed results. While some found that those with a high-RS outperformed those with a low-RS (e.g., Coughlin & Tremblay, 2013; Miyake & Friedman, 1998; Sagarra, 2007; Sagarra & Herschensohn, 2010), others found no correlation between RS and L2 RC (e.g., Felser & Roberts, 2007; Juff, 2004). For example, Sagarra (2007) examined the relationship between L1-RS and sensitivity to gender agreement in Spanish by recruiting English learners of Spanish. The findings showed that those with a high-RS received higher scores than those with a low-RS on the test. Sagarra and Herschensohn (2010) also recruited English learners of Spanish and yielded similar results in which the high-RS readers outperformed the low-RS readers on the test. Likewise, Coughlin and Tremblay (2013) also confirmed the critical role of RS in processing L2 French number agreement by recruiting L1 English speakers. Conversely, Felser and Roberts (2007) yielded different results. Specifically, they found no significant differences in comprehending English *wh*-sentences between high and low-RS Greek learners. Recently, Park et al. (2016) investigated the role of L2-RS in L2 RC performance at the discourse-level by recruiting fifty Korean undergraduate students at a similar English proficiency level. The findings revealed a significant role of RS in L2 RC performance. Specifically, those with a high-RS performed better than those with a low-RS did, regardless of the types of RC questions, factual and inferential. The high-RS group also showed better retention than the low-RS group.

2.3. Reading Span and Eye Movements During Reading

A growing body of research has reported that EMs are closely associated with RC performance (e.g., Burton & Daneman, 2007; Carpenter & Just, 1983; Conway & Engle, 1996; Hyönä & Nurmine, 2006; Park, Choi, & Lee, 2012; Rayner, Sereno, & Ranyer, 1996). For instance, EMs illustrate what is happening during reading since the eye-tracker observes the reader's EMs on a moment-by-moment basis. EMs, therefore, can explain how RS affects the reader's text processing, which in turn leads to differences in RC performance. For instance, duration and frequency of fixations depend on the degree of text difficulty (Carpenter & Just, 1983). If the reader is not fluent or the text is difficult, the reader frequently moves back to earlier parts of the text to resolve the problem.

Calvo (2001) examined the role of RS in RC using an eye-tracker. Forty native Spanish college students were asked to find inferences in the four different contexts. The findings revealed that the high-RS readers had shorter fixation times and fewer rereading times in the last part of a sentence than the low-RS readers did. The high-RS readers appeared to initiate inferences earlier, which provided them with more time available for integrating information and comprehending implicit meaning in the text (Kintsch, 1988). Conversely, the low-RS readers who lacked resources were likely to experience considerable constraints on RS and thus have difficulty generating inferences (Kintsch, 1988).

Calvo's (2004) other study also found the role of RS significant in elaborative inferences. Specifically, the high-RS readers were better at making predictive inferences than the low-RS readers. EM observation showed that the high-RS readers had shorter fixations and fewer regressions than the low-RS readers did. It can be assumed that large capacity provides the reader with more resources and promotes deep processing.

Traxler, Morris, and Seely (2002) also examined the influence of RS in L1 relative clauses in terms of EMs. For the study, they manipulated the complexity of sentences with animacy and clause type (subject/object-relative clause). The findings revealed that the low-RS readers were more affected by syntactic complexity of object-relative sentences than the high-RS readers were.

Conversely, Traxler et al. (2012) found no substantial influence of RS in processing of English (L1) relative clauses. They found that the pattern of EMs was more influenced by reading speed rather than RS.

