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The Effects of Extensive Reading, Timed Reading, and Repeated Oral Reading on Japanese University L2 English Learners' Reading Rates and Comprehension over One Academic Year

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Abstract

The effects of extensive, timed, and repeated oral reading on 101 lower-intermediate Japanese university L2 English learners' reading rates and comprehension were investigated over one academic year. The participants were divided into four quasi-experimental groups: (a) Group 1 did extensive, timed, and repeated oral reading with prosody and chunking training; (b) Group 2 practiced extensive and timed reading; (c) Group 3 did extensive reading only; and (d) Group 4 did not receive any reading fluency treatments. Three different texts of varying length and difficulty were used to measure reading rate at three times during the year. The results indicated that all three reading fluency treatment groups made statistically significant reading rate gains on the three measures while maintaining comprehension. Notably, Group 1, the group that received the most wide-ranging treatment, outperformed the other groups. Therefore, this study underscores the importance of taking a comprehensive approach to developing reading fluency in L2 contexts.

Keywords: reading fluency, extensive reading, timed reading, oral reading, repeated reading, reading rate, reading comprehension

In this modern digital age, a wealth of textual information is readily available to second language (L2) learners, and for many, L2 reading is an integral part of their daily lives. Thus, improving L2 reading fluency is crucial because fluent readers are afforded numerous advantages; one of which is efficiency. Faster reading enables readers to process greater amounts of information at faster speeds, saving them time and mental energy. Moreover, fluent reading facilitates L2 learning because rapid processing of large quantities of texts provides learners with more linguistic input necessary for L2 development (e.g., Grabe; 2009; Nation & Waring, 2020). Furthermore, proficient readers benefit from affective advantages associated with fluent reading such as increased understanding, motivation, and enjoyment (e.g., Nuttall, 1996; Takase, 2007). When taken together, learners can experience more confidence and competency in L2 reading tasks. Therefore, reading fluency offers a key to success in L2 learners' academic, professional, and personal aspirations.

Comfortable first language (L1) reading speeds have been measured around 300 words per minute (wpm) (Carver, 1990), and L2 reading experts have recommended a pedagogical goal of 200–250 wpm for L2 readers (Anderson, 2008; Nation & Malarcher, 2007a). Unfortunately, many intermediate-level L2 learners of English are not fluent L2 readers with reading speeds of less than 100 wpm prior to a reading fluency treatment (Beglar et al, 2012). Moreover, reading speeds of less than 100 wpm often hinder comprehension because it taxes working memory during the reading process (Nation, 2005).

Japanese learners of English are no exception to slow reading speeds in their L2 linguistic development. While much of their non-fluent reading can be attributed to the prevalence of grammar-translation and intensive reading in secondary educational contexts in Japan (Kikuchi & Browne, 2009), another major reason is that reading in English is an inherently complex cognitive activity. Besides orthographic differences between English and Japanese, English spelling can be opaque with irregular sound-letter correspondences. Moreover, the theory of automatic information processing in reading contends that reading requires the rapid and complex synchronization of many mental processes that must be executed simultaneously and automatically (LaBerge & Samuels, 1974). Despite an urgent need for comprehensive reading fluency training, it is often neglected in L2 curriculums and warrants further research (Grabe & Stoller, 2020). Hence, the main purpose of this study is to investigate the effects of extensive, timed, and repeated oral reading on Japanese L2 university learners' reading rate and comprehension over one academic year.

Literature Review

Defining Reading Fluency

Reading fluency is reading with speed, accuracy, ease, and sufficient comprehension while also employing appropriate prosody when reading aloud (Grabe, 2009). This is the product of a complex coordination of cognitive processes, starting with bottom-up processes. At the most fundamental level, readers must carry out sublexical processes necessary for decoding and word recognition, which requires knowledge of and rapid access to the orthographic, semantic, and phonological features of words (Perfetti & Hart, 2002). Reading experts agree that these bottom-up processes must be automatized for proficient reading (Birch & Fulop, 2020; Perfetti & Hart, 2002). Automatization is a significant shift in mental processing, and the performance benefits include a decrease in error rate, reaction time, cognitive effort, and interfering stimuli with an increase in concentration, focus, and performance (Breznitz, 2006; DeKeyser, 2007). Thus, automatization is the cornerstone for fluent reading because it frees up cognitive resources for higher-order processes such as utilizing background knowledge, making inferences, and evaluating the text (Grabe, 2009; LaBerge & Samuels, 1974).

L2 Reading Rate Studies

Extensive reading. L2 reading fluency literature has reported various ways learners' reading rates have been developed. One way has been through extensive reading (ER), where learners read

large quantities of highly comprehensible texts on topics of interest to develop fluency and a sustainable reading habit. Prior studies have shown the benefits of ER on reading rate. A primary example in the Japanese context has been conducted by Beglar et al (2012) who examined first-year Japanese university English learners and found mean reading rate gains of 8.02 (89.71→97.73 standard words per minute [swpm]), 12.84 (94.50→107.34 swpm), and 16.84 (103.09→119.93 swpm) swpm (a standard word is one unit that consists of six adjacent letters, spaces, or punctuation [Carver, 1990]) over one academic year for treatment groups that read 136,029.07, 158,993.56, and 200,170.00 standard words, respectively, through pleasure reading.

Similar reading rate gains were shown by Huffman (2014) who found that first-year Japanese university students increased their reading rate by 20.73 swpm (110.59→131.33 swpm) after processing 80,202 standard words through ER over one semester. Moreover, Sakurai (2015) found comparable one-semester gains of 12.74 wpm (101.12→113.86 wpm) over one semester with first-year Japanese university students who read 99,793.51 words.

Repeated reading. Another activity that has been shown to benefit reading rate is repeated reading (RR), in which learners read the same passage repeatedly in an effort to automatize word recognition, which leads to increased comprehension. Among Japanese university learners, RR has been shown to effectively increase both rate and comprehension. For example, Taguchi and Gorsuch (2002) used RR with first-year Japanese students over 10 weeks. Eight graded readers divided into 28 segments (≈10,220 words) over 28 sessions were used. Each segment was read seven times during a session and read once more at the start of the next session. Students recorded their reading time on their initial reading of a passage, and it was followed by assisted RR (audio supported RR) three times as well as three silent repeated readings. The control group read a range of passages with varying difficulty at their own pace. They found that the RR group outperformed the control group by making a significant within-subjects rate gain of 40.25 wpm (113.25→153.50 wpm) from the pretest to the posttest compared to a non-significant gain of 10.49 wpm (115.70→126.19 wpm) for the control group. Comprehension increased significantly for both groups.

Timed reading. Yet another effective way to improve reading rate has been via speed reading or timed reading (TR). TR is where learners concentrate on increasing their reading rate with mild time pressure by routinely reading short passages of similar length and difficulty and answering comprehension questions. Using passages where students know most of the vocabulary, such practice augments focus and concentration. It also encourages learners to read smoothly without using a dictionary during the process and make fewer reading regressions. Large rate gains have been observed through TR. Chung and Nation (2006) found gains of 73→132 wpm on multiple measures over nine weeks with Korean first-year university students. Chang (2010) used TR once a week for 13 weeks with Taiwanese university students and found that the TR group made a significant rate gain of about 29 wpm (118→147 wpm) while the comparison group only gained about 7 wpm (124→131 wpm). A six-month speed reading course has been shown to be beneficial on reading rate and general reading comprehension in the Japanese high school context (Underwood et al, 2012). Fifty-one out of 105 tenth graders were randomly assigned to an experimental group and did timed reading twice a week using *Reading for Speed and Fluency 1* (Nation & Malarcher, 2007a). The results indicated that experimental group decreased their

reading time by an average of 47 seconds (first three readings: *M* = 173 seconds; last three readings; *M* = 125 seconds, or 104→144 wpm).

The differential effectiveness of reading fluency treatments has also been investigated. Chang (2012) found that TR four times a week was more effective in producing faster reading rates when compared to a repeated oral reading (ROR) treatment twice a week with adult learners over 13 weeks. The TR group gained about 50 wpm (102→152 wpm) after reading 52 passages silently (≈16,800 words) while the ROR group gained about 23 wpm (83→106 wpm) after reading 26 passages (≈39,000 words) up to five times in various ways; however, none involved time pressure. The results suggest that the time pressure in TR facilitated the rate gains over the number of words read. However, when comparing TR and silent RR with Taiwanese university learners over 13 weeks, Chang and Millet (2013) found that the RR group who read TR passages five times per session (≈39,000 words) had faster reading rates and made more gains by the end of the treatment period compared to the TR group who read approximately 7,800 words. RR participants increased their reading rate by 47 (103→150 wpm) and 45 wpm (102→147 wpm) for practiced and unpracticed texts, respectively, while the TR group increased by 13 (107→120 wpm) and 7 wpm (102→109 wpm). While the superiority of one treatment over the other seems inconclusive, the difference in the amount of text read by the groups in these two studies varied greatly. The ROR group in Chang (2012) read a little more than twice the amount of the TR group but did not outperform the TR group. In contrast, the RR group in Chang and Millet (2013) read almost five times more than the TR group, resulting in greater rate gains. These results suggest there might be a threshold at play where the number of words read outweighs the type of fluency treatment being used.

