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Unassisted repeated reading: Exploring the effects of intensity, treatment duration, background knowledge, individual variation, and text variation on reading rate

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Abstract

Two groups of English as a second language students engaged in a fourteen-week repeated reading (RR) treatment: (1) a 3x group (n = 16), which engaged in three readings per session, and (2) a 5x group (n = 15), which engaged in five readings per session. Reading rate and background knowledge were measured at five points to assess the effect of treatment length as well. Results from a mixed effects repeated measures ANCOVA model showed that neither treatment group nor treatment length had a significant effect on reading rate, but background knowledge did. The model also revealed that the fixed effects (e.g., treatment, duration, and background knowledge) explained 8.1% of the variation in reading rates (R^2 = .081). The random effects of individual variation and text variation explained 0.9% (R^2 = .009) and 0.3% (R^2 = .003) of variance in reading rate respectively, meaning the entire model could explain 9.3% of the variation (R^2 = .093). It was concluded that reading three times per session was more efficient than reading five times per session, and background knowledge is a variable that must be controlled for in reading studies

***Keywords**:* repeated reading, reading fluency, L2 reading, reading rate, background knowledge, mixed effects

Introduction

Repeated Reading

Unlike explicit elements of language development, reading fluency is developed implicitly, a gradual process requiring repetition and much exposure to print (Grabe & Stoller, 2020). For several decades, repeated reading (RR) has been employed as a means to promote reading fluency first in first language (L1) settings and later adapted to English as a second language (ESL)/English as a foreign language (EFL) contexts. RR is defined as "rereading a short, meaningful passage several times until a satisfactory level of fluency is reached" (Samuels, 1979, p. 404) and is based on LaBerge and Samuel's (1974) automaticity theory, which states that automaticity in lower-level reading processes (e.g., word-level decoding, lexical retrieval, and sentence parsing; Grabe & Stoller, 2020, pp. 14–21) frees up mental capacity and subsequently contributes to better comprehension. Thus, as readers engage in RR, their decoding speed should increase, which results in reading rate increases. Since RR's

inception, two major methods to implement it have been developed: assisted and unassisted RR. Assisted RR entails the listening of a text read orally (either through live readings or recorded readings) while unassisted repeated reading omits the listening to texts being read and rather consists of individual reading of text, which can be done orally and/or silently.

RR's effectiveness in developing reading fluency has been studied in English L1 contexts among school-age children. Specifically, RR has been shown to increase reading rate (Carver & Hoffman, 1981; Dowhower, 1987; Herman, 1985; Kuhn, 2005; Rasinski, 1990; Rashotte & Torgesen, 1985). Gains in reading rate can be transferred to unpracticed texts (Dowhower, 1987; Herman, 1985; Rashotte & Torgesen, 1985). For example, Dowhower (1987) reported that second graders increased their oral reading rate by over 75% in both assisted and unassisted treatments. Similarly, Rasinski (1990) found that third graders improved their oral reading rate by 20% in a short, assisted RR intervention and by 25% in a short, unassisted RR intervention. Thus, it can be concluded that RR is indeed a beneficial approach in developing reading fluency of children in English L1 contexts.

The effect of RR on reading rate in ESL/EFL settings has received some attention but still remains a relatively unexplored area (see Taguchi et al., 2006). In post-secondary EFL contexts, it has been shown that oral repeated reading can lead to increased reading rate (Chang, 2012; Shimono, 2018). Other studies in the same setting have investigated the effects of silent RR on reading rate with some mixed results (Taguchi, 1997; Taguchi & Gorsuch, 2012; Taguchi et al., 2004; Gorsuch & Taguchi, 2008; Chang & Millett, 2013). However, the effect of RR on reading rate development in ESL contexts has not received any attention as the research has focused primarily on children's language development (see Blum et al., 1995; Koskinen et al., 2000; Quiroga et al., 2002). As an extension of the existing post-secondary EFL RR research, the current study specifically investigated the impact of unassisted RR on reading rate in a post-secondary ESL setting.

In the previous post-secondary EFL RR studies, two variables related to reading rate have not been explored: (1) intensity, the number readings per RR session and (2) duration of treatment, the length of a RR intervention. There is anecdotal evidence suggesting that too many readings can be counterproductive, due to resultant participant boredom, disengagement, discouragement, and demotivation (Chang & Millett, 2013, p. 140; Taguchi et al., 2012, p. 48; Taguchi et al., 2016, pp. 110–111). Regarding treatment duration, some have suggested that post-secondary ESL/EFL fluency programs lasting an entire semester will also result in boredom and a sense of drudgery (Millett, 2008, p. 25). Thus, the current study had two objectives pertaining to the development of reading rate: (1) to compare two RR treatments with varying degrees of intensity (e.g., five reading per session compared to three) and (2) to investigate empirically the effect of RR treatment length.