Taken together, we can only infer the relationship of RS in RC through students' RC performance. It is, therefore, important to use tools in such a way to observe what is happening during reading. Despite its apparent usefulness, few studies have focused on both text processes (EMs) and its outcomes (RC scores). Moreover, the majority of studies on RS have focused on L1 reading. To my knowledge, no previous studies have employed EMs in order to provide explicit information regarding the role of RS in L2 discourse-level reading. Eye-tracking methodology is a good way to observe reading processes in that it is non-intrusive and does not interfere with authentic reading processes. For instance, the eye-tracker appears as a normal computer monitor. Based on Park et al.'s (2016) study, the present study observes how RS affects L2 text processing in terms of EMs. It also probes the association between EMs and RC performance. The following are specific research questions:

1) Are there any differences between high- and low-RS groups in L2 RC performance?
2) Are there any differences between high- and low-RS groups in EMs while processing L2 text?
3) Are there any associations between EMs and RC performance?

3. METHODOLOGY

3.1. Participants

Forty-five native speakers of Korean (male = 22, female = 23) at a Korean university participated in the study. The students had studied English for more than 10 years through formal education, and their ages ranged from 19 to 28 (M = 23.21). The students' TOEIC scores ranged from 750 to 870 (M = 825.50, SD = 54.85), and none of them had been in English-speaking countries for more than one month. Thus, the students were homogeneous in terms of L2 educational background. They had normal or corrected to normal vision and were paid for their participation.

3.2. Materials

The present study used the same material used in Park et al.'s (2016) study, including the language background information questionnaire, L2-RS, and RC tests.

3.2.1. Language background information questionnaire

A language background questionnaire was constructed to collect the participants' background information. The questions incorporated into the questionnaire consisted of personal information as follows: age, gender, their age to start learning English, the number of years of English language study, and study materials on English.

3.2.2. Reading span test

Based on Park et al.'s (2006) study that L2-RS better predicts L2 RC performance, an L2-RS test was used which adapted the design of Daneman and Carpenter (1980). The RS test was comprised of five RS levels (5 sets per level), ranging from two and extending up to six. Each set contained four sentences, so a total of 100 unrelated sentences were generated (see Park et al., 2016 for details). Specifically, the number of words in the sentences ranged from eight to ten. The target words were nouns and were composed of two or three syllables. The word-frequency effect in the RS test was controlled using the British National Corpus (BNC). Based on frequency of occurrence in the BNC, the words belonged to the first 5,000 word families. By avoiding using words with similar meaning within each set, semantic relations of the target words were controlled. The students were instructed to recall the last word of the sentences in each set.

3.2.3. Reading comprehension test

The RC test was composed of forty-five multiple-choice questions based on fifteen texts with various topics, including animals, culture, and history (mean words per text = 120). Each text contained three questions, comprising main ideas, important details, and inferences.

Each text was presented on one screen in order to present natural reading conditions, which allowed the students to go back to and reread the previous parts when necessary. It is assumed that the low-RS readers needed more time for encoding, lexical access, and parsing, in comparison with the high-RS readers. Timed reading, therefore, was employed to observe how differently the students distribute their time and resources according to their RS. The reading time was set using a pilot study of five students at a similar proficiency level. The longest time needed to read the text was selected to ensure all participants had sufficient time.

3.2.4. Eye movement measures

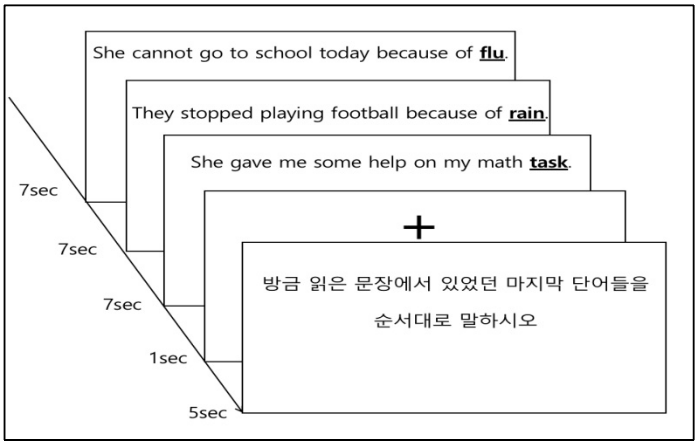
An eye-tracker was used while the participants were reading the texts to compare high- and low-RS groups in terms of L2 text processing. The eye-tracker was Tobii 1750, which is an infrared video-based tracking system combined with hyperacuity image processing. The texts were written in Times New Roman 24-point font with double-spaced lines within a slide of 1023 × 768 pixels (resolution = 1280 × 1024 pixels; gaze estimation frequency = 50 Hz). The color setting was inverted with white text on a black background on PowerPoint slides. The inverting color is easier to read since it makes the texts stand out. Each text was presented as a TIFF format on the computer screen.