Researchers have also employed combinations of reading fluency treatments to further optimize reading rate. Ellis (2016) used TR, RR, and ER with Japanese tenth-graders over one academic year. TR was done twice a week with a total of 50 passages read and one repeated reading was done for each passage. An average of 20.52 books were read through ER. The results indicated a 49 wpm gain from Term 1 to Term 2 (170→219 wpm) and a 12 wpm gain from Term 2 to Term 3 (219→231 wpm) for a total gain of 61 wpm over the year.

McLean and Rouault (2017) provided further evidence of the effectiveness of coupling reading fluency treatments. Examining first-year Japanese university students over one academic year, two groups were compared: One did ER while the other did grammar-translation and intensive reading. Both groups did TR twice a week. The ER group had a gain of 30.96 swpm (99.38→130.34 swpm) after reading 107,964.04 words while the grammar-translation group read 16,464 words and gained 5.26 swpm (97.79→103.05 swpm), showing that ER coupled with TR is more efficacious in improving reading rate than TR and grammar-translation.

Oral reading (OR) has received more attention in the field lately as L2 reading experts have argued for the practice of OR and ROR in order to facilitate fluent reading with prosody (Grabe, 2010; Nation, 2005). Despite some resistance to the practice of OR in L2 classrooms by practitioners (Gibson, 2008), for Japanese L2 learners, OR is beneficial because it provides elementary and intermediate learners with a feel for the prosody and rhythm of English (Takeuchi, 2003). Moreover, by practicing prosody through OR, learners can become more conscious of how content and function words can be grouped into meaningful and rhythmic

phrases or chunks. When learners are given texts with slashes that separate a sentence into chunks, this technique has been shown to enhance fluency (Kadota et al, 1999; Yamashita & Ichikawa, 2010).

The effectiveness of using both ROR and TR with first- and second-year Japanese university students over one semester has also been demonstrated (Shimono, 2018). Group 1 received two types of reading fluency treatments—two TR passages per week and each passage was reread twice orally with chunking and prosody practice. Group 2 did three TR passages per week. Using four scoring methods of reading rate, Group 1 made statistically significant gains ranging from 12.58 to 27.35 swpm while Group 2 also made significant gains ranging from 15.42 to 26.63 swpm. Posttest between-subjects measures revealed that both treatment groups outperformed the comparison group, but no difference was found between the treatment groups' reading rates.

The Current Study

Gaps and Purposes

A large body of the L2 reading fluency research has shown how independent treatments of ER, TR, and ROR are effective in facilitating reading fluency gains. However, there have been numerous design inadequacies in previous research. First, few researchers have employed combinations of treatments leading to a paucity of empirical evidence in this area. Second, most studies have been limited to one semester. Third, the design and reading rate measurement in past studies have been lacking. Some studies did not measure comprehension (e.g., Chung & Nation, 2006) or did not have a control/comparison group (e.g., Chang, 2012). Nearly all past reading fluency studies did not carry out task acclimation procedures where participants are given several practice readings prior to the treatment and reading speeds of those passages are not used to assess initial reading speeds. Thus, past reported rate gains might be inflated. Fourth, reading rate has not often been measured using swpm; reading rate figures measured in standard words are often about 15% lower than wpm measurements (Beglar & Hunt, 2014). Fifth, unlike the current study, past studies have not strictly controlled for passage length for TR treatment passages or pre- and posttests in swpm nor have they strictly regulated lexical coverage according to word-frequency levels, making past measurements less reliable. Finally, prior studies have not often differentiated between the genre or type of reading passage being measured.

Therefore, in addition to addressing the design and measurement inadequacies of past studies, the primary purpose of the study is to compare the reading rate and groups that receive various reading fluency treatments over one academic year.

Hypotheses

Four quasi-experimental groups were created for this study. Group 1 did a combination of three reading fluency activities: ER, TR, and ROR with chunking and prosody practice (henceforth, the OTER group [Oral-Timed-Extensive Reading group]). Group 2 did ER and TR (henceforth, the TER group [Timed-Extensive Reading group]). Group 3 did ER only (henceforth, the ER

group [Extensive Reading group]). Finally, Group 4, the comparison group did speaking, listening, and other communication-based tasks. Therefore, two hypotheses were posed:

> Hypothesis 1: The three reading fluency treatment groups (OTER, TER, and ER) would make significant reading rate increases on the three different texts on the posttests while maintaining adequate comprehension levels over one academic year. The comparison group would not make significant reading rate gains.
>
> Hypothesis 2: The three reading fluency treatment groups would read significantly faster than the comparison group while maintaining adequate comprehension on the posttests. Additionally, the OTER and the TER groups would read significantly faster than the ER group because they received TR treatments which specifically target increasing reading rate. Because the OTER and TER groups' treatments and time on task were similar, no significant reading rate differences would be found between them.

Method

Participants

The participants were 101 (54 males; 47 females) first- and second-year, lower-intermediate Japanese students from a middle tier private university in Japan. Their ages ranged from 18–21 years old. All participants' L1 was Japanese, and they had at least six years of formal English education.

The participants were sampled from four intact classes and formed four quasi-experimental treatment groups: OTER group (n = 26); TER group (n = 25); ER group (n = 25); and the comparison group (n = 25). Members of the three treatment groups were English majors. The OTER and ER groups consisted of first-year students, and TER group members were second-year students. The English department streamed classes according to TOEIC Bridge scores resulting in six classes leveled according to proficiency. The OTER group was the fifth highest class (TOEIC Bridge: M = 134.26; SD = 2.90), and the ER group was sixth highest for first-year students (TOEIC Bridge: M = 127.04; SD = 2.95). The TER group was the fifth highest class for the second-year students (TOEIC Bridge taken as first-year students: M = 138.08; SD = 7.15; standard TOEIC listening and reading: M =388.40; SD = 54.50). The comparison group members belonged to non-English departments (TOEIC Bridge: M = 132.04; SD = 15.42). A TOEIC Bridge score of 120, 130, and 140 is roughly equivalent to 310, 345, and 395, respectively, on the standard TOEIC listening and reading test (Educational Testing Service, 2016).

The researcher, who is North American, taught the OTER, TER, and comparison groups which met once a week for 90 minutes. The ER group was taught by a bilingual Japanese teacher.

Operationalizing Reading Fluency

A central measurement in operationalizing reading fluency is the total performance time of the reading task (Breznitz, 2006). Another important measurement is reading comprehension. Reading experts have agreed that a criterion of 70% on multiple-choice measures constitutes sufficient comprehension under fluent reading conditions (Anderson, 2008; Nation, 2005).

Dependent Variable Reading Rate Measures for the Pretest/Posttests

Reading rate was measured by three sets of passages: (a) anchor passages; (b) academic passages; and (c) ER passages.

Anchor Passages

This set consisted of the two passages taken from *Reading Power* (Mikulecky & Jeffries, 2005) and the participants' reading rate was determined by the average rate of these passages on each test time. Both passages were modified to have almost exactly 200 standard words each with eight comprehension questions. These passages are called the anchor passages because the same readings were used for the pretest and posttests, and the purpose of these passages was to keep the measurement of reading rate internally consistent and reliable. While the comprehension items remained the same on each measure, the order of the questions was randomized on each testing occasion.

Academic Passages

These TR passages consisted of three sets (A, B, and C) in which each set contained two reading passages with eight comprehension questions per passage. A participant's reading rate was determined by averaging their reading rate of the two passages of each set per test time. The passages were adapted and modified from the reading comprehension tests used in Burrows (2012). These passages differed from the anchor passages in that they were slightly longer (≈250 standard words each), moderately more difficult in terms of readability statistics, and the themes were more academic in nature. The three sets were arranged to be approximately equal in difficulty and were randomly distributed and counterbalanced during the testing periods.

ER Passages

To assess reading rate under ER conditions, the participants were instructed to read a graded reader book for 20 minutes in class. Three books from Oxford Bookworms, Level 1, were randomly distributed and counterbalanced. Participants were told to read as much as they could and after 20 minutes, they indicated the last word they read. Twenty-five comprehension questions that covered the entire graded reader story were then given. There were seven chapters in the books with at least three questions per chapter. To prevent random guessing, participants were told that the questions were ordered chronologically according to the story and instructed to answer only the questions up until where they finished reading. See Table 1 for the word count and readability statistics for the anchor, academic, and ER passages.

Table 1
Word Count and Readability Statistics for the Dependent Variable Reading Passages

Passage Type/Passage Name	Number of standard words	Flesch-Kincaid Reading Ease	Flesch-Kincaid Grade Level
Anchor Passages			
Alaska: Animals Everywhere	200.17	77.1	5.1
A Taste of Brazil	200.00	69.5	5.9
Academic Passages			
Email at Work (Set A)	250.00	71.5	6.5
America's Use of Nuclear Weapons (Set A)	250.00	62.8	8.0
The Coca-Cola Company (Set B)	250.33	60.8	8.0
The Mayans (Set B)	249.83	71.0	6.1
The Human Body (Set C)	250.33	65.6	7.8
The USA Space Program (Set C)	249.83	56.7	8.0
ER Passages			
The Lottery Winner (Border, 2008)	4,959.67	86.0	3.1
Goodbye Mr. Hollywood (Escott, 1997)	4,567.00	92.3	2.2
Remember Miranda (Akinyemi, 1996)	4,441.17	90.4	2.5

Vocabulary Profile of Pretest/Posttest Passages

Both the anchor and academic passage sets were modified to have 98% coverage from the first 2,000 most frequent words according to the British National Corpus-Corpus of Contemporary American English (BNC-COCA) plus proper nouns. Words outside the 2,000 most frequent words, excluding loan words, were glossed with Japanese translations. ER passages were not modified lexically, but the lexical coverage was predominantly from the first 2,000 frequent words.