In addition to intensity and duration, the impact of background knowledge, individual variation, and text variation have not been accounted for in post-secondary ESL/EFL RR studies despite their noted impact on reading generally for English language learners (ELL) (Shin et al., 2019; Anderson, 1991; Laufer & Ravenhorst-Kalovski, 2010). Therefore, the current study also included a third objective: (3) to assess empirically the effect of background knowledge, individual variation, and text variation on reading rate. The results from such an investigation can be used to (a) improve ESL/EFL reading fluency instruction by optimizing such activities so maximum gains can be realized and (b) better elucidate the impact of potentially intervening variables on reading rate.

Repeated Reading and Reading Rate

Taguchi and his colleagues (Taguchi, 1997; Taguchi & Gorsuch, 2002; Taguchi et al., 2004; Gorsuch & Taguchi, 2008) conducted four RR studies in post-secondary EFL settings, which investigated the effect of a combination of assisted and silent unassisted RR on reading rate and comprehension (see Table 1). Because the focus of the current study was on reading rate, results pertaining to comprehension are not reported. These studies produced mixed results for within group comparisons from pre-test to post-test: In some cases, reading rate increased after the RR treatment (Taguchi, 1997; Taguchi & Gorsuch, 2002; Gorsuch & Taguchi, 2008) whereas reading rates decreased in other cases (Taguchi et al., 2004; Gorsuch & Taguchi, 2008). For example, the largest rate gain was in the 2002 study (+40 wpm, $d = 1.33$), and the largest rate decrease was in the 2008 study (-18 wpm, $d = -0.49$). Thus, the evidence reported in these initial studies is not conclusive, resulting in the need for further examination of the impact of RR on reading rate.

Table 1

Summary of Previous Post-Secondary EFL RR Studies

Study	Readings/ passage	Passages/ week	Length (weeks)	Total Sessions	Total Readings	Gain (WPM)	Cohen's *d*
Taguchi (1997)	7	3	10	30	210	+20	1.19
Taguchi & Gorsuch (2002)	5	ca. 3	10	28	196	+40	1.33
Taguchi et al. (2004)	5	2–3	17	42	210	-3	-0.14
Gorsuch & Taguchi (2008)	5	2	11	22	110	+20 -18	0.53 -0.49
Chang & Millett (2013)	5	2	13	26	130	+ 47 +45	1.58 1.55

Note. Gains and their corresponding Cohen's d values were for within group comparisons.

Guided by these four foundational studies, Chang and Millett (2013) conducted an additional RR study in a post-secondary EFL environment using silent unassisted RR (refer to Table 1). They argued that some of the unfavorable results found in previous studies stemmed from inequality of text difficulty and the use of narrative texts. That is, text difficulty was not symmetrical between treatment texts and testing texts, nor was it symmetrical between pre-tests and post-tests. Therefore, they employed texts that were intentionally designed for fluency development: texts that were discrete and controlled for passage length, vocabulary, and grammar. Such texts had been used previously in studies investigating timed reading, also referred to as speed reading, with increases in reading rate being reported (see Chung & Nation, 2006; Macalister, 2008, 2010). Essentially, Chang and Millet (2013) adapted the methodology of timed reading to create their RR intervention. That is, instead of reading passages only one time as done in timed reading, participants in their study read passages five times. Within group results showed that participants in the RR treatment group improved their reading rate by 47 words per minute ($d = 1.58$) on practiced texts and 45 words per minute on unpracticed texts ($d = 1.55$). The RR group also outgained a control group by 34 words per minute and 38 words per minute on practiced texts and unpracticed texts respectively. These results demonstrate that controlling for text type, passage length, vocabulary, and grammar can reduce noise and potentially lead to reading rate gains.

Intensity and Duration

While previous post-secondary EFL RR studies have mostly demonstrated positive results in regard to reading rate gains, two principal aspects remain relatively unexplored and require further attention. The first variable requiring more attention is intensity—the number of readings per RR session. Two studies have investigated the impact of the number of readings for within group comparisons. For example, Stoddard et al. (1993) found that for English L1 underperforming readers in the fourth and fifth grades, reading rate increased from three readings to seven within a single RR session. In Taguchi's (1997) post-secondary EFL study, participants' silent reading rates increased from the first to fifth readings and from the fifth to seventh readings in a single session. These results indicate that more readings per session can lead to gains in reading rate. It is important to note that these studies investigated intensity in a single session, not the effect of intensity over the course of an entire treatment. In contrast to the findings from Stoddard et al. (1993) and Taguchi (1997), it has been noted that RR treatments with too many readings per session over the course of an entire treatment—to much intensity—can be boring, disengaging, discouraging, and demotivating, which can result in adverse effects. (Chang & Millett, 2013, p. 140; Taguchi et al., 2012, p. 48; Taguchi et al., 2016, pp. 110-111). While three to five readings have been recommended as optimal (Nation, 2009a, p. 136), this claim has yet to be tested empirically over the course of an entire RR treatment period.