To observe natural reading behavior without disruption, each text was presented on one screen. It allows the students to have a number of different options for resolving problems. For example, they may stay longer with the sentence containing difficulty, move on to the next sentence searching for clarification, or look back to related information. In addition, the texts were divided into three parts, five texts for each part, in order to minimize the potential effects of fatigue. AOI's (Areas of Interest) were used as a tool to select regions and to extract metrics for these regions separately. It included how much time the participant spent on first encounter of an AOI (first-fixation time: FFT), the total amount of time the participant spent on an AOI (total fixation time: TFT), how many fixations were counted (fixation count: FC), and how many times the region were revisited (second-fixation or regression time: SFT). The characteristics of the participants' EMs were determined by four measures: first-fixation time (FFT), total fixation time (TFT), second-fixation or regression time (SFT), and fixation count (FC).

3.3. Procedure

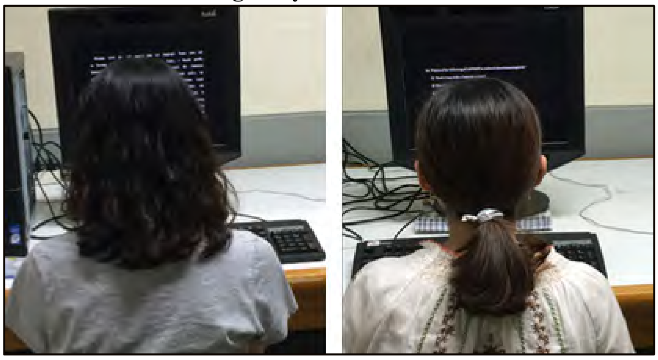
The data were collected individually in a quiet room. The average experiment time for each participant lasted about 70 minutes. After completing the background information questionnaire, the L2-RS test was administered to the students. Five practice trials were given prior to the actual RS test. Feedback on the accuracy of their responses was given to the participants in the practice session. To keep the participants from repetitive practicing in their minds, they were instructed to read out loud each sentence in the RS test at their own pace. Each sentence was presented for seven seconds. At the end of each set, a cross and then the word "recall" appeared on the screen. After then, the participants were instructed to recall the target words in the order in which they were presented. The researcher recorded their responses on answer sheets (see Figure 2). According to their RS scores, the students were divided into two RS groups: either a high-RS or a low-RS group. A five-minute break was given before the RC test in order to minimize the negative effects of fatigue on the RC test.

FIGURE 2
Sample of Reading Span Test



Before starting the RC test, the students were informed that their EMs would be recorded while they were reading the passages. The students were asked to minimize head movements during the reading. After calibration, the students were asked to start the test (see Figure 3). The same procedure was repeated at the beginning of each of the three parts of the RC test. The computer recorded their answer choices and the response times for the questions. According to the survey after the RC test, the reading time for each text was long enough for the participants to process the text.