MReader

MReader (n.d.), an online module, was used to confirm that participants read and comprehended the graded readers for ER. MReader tracked the books read, number of words read, and quizzes passed. They earned credit for the number of words read from a novel by taking an open-book quiz. Most quizzes had 10 questions with a 15-minute time limit. Participants who achieved a score over 60% passed the quiz. Those who failed did not receive credit for the number of words in the book. They were encouraged to read novels at or below their current level. Some ER was done during class time, but most was done outside the classroom. The spring and fall semester reading goals are illustrated in Table 2.

Table 2
ER Goals for One Academic Year

Semester	Week 4 deadline (number of words)	Week 9 deadline (number of words)	Week 14 deadline (number of words)
First Year – Spring Semester	20,000	50,000	80,000
First Year – Fall Semester	60,000	90,000	120,000
Second Year – Spring Semester	70,000	105,000	140,000
Second Year – Fall Semester	80,000	120,000	160,000

ER Reading Amount for Each Reading Fluency Group

The number of words each of the reading fluency treatment groups read through ER for the first semester, second semester, and the yearly total is noted in Table 3. The TER group read the most because they were second-year students and had higher word targets. The OTER and ER participants were first-year students, so their reading amounts were similar.

Table 3
Descriptive Statistics of the Total Number of Words Read via ER Over One Academic Year

Group/Semester	*M*	*SD*	*95% CI*
OTER			
1st semester	100,531.39	47,289.77	[81,430.63, 119,632.14]
2nd semester	166,171.96	49,995.11	[145,978.50, 186,365.42]
Yearly total	266,703.35	86,094.23	[231,929.14, 301,477.56]
TER			
1st semester	169,759.12	35,765.04	[154,996.04, 184,522.20]
2nd semester	182,729.84	63,505.70	[156,515.98, 208,943.71]
Yearly total	352,488.96	81,128.74	[319,000.66, 385,977.26]
ER			
1st semester	108,212.68	29,412.81	[96,071.67, 120,353.69]
2nd semester	155,984.00	33,004.66	[142.270.35, 169,517.65]
Yearly total	264,106.68	51,372.43	[242,901.18, 285,312.18]

TR Treatment Period Practice Passages for the OTER and TER Groups

A total of 60 passages were used with eight comprehension questions per passage. Twenty-five passages from *Reading Power* (Mikulecky & Jeffries, 2005), 11 fables from *Basic Reading Power 1* (Jeffries & Mikulecky, 2009), three selected passages from each of the eight chapters of *Reading for Speed and Fluency: 1* (Nation & Malarcher, 2007a), and one passage from *Reading for Speed and Fluency: 2* (Nation & Malarcher, 2007b) were used for the TR training materials during the treatment period for the OTER and TER groups. These passages were selected because they used vocabulary predominantly from the first 2,000 most frequent English words, suitable for the participants (see below for the vocabulary sizes of each group). All passages were modified to make the length, difficulty, and vocabulary profile consistent with each other.

Vocabulary Size Test

The first six levels of Nation and Beglar's (2007) Vocabulary Size Test (monolingual, 14,000 version) was used to estimate the participants' written receptive vocabulary size for the purpose of selecting suitable reading materials. The vocabulary sizes for the OTER, TER, ER, and comparison groups were 3,412.00 (*SD* = 534.10), 3,428.00 (*SD* = 414.85), 3,184.00 (*SD* = 395.47), and 2,972.00 (*SD* = 503.75), respectively.

Procedures

This study was conducted over one academic year (two 15-week academic semesters) for a total of 30 weeks. The treatment period lasted 10 weeks during each of the spring and fall semesters for a total of 20 weeks. The participants were informed of the purposes of the study and signed consent forms for their data to be used and could withdraw their data at any time. They were also assured that confidentiality would be maintained.

Data was collected three times during the academic year. Once at the beginning of the year before the commencement of the treatment (pretest), once at the end of the first semester (posttest 1), and once at the end of the second semester (posttest 2). Two task acclimation TR practice passages were given prior to administering the reading rate pretests. See Table 4 for an outline of the procedures.

Table 4
Procedure for the Quasi-experimental Groups During the Academic Year of an ER Course

Week	Activity
	First Semester
1	Introduction to the study
2	Consent forms signed; ER pretest; TR acclimation passages; Vocabulary size test
3	TR pretests
4	10-week reading fluency treatment (OTER and TER groups only)
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	ER posttest 1
15	TR posttests 1
	Summer Break
	Second Semester
1	10-week reading fluency treatment (OTER and TER groups only)
2	
3	
4	
5	

6	
7	
8	
9	
10	
11	TR posttests 2
12	ER posttest 2
13	Winter Break
14	
15	Conclusion of the study

OTER Group

This groups' treatment consisted of using MReader (n.d.) for ER throughout the year. In addition, two consecutive TR passages with comprehension questions were administered every week. A total of 40 TR practice passages were read over the school year, 20 per semester.

For the TR activity, the participants were told to try to read as fast as they could but not at the expense of losing comprehension. Answering at least six out of eight (75%) comprehension questions correctly was the goal. If they answered fewer than six questions correctly, they were instructed to read more carefully on the next set of passages. In contrast, the participants were encouraged to push themselves to read even faster the next time if they achieved a perfect comprehension score.

Before the TR passages were administered, the participants were instructed to look at their reading times and comprehension scores from previous passages and encouraged to improve on their reading speed while maintaining optimal comprehension. After the instructor distributed the passages, the participants were told to start their stopwatch and begin reading. After finishing, they pushed the stop button and recorded their reading times at the bottom of the page. They proceeded to answer the comprehension questions on the other side of the page without referring back to the passage. The instructor monitored the participants so that they would not reread sections. Finally, they calculated and recorded their reading speeds and comprehension scores on a graphic organizer.

Afterwards, the ROR procedure commenced which included chunking and prosody training designed to enhance reading fluency. The instructor handed out the same two TR passages except the texts were marked with forward slashes that separated 3–5 word phrases/thought-groups. These slashes were designed to help the participants see where they should chunk words together. The instructor then read the passage aloud. After each chunk, the participants repeated the phrase and were encouraged to mimic the prosody of the instructor. This included the intonation, rhythm, stress, pronunciation, and speed. Feedback was given throughout to heighten the participants' awareness regarding how to improve on their oral readings. In addition, they were encouraged to mark intonation patterns with up and down arrows, circle stressed words and syllables, notate connected speech, and use hand gestures to illustrate the rhythm. After one choral reading with the instructor, the participants were told to reread the passages orally with a partner. While one partner was reading aloud, the other partner listened and peer-assessed the

oral reading performance in terms of intonation, rhythm, stress, pronunciation, and appropriate speed. The total time for this TR and ROR treatment took about 30 minutes out of the 90-minute class.

TER Group

The treatment for this group was ER using MReader and three consecutive TR passages per week with comprehension questions. The TR procedure was the same as the OTER group except there were no ROR. In an effort to counterbalance time on task, the TER group received 20 additional TR passages compared to the OTER group during the treatment period. Thus, 60 TR passages were read throughout the year, 30 per semester. Each session took about 20 minutes.

ER Group

This group did ER using MReader as well as developing reading skills and strategies. Reading activities for this class included in-class sustained silent reading, worksheets for graded readers, discussion groups for the stories, as well as presentations and dramatizations of the books they read. These activities were also done by the OTER and TER groups as part of the curriculum.

Comparison Group

The participants in this group did not receive any reading fluency treatments during their class period. Instead, they focused on basic L2 communicative functions with an emphasis on speaking and listening. Pronunciation practice was also done, but mainly on the segmental aspects of English.

Data Analysis

Hypothesis 1. To assess changes for within-subjects reading rates over one academic year, one-way repeated-measures ANOVAs were conducted for each group and for each set of reading passages. Because there were four groups and three sets of reading passages, a total of 12 repeated-measures ANOVAs were performed with the factor as time and the dependent variable as reading rate for the three sets of reading passages operationalized in swpm.

The assumptions of normality and outliers were checked. Because ANOVAs are robust against violations of non-normal distributions (Field, 2009, p. 360), when violations occurred, the multivariate Pillai's Trace was interpreted because it is the most robust to violations of assumptions, especially when sample sizes are equal (Field, 2009, p. 605). Furthermore, *z*-scores were tabulated for each set of reading passages to check for outliers and such cases were replaced with a 3.29 *z*-score equivalent (Tabachnick & Fidell, 2013), which only occurred once for a participant in the ER group.

Hypothesis 2. A comparison of pretest reading rates was performed to check for initial differences in reading rate between the groups. A MANOVA was run with the treatment groups as the independent variable and the pretest reading rates of the three sets of passages as the dependent variables. It indicated that the groups were unequal in terms of initial pretest reading

rates, Pillai's Trace = 0.47, $F(9, 288) = 5.89$, $p < .001$ partial $\eta^2 = .16$. Assumptions of the MANOVA were met. Due to initial differences in reading rate among the groups, it was decided that the pretest scores would be used as covariates in the main analyses as a way to control for differences between the groups.

In order to assess differences in reading rates between the groups in the study, a one-way multivariate analysis of covariance (MANCOVA) was performed for both posttest 1 and posttest 2. The independent variable had four levels which were the OTER, TER, ER, and comparison groups. The six dependent variables were the posttest 1 and posttest 2 reading rates for the anchor, academic, and ER passages. The three covariates were the pretest reading rates for those passages.

Other assumptions of the MANCOVAs which include multicollinearity, linearity between the dependent variables and the covariates and multivariate outliers were checked and met. Because the assumption for multivariate normality was not met for both the posttest 1 and posttest 2 MANCOVAs, Pillai's Trace was interpreted as this statistic is most robust against violations of assumptions (Field, 2009, p. 605).

All ANOVAs and follow-up comparisons in this study were tested at a stricter .01 significance level to control for Type I and II errors. Effect sizes for the follow-up pairwise comparisons were evaluated using Cohen's *d*, where 0.60 is considered a small effect size, 1.00 is medium, and 1.40 is a large effect for within-group contrasts. For between-subject contrasts, 0.40, 0.70, and 1.00 constitutes small, medium, and large effect sizes, respectively (Plonsky & Oswald, 2014).

Results

Hypothesis 1 was answered by assessing the within-subjects changes in reading rate of these passages over one academic year with corresponding comprehension percentages.

OTER Group

For the anchor passages, the mean reading rates increased linearly from 114.96→168.84→204.44 swpm on the pretest, posttest 1, and posttest 2, respectively, with comprehension levels above 70%. Descriptive statistics of the reading rates and comprehension percentages for the reading passages are seen in Table 5. The results for the repeated measures ANOVA showed a non-random time effect, indicating that the reading rate increase was systematic and statistically significant over the measures—Pilai's Trace = .73, $F(2, 24) = 32.53$, $p < .001$, multivariate partial $\eta 2 = .73$.

Table 5
Descriptive Statistics of the Reading Rates and Comprehension Percentages for the Anchor, Academic, and ER Passages for Pretest, Posttest 1, and Posttest 2 for the OTER Group (*n* = 26)

	Reading Rates (swpm)			*Comprehension Percentages*		
Passages/Time	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*
Anchor						
Pretest	114.96	16.54	[108.28, 121.64]	85.82	7.82	[82.66, 88.97]
Posttest 1	168.84	44.47	[150.87, 186.80]	81.97	10.94	[77.55, 86.39]
Posttest 2	204.44	57.34	[181.28, 227.59]	86.06	8.53	[82.61, 89.50]
Academic						
Pretest	101.29	21.43	[92.64, 109.95]	70.19	12.54	[65.13, 75.26]
Posttest 1	153.36	40.50	[137.00, 169.72]	64.63	16.13	[58.12, 71.15]
Posttest 2	197.31	64.11	[171.41, 223.21]	67.07	12.94	[61.84, 72.29]
ER						
Pretest	81.63	22.16	[72.68, 90.58]	77.48	18.19	[70.14, 84.83]
Posttest 1	98.52	31.42	[85.83, 111.21]	81.68	9.96	[77.66, 85.70]
Posttest 2	135.19	38.40	[119.69, 150.70]	82.14	11.53	[77.48, 86.80]

Follow-up paired *t*-tests were conducted to identify where the effect for time was significant. They indicated that the gains in reading rate were significant from the pretest to posttest 1, posttest 1 to posttest 2, and the pretest to posttest 2 with effect sizes of medium, medium, and large, respectively. See Table 6 the descriptive statistics of the univariate post hoc *t*-tests and effect sizes.

Table 6
Descriptive Statistics of the Univariate Post hoc t*-tests for the OTER Group and Effect Sizes*

Passages/Time	*M (gain in swpm)*	*SD*	*95% CI*	*t*	*P*	*Cohen's d*
Anchor						
Pretest-Posttest 1	53.88	39.56	[37.90, 69.86]	-6.94	< .001	1.36
Posttest 1-Posttest 2	35.60	36.09	[21.02, 50.17]	-5.03	< .001	0.99
Pretest-Posttest 2	89.48	55.91	[66.89, 112.06]	-8.61	< .001	1.60
Academic						
Pretest-Posttest 1	52.07	33.79	[38.42, 65.71]	-7.86	< .001	1.54
Posttest 1-Posttest 2	43.95	44.42	[26.01, 61.89]	-5.05	< .001	0.99
Pretest-Posttest 2	96.02	58.14	[72.54, 119.50]	-8.42	< .001	1.65
ER						
Pretest-Posttest 1	16.89	24.36	[7.05, 26.73]	-3.54	.002	0.69
Posttest 1-Posttest 2	36.67	28.85	[25.02, 48.33]	-6.48	< .001	1.27
Pretest-Posttest 2	53.56	37.94	[38.24, 68.89]	-7.20	< .001	1.41

For the academic passages, an increase from 101.29→153.36→197.31 swpm on the pretest, posttest 1, and posttest 2, respectively, was observed. Comprehension of 70% was met on the pretest but dropped to 64.63% on posttest 1 and trended upward to 67.07% on posttest 2 (refer back to Table 5 for descriptive statistics). This reading rate increase was significant: Pillai's Trace = .76, $F(2, 24) = 38.79$, $p < .001$, multivariate partial $\eta^2 = .76$. Follow-up tests revealed that all gains were significant from the pretest to posttest 1, posttest 1 to posttest 2, and the

pretest to posttest 2 with effect sizes of large, medium, and large, respectively (refer back to Table 6 for descriptive statistics).

For the ER passages, there was a continuous rise in reading rate from 81.63→98.52→135.19 swpm on the pretest, posttest 1, and posttest 2, respectively, with sufficient comprehension levels (refer back to Table 5 for descriptive statistics). The rate increase was significant: Pillai's Trace = .68, $F(2, 24) = 25.96$, $p < .001$, multivariate partial $\eta 2 = .68$. Follow-up tests illustrated that all gains were significant from the pretest to posttest 1, posttest 1 to posttest 2, and the pretest to posttest 2 with small, medium, and large effect sizes, respectively (refer back to Table 6 for descriptive statistics).

TER Group

Reading rates for the anchor passages linearly increased from 121.02→157.67→180.30 swpm on the pretest, posttest 1, and posttest 2, respectively, with comprehension above 70% (see Table 7 for descriptive statistics). This progression was significant: Pillai's Trace = .59, $F(2, 23) = 16.38$, $p < .001$, multivariate partial $\eta 2 = .59$.

Table 7
Descriptive Statistics of the Reading Rates and Comprehension Percentages for the Anchor, Academic, and ER Passages for Pretest, Posttest 1, and Posttest 2 for the TER Group ($n = 25$)

	Reading Rates (swpm)			*Comprehension Percentages*		
Passages/Time	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*
Anchor						
Pretest	121.02	20.24	[112.66, 129.37]	84.50	11.57	[79.72, 89.28]
Posttest 1	157.67	53.81	[135.46, 179.88]	83.00	14.38	[77.06, 88.94]
Posttest 2	180.30	61.45	[154.93, 205.66]	84.25	10.23	[80.03, 88.47]
Academic						
Pretest	109.76	22.33	[100.55, 118.98]	61.50	12.72	[56.25, 66.75]
Posttest 1	148.49	50.75	[127.54, 169.44]	61.75	13.66	[56.11, 67.39]
Posttest 2	176.23	48.55	[156.19, 196.27]	70.25	12.01	[65.29, 75.21]
ER						
Pretest	109.34	31.97	[96.14, 122.53]	80.98	18.45	[73.37, 88.60]
Posttest 1	122.23	35.13	[107.73, 136.73]	81.36	13.66	[75.72, 86.99]
Posttest 2	143.50	33.56	[129.65, 157.35]	82.46	13.71	[76.80, 88.12]

Follow-up tests indicated that the effects between all comparisons were significant. Effect sizes were small, small, and medium from the pretest to posttest 1, posttest 1 to posttest 2, and the pretest to posttest 2, respectively (see Table 8 for descriptive statistics).

Table 8
Descriptive Statistics of the Univariate Post hoc t*-tests for the TER Group and Effect Sizes*

Passages/Time	*M (gain in swpm)*	*SD*	*95% CI*	*t*	*p*	*Cohen's d*
Anchor						
Pretest-Posttest 1	36.65	41.44	[19.55, 53.76]	-4.42	< .001	0.88
Posttest 1-Posttest 2	22.63	36.83	[7.43, 37.83]	-3.07	.005	0.61
Pretest-Posttest 2	59.28	50.87	[38.28, 80.28]	-5.83	< .001	1.16
Academic						
Pretest-Posttest 1	38.73	45.10	[20.11, 57.34]	-4.29	< .001	0.86
Posttest 1-Posttest 2	27.74	30.87	[15.00, 40.48]	-4.49	< .001	0.90
Pretest-Posttest 2	66.47	42.57	[48.89, 84.04]	-7.81	< .001	1.56
ER						
Pretest-Posttest 1	12.89	34.56	[-1.37, 27.16]	-1.87	.074	0.37
Posttest 1-Posttest 2	21.27	38.33	[5.45, 37.10]	-2.78	.011	0.55
Pretest-Posttest 2	34.16	25.16	[23.78, 44.55]	-6.79	< .001	1.36

For the academic passages, rates increased linearly from 109.76→148.49→176.23 swpm on the pretest, posttest 1, and posttest 2, respectively. The comprehension percentage on the pretest was 61.50% with a slight increase to 61.75% on posttest 1. However, comprehension reached 70.25% on posttest 2 (refer back to Table 7 for descriptive statistics). The rate increase was significant: Pillai's Trace = .74, $F(2, 23) = 31.99$, $p < .001$, multivariate partial $\eta 2 = .74$. Post hoc tests indicated all increases were significant with effect sizes of small, small, and large from the pretest to posttest 1, posttest 1 to posttest 2, and the pretest to posttest 2, respectively (refer back to Table 8 for descriptive statistics).