FIGURE 3
Recording of Eye Movements



3.4. Scoring

For the RC test, each correct answer was given one point. For the RS tests, the participants were allowed to move to the next level as long as they correctly recalled more than three sets of target words at a particular level (the total set is five at each level). The test was stopped when the participants failed to correctly recall three sets of targets words at a level. If the participants correctly recalled two sets of target words at their final level, they received a half point. For instance, at the four-sentence level, if the participants recalled three sets of target words correctly, and at the five-sentence level, they recalled two sets of target words correctly, their RS would be 4.5. Specifically, Level 4 was taken as the participants' RS level and a half point was added to their RS score (Level 4 + .5 point). For the analysis of EMs, each sentence was considered as an Area of Interest (AOI), and EMs within sentences were–ignored (see Figure 4). For example, the FFT was computed by tallying all the single fixations on each text and then the FFT was averaged for each participant over each text during the first encounter. Similarly, the TFT was the mean of the AOI fixations across all fifteen texts. The SFT, the summed duration of fixations landing on the already read parts of a word in the text, was calculated by subtracting the FFT from TFT. The FC was the sum of the numbers of visits on the AOI in the texts. The mean SFT and FC were used for data analysis. The response time was also calculated. The unit of time used for the calculation was the millisecond (ms). The fixation indices mentioned above were computed for each AOI.

3.5. Data Analysis

Thirty-six students were included for the data analysis. Six students whose fixations on the texts were not observed properly were excluded. In addition, three students who received the lowest and highest scores from the EMs were excluded. A MANCOVA was conducted to examine the role of RS in RC performance and EMs. The students' level of RS (high and low) served as an independent variable, whereas the RC scores and the four types of EMs served as dependent variables. To control the effects of L2 proficiency, the students' TOEIC scores served as a covariate. Fixations shorter than 50 ms were excluded from the analyses. The magnitude of the main effect of RS was computed by Cohen's *d* (Cohen, 1988). Alpha level was set at .05 for all the statistical analysis.

4. RESULTS

4.1. Descriptive Statistics

Table 1 summarizes descriptive statistics of variables. The distributions of all the variables used for the research question were normal with skewness and kurtosis within ±2. The mean score of RS was 3.2 (*SD* = .8). Nineteen students who scored above the mean on the RS test were assigned to the high-RS group (*M* = 3.8, *SD* = .5), and seventeen students who scored below the mean were assigned to the low-RS group (*M* = 2.6, *SD* = .4). The correlations between the TOEIC scores and RS groups were satisfied (r = .42, p = .007). Thus, TOEIC scores were appropriate to use as a covariate.

FIGURE 4
Example of AOI Settings and EM Measures

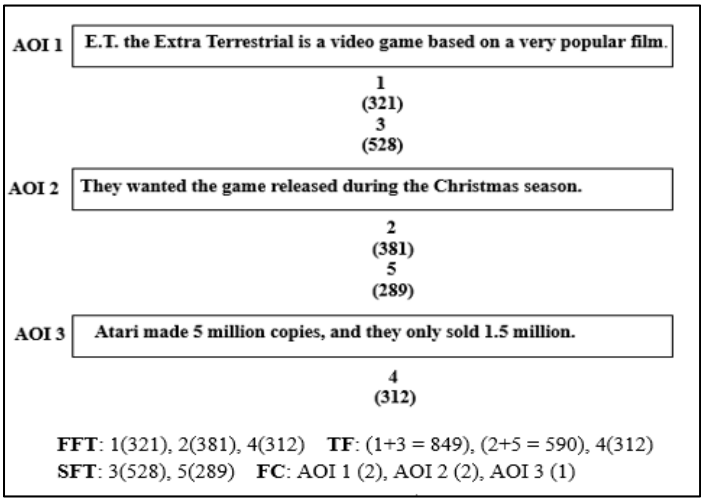


TABLE 1
Descriptive Statistics (*N* = 36)

Variable			Variable			Variable		
TOEIC Scores	*M*	816.3	FFT	*M*	309.7	Fixation Count	*M*	6.0
	SD	56.2		*SD*	75.35		*SD*	1.7
RS Scores	*M*	3.2	SFT	*M*	5395.1	Response Time	*M*	783.1
	SD	0.8		*SD*	444.7		*SD*	177.9
RC Scores	*M*	32.0	TTF	*M*	5756.8			
	SD	4.3		*SD*	430.4			