For the ER passages, rates increased linearly throughout the measures—109.34→122.23→143.50 swpm on the pretest, posttest 1, and posttest 2, respectively, with comprehension above 70% (refer back to Table 7 for descriptive statistics). A significant effect for time was found for rate: Pillai's Trace = .66, $F(2, 23) = 22.21$, $p < .001$, multivariate partial $\eta 2 = .66$. While a mean increase in reading rate of 12.89 swpm was observed from the pretest to posttest 1, the effect was not significant with a small effect size. Additionally, using .01 as the criterion for significance, the 21.27 swpm increase seen from posttest 1 to posttest 2 was not significant, and the effect size was small. However, the total increase for the academic year was 34.16 swpm, and this was significant with a medium, nearing large effect size (refer back to Table 8 for descriptive statistics).

ER Group

Reading rates for the anchor passages increased linearly from 94.87→102.55→115.31 swpm on the pretest, posttest 1, and posttest 2, respectively, with comprehension above 70% (see Table 9 for descriptive statistics). This upward progression in rate was significant: Pillai's Trace = .36, $F(2, 22) = 6.26$, $p = .007$, multivariate partial $\eta 2 = .36$.

Table 9
Descriptive Statistics of the Reading Rates and Comprehension Percentages for the Anchor, Academic, and ER Passages for Pretest, Posttest 1, and Posttest 2 for the ER Group (*n* = 25)

	Reading Rate (swpm)			*Comprehension Percentage*		
Passages/Time	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*
Anchor						
Pretest	94.87	28.45	[82.86, 106.89]	85.68	9.84	[81.52, 89.83]
Posttest 1	102.55	26.35	[91.42, 113.68]	80.99	15.69	[74.36, 87.62]
Posttest 2	115.31	19.65	[107.01, 123.61]	87.24	12.43	[81.99, 92.49]
Academic						
Pretest	86.56	26.28	[75.72, 97.41]	62.75	16.88	[55.78, 69.72]
Posttest 1	93.14	31.96	[79.95, 106.33]	58.75	16.34	[52.01, 65.49]
Posttest 2	102.57	25.33	[92.12, 113.03]	63.25	13.66	[57.61, 68.89]
ER						
Pretest	87.02	15.03	[80.82, 93.22]	73.97	15.63	[67.52, 80.42]
Posttest 1	93.94	17.68	[86.64, 101.24]	77.89	23.08	[68.36, 87.41]
Posttest 2	96.07	18.53	[88.43, 103.72]	77.72	14.31	[71.81, 83.63]

While there was an increase in rate of 7.68 swpm from the pretest to posttest 1, follow-up tests indicated the effect trended toward significance but failed to meet the .01 criterion. Additionally, the 12.76 swpm gain from posttest 1 to posttest 2 did not meet the significance criterion. Overall, the gain of 20.44 swpm from the pretest to posttest 2 achieved significance with a small effect size (see Table 10 for descriptive statistics).

Table 10
Descriptive Statistics of the Univariate Post hoc t*-tests for the ER Group and Effect Sizes*

Passages/Time	*M (gain in swpm)*	*SD*	*95% CI*	*t*	*p*	*Cohen's d*
Anchor						
Pretest-Posttest 1	7.68	15.28	[1.23, 14.13]	-2.46	.022	0.50
Posttest 1-Posttest 2	12.76	22.87	[3.11, 22.42]	-2.74	.012	0.56
Pretest-Posttest 2	20.44	27.95	[8.64, 32.24]	-3.58	.002	0.73
Academic						
Pretest-Posttest 1	6.58	14.43	[0.64, 12.55]	-2.29	.031	0.46
Posttest 1-Posttest 2	9.43	22.17	[0.26, 18.56]	-2.12	.044	0.43
Pretest-Posttest 2	16.01	20.47	[7.56, 24.46]	-3.91	.001	0.78
ER						
Pretest-Posttest 1	6.92	-	-	-	-	0.46
Posttest 1-Posttest 2	2.13	-	-	-	-	0.11
Pretest-Posttest 2	9.02	-	-	-	-	0.52

Reading rates for the academic passages increased linearly from 86.56→93.14→102.57 swpm on the pretest, posttest 1, and posttest 2, respectively. However, comprehension percentages were below 70% (refer back to Table 9 for descriptive statistics). However, the upward progression in rate was significant: Pillai's Trace = .42, F (2, 23) = 8.28, p = .002, multivariate partial $\eta 2$ = .42. While there was a mean increase in rate of 6.58 swpm from the pretest to posttest 1, it was not significant. Likewise, the 9.43 swpm gain from posttest 1 to posttest 2 was non-significant.

However, the overall gain of 16.01 swpm from the pretest to posttest 2 was significant with a small effect size (see Table 10 for descriptive statistics).

Reading rates for the ER passages linearly increased from 87.02→93.94→96.07 swpm on the pretest, posttest 1, and posttest 2, respectively, while maintaining sufficient comprehension (see Table 9 for descriptive statistics); however, this trend did not meet the significance criterion, Pillai's Trace = .27, F (2, 23) = 4.20, p = .028, multivariate partial η^2 = .27, and the effect sizes were small (refer back to Table 10 for descriptive statistics).

Comparison Group

While the comprehension levels were sufficient, reading rates for the anchor passages saw a non-linear progression with a decrease from 111.90→98.09 swpm from the pretest to posttest 1 followed by an increase to 107.90 swpm on posttest 2 (see Table 11 for descriptive statistics). These changes were significant: Pillai's Trace = .47, F (2, 23) = 10.33, p = .001, multivariate partial η2 = .47.

Table 11
Descriptive Statistics of the Reading Rates and Comprehension Percentages for the Anchor, Academic, and ER Passages for Pretest, Posttest 1, and Posttest 2 for the Comparison Group
(n = 25)

	Reading Rate (swpm)			*Comprehension Percentage*		
Passages/Time	*M*	*SD*	*95% CI*	*M*	*SD*	*95% CI*
Anchor						
Pretest	111.90	27.36	[100.60, 123.19]	72.75	19.08	[64.87, 80.63]
Posttest 1	98.09	21.74	[89.12, 107.06]	81.25	13.38	[75.73, 86.77]
Posttest 2	107.90	21.62	[98.97, 116.83]	86.25	14.43	[80.29, 92.21]
Academic						
Pretest	91.08	25.09	[80.72, 101.44]	58.25	18.90	[50.45, 66.05]
Posttest 1	86.33	18.67	[78.62, 94.03]	65.00	14.66	[58.95, 71.05]
Posttest 2	92.05	23.07	[82.53, 101.57]	65.75	15.00	[59.56, 71.94]
ER						
Pretest	70.38	22.13	[61.24, 79.52]	71.46	21.08	[62.76, 80.16]
Posttest 1	67.37	23.68	[57.60, 77.15]	76.25	11.48	[71.51, 80.98]
Posttest 2	71.71	23.08	[62.18, 81.23]	73.86	12.44	[68.73, 79.00]

Follow-up tests showed there was a significant decrease of -13.81 swpm with a small effect size from the pretest to posttest 1. From posttest 1 to posttest 2, a significant gain of 9.81 swpm with a small effect size was observed. Overall, there was a net non-significant decrease across the academic year of 4.00 swpm with a small effect size (see Table 12 for descriptive statistics).

Table 12
Descriptive Statistics of the Univariate Post hoc t*-tests for the Comparison Group and Effect Sizes*

Passages/Time	*M (gain in swpm)*	*SD*	*95% CI*	*t*	*p*	*Cohen's d*
Anchor						
Pretest-Posttest 1	-13.81	23.52	[-23.51, -4.10]	-2.94	.007	0.56
Posttest 1-Posttest 2	9.81	10.57	[5.45, 14.17]	-4.64	< .001	0.93
Pretest-Posttest 2	-4.00	18.66	[-11.70, 3.71]	-1.07	.295	0.21
Academic						
Pretest-Posttest 1	-4.69	-	-	-	-	0.27
Posttest 1-Posttest 2	5.72	-	-	-	-	0.54
Pretest-Posttest 2	1.03	-	-	-	-	0.06
ER						
Pretest-Posttest 1	-3.01	-	-	-	-	0.14
Posttest 1-Posttest 2	4.34	-	-	-	-	0.25
Pretest-Posttest 2	1.33	-	-	-	-	0.07

For academic passages, reading rates decreased by 4.69 swpm from the pretest to posttest 1, increased by 5.72 swpm from the posttest 1 to posttest 2, with an overall increase of 1.03 swpm from the pretest to posttest 1. All comprehension percentages throughout the measures were below 70% (refer back to Table 11 for descriptive statistics). This rate progression was non-significant: Pillai's Trace = .23, F (2, 23) = 3.48, p = .048, multivariate partial $\eta 2$ = .23, and the effect sizes were small (refer back to Table 12 for descriptive statistics).

For ER passages, the pretest, posttest 1, and posttest 2 were 70.38, 67.37, and 71.71 swpm, respectively. Comprehension percentages were all above 70% (refer back to Table 11 for descriptive statistics). However, this trend was non-significant: Pillai's Trace = .06, F (2, 23) = .74, p = .487, multivariate partial $\eta 2$ = .061. Effect sizes were small (refer back to Table 12 for descriptive statistics).

Hypothesis 2 was answered by analyzing the between-subjects differences of their adjusted reading rates of the passages on posttest 1 and 2 (see the data analysis for details).

Posttest 1

The results for the MANCOVA indicated that significant differences were found among the four groups on the dependent measures, Pillai's Trace = 0.54, F (9, 279) = 6.73, p < .001. The strength of the relationship between the groups and posttest 1 scores assessed by a partial η^2 showed that the group variable accounted for 17.80% of the variance of the dependent variables. Posttest 1 reading rates for the anchor passages adjusted for initial differences were 167.14, 139.40, 114.01, and 107.12 swpm for the OTER, TER, ER, and comparison groups, respectively. The adjusted means were 150.49, 135.21, 105.31, and 92.53 swpm, respectively, for the academic passages, and 100.09, 107.51, 95.10, and 79.74 swpm, respectively, for the ER passages. See Table 13 for descriptive statistics and Figures 1, 2, and 3 for graphical representations.

Table 13
Adjusted Means, Standard Errors, and 95% Confidence Intervals of Posttest 1 Reading Rates in Standard Words per Minute for the Three Types of Reading Passages

Passages/Group	*M*	*SE*	95% CI
Anchor passages			
OTER	167.14	5.97	[155.28, 179.00]
TER	139.40	6.59	[126.31, 152.49]
ER	114.01	6.52	[101.07, 126.56]
Comparison	107.12	6.49	[94.23, 120.02]
Academic passages			
OTER	150.49	6.14	[138.29, 162.68]
TER	135.21	6.78	[121.75, 148.67]
ER	105.31	6.70	[91.99, 118.62]
Comparison	92.53	6.68	[79.27, 105.79]
ER passages			
OTER	100.99	4.52	[92.02, 109.96]
TER	107.51	4.99	[97.61, 117.41]
ER	95.10	4.93	[85.31, 104.89]
Comparison	79.74	4.91	[69.99, 89.49]

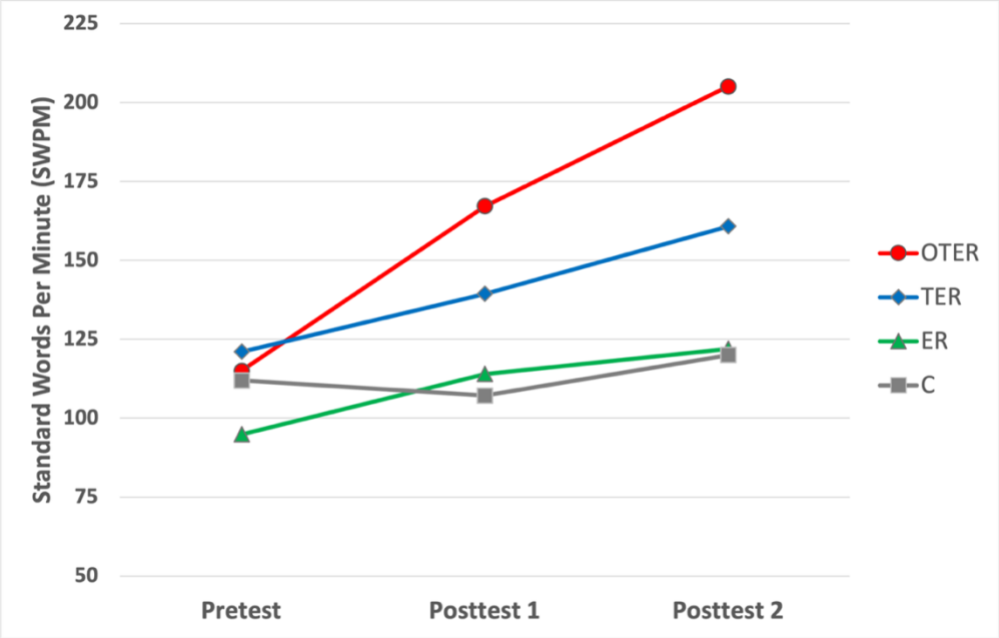

Figure 1
Mean Reading Rates for the Pretest and Adjusted Mean Reading Rates for Posttest 1 and Posttest 2 for the Anchor Passages for the OTER, TER, ER, and Comparison Groups

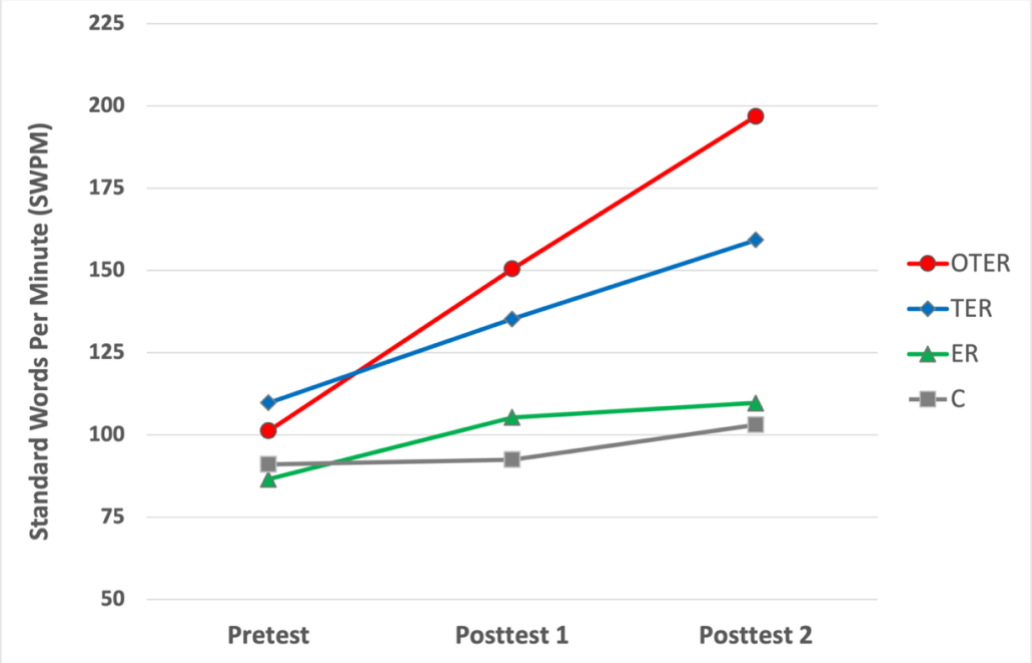

Figure 2
Mean Reading Rates for the Pretest and Adjusted Mean Reading Rates for Posttest 1 and Posttest 2 for the Academic Passages for the OTER, TER, ER, and Comparison Groups

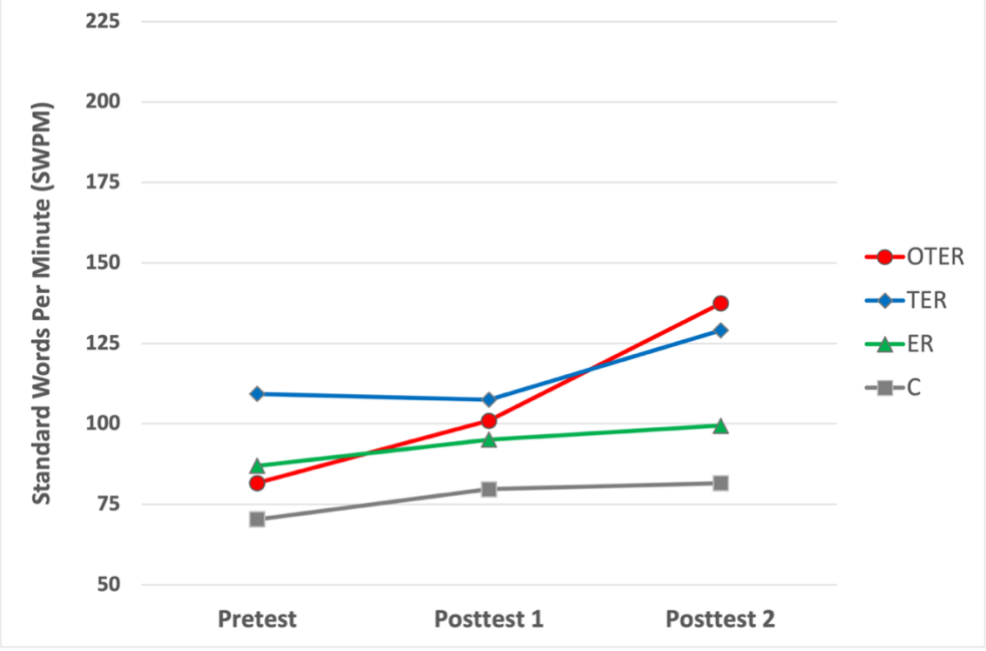

Figure 3
Mean Reading Rates for the Pretest and Adjusted Means for Posttest 1 and Posttest 2 for the ER Passages for the OTER, TER, ER, and Comparison Groups

One-way ANOVAs were performed on the dependent variables as follow-up tests to the MANCOVA. Significant differences were found between the groups for each passage: anchor passages—$F(3, 93) = 20.15$, $p < .001$, partial $\eta^2 = .39$; academic passages—$F(3, 93) = 17.52$, $p < .001$, partial $\eta^2 = .36$; and ER passages—$F(3, 93) = 5.47$, $p = .002$, partial $\eta^2 = .15$. Post hoc analyses to the univariate ANOVA for posttest 1 reading rates consisted of conducting pairwise comparisons to see how the groups differed from each other on posttest 1.