4.2. The Role of RS in L2 Reading Comprehension

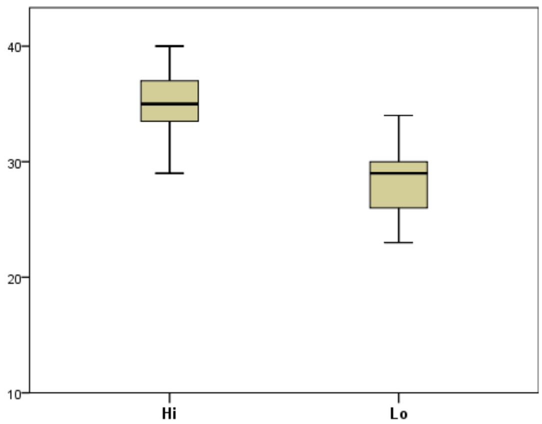
The high-RS group (*M* = 35.0, *SD* = 2.8) outperformed the low-RS group (*M* = 28.7, *SD* = 3.0) on the RC test, as shown in Figure 5. The results of ANCOVA revealed a significant main effect of RS on RC performance after controlling the students' proficiency: $F(1, 33) = 40.1$, $p < .001$, partial eta squared = .55 (see Table 2). The low-RS group (*M* = 860.3, *SD* = 201.9) spent more time answering questions than the high-RS group (*M* = 696.8, *SD* = 91.5), there was no significant difference between the groups: $F(1, 33) = 5.62$, $p = .024$, partial eta squared = .015.

TABLE 2
Comparing Mean RC Scores Between RS Groups

Variable		High	Low	*F*	*p*	*df*	*Partial eta squared*
RC	*M*	35.0	28.7	40.1	.00	33	.55
	SD	2.8	3.0				

Note. High: *N* = 19, Low: *N* = 16

FIGURE 5
Comparing Mean RC Scores Between RS Groups



4.3. The Role of RS in Eye Movements during L2 Reading

Levene's test and Box's test showed that the RS groups did not have significant differences in the four types of EMs. That is, the homogeneity between group variances in respect of EMs was met ($p > .05$). Thus, the assumptions of linearity, normally distributed errors, and uncorrelated errors were checked and met.

The results of MANCOVA analyses showed significant differences between the groups in the TFT and SFT, as shown in Table 3. In the TFT, the low-RS group ($M = 5949.2$) spent longer time than the high-RS group ($M = 5592.9$), with significance: $F(1, 33) = 8.61$, $p = .006$ partial eta-squared = .21. In the SFT, the low-RS group ($M = 5638.3$) also spent longer time than the high-RS group ($M = 5297.4$), with significance: $F(1, 33) = 8.55$, $p = .006$, partial eta squared = .21. Conversely, there were no significant differences between the groups in the FFT: $F(1, 33) = .99$, $p = .33$, partial eta squared = .03, as shown in Figure 6. The low-RS group ($M = 310.9$) spent more time than the high-RS group ($M = 294.5$). In the FC, the low-RS group ($M = 6.4$) showed more frequent EMs than the high-RS group ($M = 5.6$), but there was no significant difference: $F(1, 33) = 2.02$, $p = .17$, partial eta squared = .06.