For the anchor passages, the adjusted mean for the OTER group was significantly higher than all other groups and the effect sizes for the TER, ER, and comparison group comparisons were medium, large, and large, respectively. The TER group had a significantly higher adjusted mean than the ER and comparison groups, and effect sizes were medium and large, respectively. While the ER group had a higher adjusted mean than the comparison group, the difference was non-significant with a small effect size. See Table 14 for the pairwise comparisons, statistical significance, and effect sizes for each group and passage for posttest 1.

Table 14
Pairwise Comparisons, Statistical Significance, and Effect Sizes for Posttest 1

	Anchor Passages	Academic Passages	ER Passages
OTER vs. TER			
Higher adjusted mean	OTER	OTER	TER
p-value (effect size)	.003* (0.87)	.107 (0.47)	.347 (0.27)
OTER vs. ER			
Higher adjusted mean	OTER	OTER	OTER
p-value (effect size)	<.001* (1.70)	<.001* (1.41)	.395 (0.25)
OTER vs. C			
Higher adjusted mean	OTER	OTER	OTER
p-value (effect size)	<.001* (1.91)	<.001* (1.79)	.001* (0.89)
TER vs. ER			
Higher adjusted mean	TER	TER	TER
p-value (effect size)	.007* (0.78)	.002* (0.90)	.079 (0.51)
TER vs. C			
Higher adjusted mean	TER	TER	TER
p-value (effect size)	.002* (0.99)	<.001* (1.27)	<.001* (1.12)
ER vs. C			
Higher adjusted mean	ER	ER	ER
p-value (effect size)	.472 (.021)	.196 (0.39)	.036 (0.63)

Note. * indicates statistical significance.

For the academic passages, while the OTER group had a higher adjusted mean than the TER group, the difference was non-significant, and the effect size was small. However, the OTER group read significantly faster than the ER and comparison groups with large effect sizes, and the TER group read significantly faster than the ER and comparison groups with a medium and large effect, respectively. The ER group had a higher adjusted mean than the comparison group, but the difference was non-significant with a small effect size (refer back to Table 14 for the pairwise comparisons, statistical significance, and effect sizes for each group and passage for posttest 1).

For the ER passages, while the TER group had a higher adjusted mean than the OTER group, the difference was non-significant with a small effect size. While the OTER and TER groups had higher adjusted means than the ER group, the differences were not significant. Effect sizes between the OTER and TER, OTER and ER, and TER and ER were small, small, and medium, respectively. The contrast between the ER and comparison groups narrowly missed significance with a small effect size. However, significant differences were found between the OTER and comparison groups with a medium effect as well as between the TER and comparison groups with a large effect (refer back to Table 14 for the pairwise comparisons, statistical significance, and effect sizes for each group and passage for posttest 1).

Posttest 2

The MANCOVA results showed that significant differences were found among the four groups on the dependent measures, Pillai's Trace = 0.65, $F(9, 279) = 8.60$, $p < .001$. The strength of the relationship between the groups and the posttest 2 scores assessed by a partial η^2 showed the group variable accounted for 21.70% of the variance of the dependent variables.

Posttest 2 reading rates for the anchor passages adjusted for initial differences were 205.14, 160.82, 122.00, and 119.97 swpm for the OTER, TER, ER, and comparison groups, respectively. The adjusted means were 196.82, 159.21, 109.74, and 103.15 swpm, respectively, for the academic passages, and 137.46, 129.09, 99.45, and 81.61 swpm, respectively, for the ER passages. See Table 15 for descriptive statistics and refer back to Figures 1, 2, and 3 for graphical representations. The OTER group had the highest adjusted means followed by the TER group, ER group, and the comparison group on each reading passage set.

Table 15
Adjusted Means, Standard Error, and 95% Confidence Intervals of Posttest 2 Reading Rates in Standard Words per Minute for the Three Types of Reading Passages

Passages/Group	*M*	*SE*	95% CI
Anchor passages			
OTER	205.14	7.83	[189.85, 220.94]
TER	160.82	8.64	[143.66, 177.97]
ER	122.00	8.54	[105.03, 138.96]
Comparison	119.97	8.51	[103.07, 136.87]
Academic passages			
OTER	196.82	7.74	[181.45, 212.19]
TER	159.21	8.54	[142.24, 176.18]
ER	109.74	8.45	[92.97, 126.52]
Comparison	103.15	8.42	[86.44, 119.86]
ER passages			
OTER	137.46	5.12	[127.30, 147.61]
TER	129.09	5.65	[117.87, 140.30]
ER	99.45	5.58	[88.36, 110.53]
Comparison	81.61	5.56	[70.57, 92.66]

Follow-up one-way ANOVAs on the dependent variables were conducted. Significant differences were found on all three sets of passages: anchor passages—$F(3, 93) = 25.49$, $p <$

.001, partial η^2 = .45; academic passages—F (3, 93) = 30.94, p < .001, partial η^2 = .50; ER passages—F (3, 93) = 23.34, p < .001, partial η^2 = .43.

Post hoc pairwise comparisons for the univariate ANOVA for posttest reading rates were performed. For the anchor passages, the results indicated that the adjusted mean for the OTER group was significantly higher than all other groups and effect sizes were large for each comparison. The TER group also significantly outperformed the ER and comparison groups, and effect sizes were both medium. However, there were no significant differences between the ER and comparison groups with a small effect size. See Table 16 for the pairwise comparisons, statistical significance, and effect sizes for each group and passage for posttest 2.

Table 16
Pairwise Comparisons, Statistical Significance, and Effect Sizes for Posttest 2

	Anchor Passages	Academic Passages	ER Passages
OTER vs. TER			
Higher adjusted mean	OTER	OTER	OTER
p-value (effect size)	<.001* (1.07)	.002* (0.91)	.286 (0.31)
OTER vs. ER			
Higher adjusted mean	OTER	OTER	OTER
p-value (effect size)	<.001* (2.04)	<.001* (2.15)	<.001* (1.42)
OTER vs. C			
Higher adjusted mean	OTER	OTER	OTER
p-value (effect size)	<.001* (2.07)	<.001* (2.30)	<.001* (2.07)
TER vs. ER			
Higher adjusted mean	TER	TER	TER
p-value (effect size)	.002* (0.91)	<.001* (1.18)	<.001* (1.07)
TER vs. C			
Higher adjusted mean	TER	TER	TER
p-value (effect size)	.002* (0.95)	<.001* (1.32)	<.001* (1.69)
ER vs. C			
Higher adjusted mean	ER	ER	ER
p-value (effect size)	.872 (.005)	.595 (0.16)	.032 (0.65)

Note. * indicates statistical significance.

For the academic passages, the adjusted mean for the OTER group was significantly higher than the TER, ER and comparison groups with a medium, large, large effect sizes, respectively. Furthermore, the TER had a significantly higher adjusted mean than the ER and comparison groups and the effect sizes were both large. While the ER group had a higher adjusted mean, there were no significant differences between the ER and comparison groups with a small effect size (refer back to Table 16 for the pairwise comparisons, statistical significance, and effect sizes for each group and passage for posttest 2).

For the ER passages, there were no significant differences between the OTER and TER groups with a small effect size. However, the OTER and TER both significantly outperformed the ER and comparison groups with large effect sizes. There were also no significant differences between the ER and comparison groups with a small effect size. (refer back to Table 16 for the

pairwise comparisons, statistical significance, and effect sizes for each group and passage for posttest 2).

Discussion

Hypothesis 1

Hypothesis 1 posited that the OTER, TER, and ER would make significant within-subjects reading rate increases on the three different texts on the posttests with adequate comprehension levels over the academic year; conversely, the comparison group would not.

OTER Group

Hypothesis 1 was mainly supported as results showed that significant reading rate gains were observed on each measure for all passages. Comprehension levels were met on all passages except for the posttest 1 and 2 academic passages; however, an upward trend toward 70% comprehension was observed. This suggests that ER, coupled with TR and ROR with chunking and prosody practice was highly effective in materializing solid reading fluency gains.

Comparing the TR results to past research suggests that learners' proficiency is a factor when observing reading rates and gains. Shimono's (2018) groups made smaller gains and read with slower speeds compared to the OTER group. This suggests that more proficient learners have the potential to achieve higher reading rates and make greater gains over a treatment period.

Reading rates under ER conditions showed linear growth over time, echoing gains seen under TR conditions; however, ER rates were slower with a flatter gain trajectory over the measures. These differences in rates and gains can be attributed to the prolonged nature of the ER task which demanded more mental effort, and participants could be subjected to fatigue and/or distracting stimuli. The first semester results coincide with prior research (e.g., Huffman, 2014; Sakurai, 2015). The overall gain for the academic year was larger than several prior one-year ER studies (e.g., Beglar et al, 2012; Nishino, 2007).

In sum, these results indicate that a treatment using ER, TR, and ROR with chunking and prosody practice greatly facilitated gains in reading fluency on three types of passages, and they are some of the most promising to date with regards to reading rate and rate gains.

TER Group

Hypothesis 1 was mainly supported as significant gains were seen on nearly all measures for each reading passage except for the pretest to posttest 1 measure for the ER passages. However, comprehension for the academic passages on the pretest and posttest 1 was below 70% comprehension.