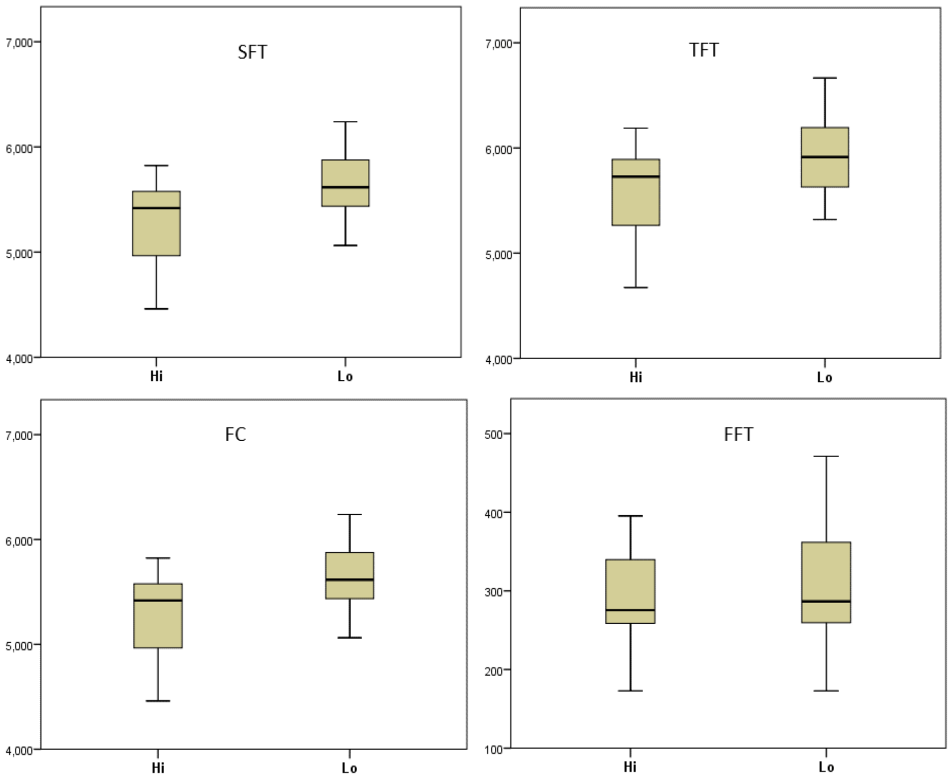
TABLE 3

Comparing Mean Scores in Eye Movements Between RS Groups

		High	*Low*	*df*	*F*	*p*	*Partial eta squared*
FFT	*M*	294.5	310.9	33	.99	.33	.03
	SD	67.5	106.2				
TFT	*M*	5592.9	5949.2	33	8.61	.006	.21
	SD	440.1	524.5				
SFT	*M*	5297.4	5638.3	33	8.55	.006	.21
	SD	428.0	464.3				
FC	*M*	5.6	6.4	33	2.02	.17	.06
	SD	1.5	2.8				

Note. High: $N = 19$, Low: $N = 16$

FIGURE 6
Comparing Mean Scores in EMs Between RS Groups



Note. *Time unit: *ms*

A Pearson product-moment correlation was computed to examine the relationship between the RC scores and the four types of EMs. A strong negative correlation was found between the RC scores and SFT: r = -.339, p = .043, as shown in Table 4. RC scores showed marginal correlations between TFT (r = -.324, p = .054) and FC (r = -.322, p = .056). The findings indicate that individual differences in RC scores can be explained by the patterns of EMs. The findings also showed that a strong relationship between the response time (RT) and RC scores, r = -.3.98, p = .016.

TABLE 4
Correlations Between RC and Patterns of EMs

		RT	FC	FFT	SFT	TFT
RC Scores	r	-.398	-.322	-.038	-.339	-.324
	p	.016	.056	.825	.043	.054

4. DISCUSSION AND CONCLUSION

The present study examined whether there are differences between the high-RS and low-RS groups in text processing by making a link between EMs and RC performance. While offline measures showed outcomes of processing (RC scores), online measures (EMs) displayed information regarding the time course of text processing. First, the findings showed that the high-RS group outperformed the low-RS group on the RC test, with significance. The result indicates that a large RS allows the readers to retain more information in memory while processing L2 text. If L2 learners are capable of processing information fast and efficiently, they can have more resources available for maintaining information in memory. Accordingly, their integration of information are more likely to be thorough (Just & Carpenter, 1980). Processing L2 texts may be a complex and challenging task for L2 readers. Even more so for those with a low-RS, especially considering the fact that L2 readers are unfamiliar with linguistic features of L2 and have not yet developed automaticity in L2 processing. For successful comprehension, it is essential for L2 readers to efficiently allocate resources in activating lexical representations and integrate them into developing syntactic and discourse representations.

The role of RS in RC performance can be accounted for by the patterns of EMs. For instance, the low-RS group needed more time than the high-RS group for the initial encoding. The low-RS group also spent more time looking back previous parts of the text. These differences between the two groups in the patterns of EMs in L2 reading support Traxler et al. (2012). Despite their longer fixations and frequent fixation moves, the low-RS group received lower RC scores compared to the high-RS group. These results suggest that the low-RS group used their resources in word-by-word processing rather than global understanding (e.g., Burton & Daneman, 2007). That is, an increase in the processing demands resulted in a decrease in storing items for the RC test, especially for the low-RS group (e.g., Alptekin & Erçetin, 2010; Graesser et al., 1997; Kintsch, 1988). When cognitive resources are overloaded, readers are required to reorganize their processes. Otherwise, information will be lost and processing will be disrupted. Presumably, those with a large RS are less likely to be affected by increases in complexity of cognitive processing. These findings indicate that using online measures (EMs) can be a good method to detect how readers process information during reading. It appears that individual variation in the patterns of EMs during text processing is influenced by RS and can provide the evidence how and why reading skills differ across L2 readers.

Reading involves complex cognitive processes. The key to successful RC requires activation of relevant prior information and reprocesses of some segments to build coherent construction in meaning. It is also critical for readers to effectively distribute resources for various processes. It is assumed that the variability in duration and frequency of eye fixations is closely related to cognitive processes (e.g., Rayner, 1998). Based on the claim, the present study attempted to provide converging evidence about how RS affects L2 RC performance by employing two measures, text processing (EMs) and outcomes (RC tests). Second, the high-RS group had shorter fixation times and received higher RC scores than their counterpart. These findings indicate that their effective time management skills during the timed reading test may help them accurately retain the content of the texts (e.g., Alptekin & Erçetin, 2010; Conway & Engle, 1996). Based on the findings, observing online processing using an eye tracker can be a useful method to bridge the gap between text processing and its outcomes, namely RC scores.

The present study makes a unique contribution to understanding the role of RS in terms of L2 processing and RC performance. Some limitations, however, merit discussion. First, the number of participants in the study are rather small. Further research with larger sample sizes is needed. Second, EM measures might offer complementary rather than definitive evidence. Using sentence-level measures of eye behavior might not optimally capture effects of RS on L2 reading. Third, the findings need to be generalized with caution in that reading can be influenced by numerous variables, including anxiety, strategy, and linguistic knowledge.

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APPENDIX

Sample Sentences of Reading-Span Test

2- Sentence
- I am not hungry because I had some **noodles**.
- During this weekend, I will work in the **garden**.

3- Sentence
- She cannot go to school today because of **flue**.
- They stopped playing football because of **rain**.
- She gave me some help on my math **task**.

4- Sentence
- She was supposed to bring the story **book**.
- She opened the heavy wooden door in the **cabin**.
- The woman dressed in blue is my favorite **aunt.**
- I found it difficult to finish the work in two **hours**.

5- Sentence
- The man is the best-trained person for the **project**.
- She really wanted to marry the man of her **dream**.
- All the evidence suggests that he stole the **money**.
- Play is essential for animals to develop social **skills**.
- She loves to chat with her friends over the **phone**.

6- Sentence
- People arrived to see the famous vocal band **group**.
- They continued their trip despite the cold **weather**.
- He developed his housing project within the **year**.
- When he was young, he used to walk to **school.**
- Many people joined in creating the modern **bike**.
- Using the right brush is important for your **teeth**.

Application levels: Tertiary

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Received on December 1, 2017
Reviewed on January 15, 2018
Revised version received on January 30, 2018