The one-semester TR gains are consistent with several past one-semester reading rate gain studies (Chang, 2010, 2012; Gorsuch & Taguchi, 2002). From posttest 1 to posttest 2, the TER

group continued to make rate gains on the TR passages which suggests that supplementing TR with ER can further enhance reading rates and gains over one academic year. Examining the ER rate progression, the increase was linear throughout the year corresponding to the growth on the TR passages. Inspecting the results of past one-year ER studies, the TER group showed higher reading rates and greater reading rate gains compared to past studies (e.g., Beglar et al, 2012). Overall, results for the TER group illustrate that a one-year treatment of ER and TR is effective in promoting demonstrable and durable reading fluency growth.

ER Group

Hypothesis 1 received mixed support. It was not supported in that semester-to-semester TR gains neared statistical significance and comprehension was below 70% on the academic passages. The one-year gains, however, reached significance and rates echo the results of Beglar et al (2012), who reported similar yearly gains. Because this group did not engage in TR, these gains were likely to have been developed more implicitly through ER which has been described as gradual and slow initially, but gain momentum in later stages (Grabe, 2010).

Although gains on the ER passages were not statistically significant, they trended upward. Moreover, similar increases have been reported (Robb & Susser, 1989). In sum, ER practice for one year produced modest, yet stable reading rate development.

Comparison Group

The reading rate progression for the comparison group was non-linear over the measures and these changes were mainly non-significant with small effect sizes. Thus, Hypothesis 1 was supported as this group did not make any meaningful increases from the pretest reading rates.

The results indicated that reading rate changes very little for L2 learners if a reading fluency treatment is not included in the curriculum. Prior reading fluency research has also shown marginal non-significant gains for comparison/control groups and even losses have been observed (Chang, 2010; Shimono, 2018). Comprehension accuracy is often prioritized over fluency and ultimately, reading rates are unstable for learners who do not consistently practice fluent reading.

General Trends Among Treatment Groups

For the OTER, TER, and ER groups, reading rates and gains for the anchor and academic passages showed a similar progression throughout the measures indicating the transfer of rate to different texts. However, compared to the anchor passages, the academic passages were read at slightly slower reading rates with fewer gains, suggesting that conceptually more difficult topics impede rate. As for comprehension, in several instances, levels would drop on posttest 1, but rebound on posttest 2, indicating the participants initially struggled comprehending at an increased rate but later adapted to reading faster with equal or higher levels of understanding.

Another trend with the OTER and TER groups is that more reading rate gains were found in the first half of the treatment period for the TR passages, and the opposite was true for the ER rate

progression with more gains seen in the latter half. This finding might be analogous to sprinting as opposed to running a marathon—increasing rates for ER requires longer periods of conditioning (time on task) before faster speeds can be reached and sustained.

Hypothesis 2

Hypothesis 2 posited that the OTER, TER, and ER would read significantly faster than the comparison group while maintaining sufficient comprehension. Also, the OTER and TER groups would read significantly faster than the ER group; no differences would be found between the OTER and TER groups.

Posttest 1

Hypothesis 2 was generally supported in three ways with a few exceptions: (a) The OTER and TER groups significantly outperformed the comparison group on all three types of passages; (b) the OTER and TER groups had significantly higher reading rates on the anchor and academic passages than the ER group; (c) there were no significant differences between the OTER and TER groups on the academic and ER passages.

However, Hypothesis 2 was not supported in the following ways: (a) The ER group did not outperform the comparison group on any of the passages; (b) the OTER group read significantly faster than the TER group on the anchor passages; (c) the OTER and TER groups did not outperform the ER group on the ER passages.

Posttest 1 results indicated that the treatment groups that practiced TR (OTER and TER groups) outperformed the ER and comparison groups in terms of reading rate. Therefore, participation in the TR activity was a catalyst that differentiated the groups. Past studies that have employed TR and RR have shown faster reading rates and larger gains when compared to reading rates and gains after ER treatments (e.g., Taguchi et al, 2004).

Additionally, while no significant differences were found between the OTER and TER groups on their rates for the academic and ER passages, significant differences were found between them on the anchor passages in favor of the OTER group. Past research has shown no significant differences in final reading rates between a TR plus ROR group and a TR only group (Shimono, 2018). However, the OTER group achieving faster rates on the anchor passages indicates that the ROR procedures can also benefit silent reading rate via the chunking practice during the repetitions. Therefore, it is contended that the ROR procedure helped to heighten the participants' focus and concentration and to read in meaningful chunks. This combination ultimately resulted in significantly faster reading speeds.

Regarding the ER passages, the TER group read at the fastest rate, likely because they were second-year students and had one year of ER practice prior to the study. Moreover, the TER and OTER groups significantly outperformed the comparison group. While the ER group outperformed the comparison group, it narrowly missed significance. However, the rates between the reading fluency treatment groups were not significantly different. Because all three reading fluency treatment groups practiced ER, the additional fluency practice through TR and

ROR did not contribute significantly enough for the groups to be differentiated under ER conditions on posttest 1.

Posttest 2

Hypothesis 2 received partial support because: (a) the OTER and TER groups significantly outperformed the ER and comparison groups on all passages; (b) there were no significant differences between the OTER and TER reading groups on the ER passages. The hypothesis was not supported because: (a) the OTER group significantly outperformed the TER group on the anchor and academic passages; (b) the ER group did not outperform the comparison group on any of the passages.

These one-year results build on the evidence that reading fluency treatments that include time pressure activities such as TR, greatly help to produce significantly higher reading rates compared to groups that do not. For the OTER and TER groups, the efficacy of their respective treatments on rate have become more evident on posttest 2. Both groups read all passages significantly faster than the other two groups.

Moreover, the OTER group surpassed every group on all measures of reading rate. Therefore, this study is the first to show the advantages of using ER, TR, and ROR with chunking and prosody practice compared to other groups. While Chang (2012) found that a TR group outperformed an ROR group in terms of rate, the ROR group did not have any time pressure during the oral repetitions, which might explain why the results were found to be in favor of the TR group. However, the current results echo Chang and Millet (2015), who found that audio-assisted reading support helped participants read significantly faster than the group that read the books silently. The researchers contended that the enhanced input from the audio-assisted ER helped the learners to read at a constant and continuous speed, kept the learners on task by heightening concentration levels, and made the stories more interesting. The choral reading with instructor in the ROR procedure of the current study had a similar effect on the OTER group in that the learners could develop the phonological characteristics of the language, such as natural rhythm, appropriate word stress, elision, and smoother reading. Moreover, the oral output in the ROR procedure helped the learners read and parse sentences in syntactic chunks (i.e., semantic phrases or thought-groups) and encouraged learners to pronounce words with the correct number of syllables, as opposed to reading with mora-based, epenthetic articulation often employed by Japanese learners which often adds syllables.

Furthermore, the fact that the OTER group outperformed the TER group on all three rate measures indicates that this difference was due to the OTER groups' treatment as opposed to the number of words processed. Ultimately, this shows that the type of activities used in a reading fluency treatment might outweigh the effects of the number of words processed in the achievement of reading rates.

The ER group processed a far greater number of words than the comparison group; however, while they read at faster rates and had a better growth trajectory, they did not statistically outperform the comparison group on any measures of rate throughout the year, despite a trend toward significance. While these results seemingly run contradictory to past findings (e.g.,

McLean & Rouault, 2017; Robb & Susser, 1989), they might be explained by a strict significance criterion or the fact that the ER group participants had the lowest proficiency in the department. Ultimately, rate growth through ER exclusively can be slow and more time on task beyond one academic year might be needed for an ER treatment group to statistically significantly outperform a comparison group.

Conclusion and Pedagogical Implications

This study has shown the efficacy of various reading fluency treatments such as ER, TR, and ROR. Specifically, a treatment of ER for one academic year promotes reading fluency growth of different types of texts among lower-intermediate Japanese university L2 English learners. In addition, ER supplemented with consistent TR practice enhances reading fluency to a greater degree. Moreover, reading fluency can be even further enhanced when ER is combined with treatments of both TR and ROR that includes chunking and prosody practice. Therefore, the pedagogical implications for EFL/ESL classrooms and curriculums are ER, TR, and ROR with chunking and prosody practice are effective reading fluency activities to be utilized in an L2 reading course. Combining these activities is advantageous because they engender comprehensive reading fluency, and there can be a high degree of transfer of reading rate to various text types and conditions. Learners can greatly benefit from this multifaceted approach as ER provides learners with prolonged exposure to print, TR provides the impetus to speed up and automatize their reading processes, and ROR provides practice of the rhythmic and prosodic features inherent in English texts which are necessary components of fluent reading.

Limitations

The first limitation is that the participants' proficiency in groups differed due to departmental streaming. Also, the TR group consisted of second-year students and therefore, they had one extra year of ER practice and a greater amount of ER required of them. Finally, the comparison group participants were not English majors, and thus, their motivation to study English might not have been as high as the three reading fluency treatment groups.

Future Research

First, L2 reading fluency development should be examined over longer periods beyond one academic year. Studies exploring the upper limits of reading rate for L2 learners are needed. Second, the retention of learners' rates after a treatment period warrants further investigation. Third, the reading fluency treatments in this study should also be used with learners from different L1 backgrounds, age groups, and reading proficiencies. Fourth, more research is needed on L2 reading rates and comprehension of texts of varying difficulty, genres, and lengths. Finally, there is a need for continuous exploration of new and innovative treatments that facilitate comprehensive reading fluency.

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