The second variable requiring further investigation is duration of treatment—the length of a RR treatment. Millett (2008) cautioned teachers to do fluency-developing activities for the first few weeks of the semester to avoid "[dragging] the programme out for the course of twelve weeks until everyone is thoroughly bored with it" (p. 25). There is some evidence to support the effectiveness of a shorter RR treatment. For example, Rasinski (1990) found that third graders whose L1 was English were able to improve their oral reading speed after just two days of treatment. Chung and Nation (2006) reported that in a semester-long timed reading treatment in a post-secondary EFL context, most of the increase in reading rates was realized in the first half although gains were still made in the second half of the semester. On the other hand, there is evidence indicating that a longer treatment may yield better results than a shorter treatment. For example, Hollingsworth (1970) found that a RR treatment of 32 sessions did not yield reading rate gains, but his follow up study (Hollingsworth, 1978), which featured 62 sessions, did result in gains. One explanation for such a dramatic difference between studies was that the first study's participants were at-level readers while the participants in the second study were below-level readers. Overall, an investigation of treatment intensity and duration could help improve RR interventions by leading to more efficient and effective implementation.

Background Knowledge, Participant Variation, and Text Variation

In addition to intensity and duration, three additional variables can impact reading rate: background knowledge, individual variation, and text variation. Pertaining to background knowledge, Birkmire (1985) found that reading rate depended on a reader's background knowledge, with more topic familiarity leading to faster reading rates. Corroborating evidence has been furnished in subsequent studies as well (see Shimoda, 1993; Priebe et al, 2012). In relation to individual variation, eye tracking data has been used to show individual differences in reading speed: individual readers vary in the amount of time to decode words and comprehend full sentences, which contributes to variations in reading rate (Rayner et al., 2015; Staub & Benatar, 2013). Such individual differences can be explained by three factors:

individual differences in (1) the amount of time needed to access long-term memory in word decoding (Jackson, 1980), (2) reading skill (e.g., average skilled vs. highly skilled; Ashby et al, 2006), and (3) that fact that topic interest can contribute to faster reading rates (Shimoda, 1993). Additionally, the impact of textual variation was demonstrated by Birkmire (1980), who reported that the location of information in the text structure affected reading rate. Word frequency also affects the length of duration as evidenced by short fixations on high frequency words as compared to low frequency words (Inhoff & Rayner, 1986). In fact, there is evidence to indicate an interaction effect between reading ability and textual factors (Ashby et al., 2005). Although there is ample evidence demonstrating the impact that these variables can have on reading rate in English L1 settings, it remains unknown how they impact non-L1 reading—specifically in a RR treatment in an ESL setting.

Rationale & Research Questions

Repeated reading has been the means of promoting reading fluency for several decades, particularly in English L1 settings. The handful of post-secondary EFL RR studies have produced somewhat conflicting results: RR interventions resulted in improved reading rates in some instances while resulting in decreased reading rate in others. Despite these findings, there has yet to be a post-secondary ESL RR study. Reading rate in a RR treatment could be mediated by variables inherent in the setting: the quantity and quality of language input generally; quality of instruction, especially in the reading classroom; and certain affective variables. This merits specific investigation of a RR treatment in an ESL context. It has also been demonstrated that the variables of intensity and treatment duration could influence the effectiveness of RR, but those variables have not yet been measured empirically. Background knowledge, individual variation, and text variation have been shown to impact reading rate and are logical variables to investigate in a RR treatment. The current study, therefore, intended to answer the following research questions:

1. To what extent does the intensity of an unassisted RR treatment affect reading rates?

2. To what extent does the duration of an unassisted RR treatment affect reading rates?

3. To what extent do background knowledge, individual variation, and text variation affect reading rates in an unassisted RR treatment?

Method

Participants

The participants in the study were 31 international students in their first semester of study at a regional university's intensive English program in the southwest United States, selected from an original pool of 34 students. Three students were excluded from the study for the following reasons: not consenting, missing the post-test, and failing to follow instructions. The native language of these participants was almost exclusively Mandarin Chinese (n = 30) with a single native speaker of Japanese (n = 1). Prior to the study, the number of years students had been studying English varied: over ten (n = 16), ten (n = 9), nine (n = 3), seven (n = 2), and six (n = 1). Intended student majors were as follows: creative media and film (n = 16), computer science (n = 5), hotel management (n = 3), engineering (n = 2), biology (n = 1),

criminal justice (n = 1), criminology (n = 1), finance (n = 1), and forestry (n = 1). The average age of the participants was 19.6 years old with a range from 18 to 24.

After taking a placement test at the beginning of the term, students were placed in the program's fourth level, which corresponded to a TOEFL score range of 45 to 56 and an IELTS score range of 5 to 5.5. Students in this fourth level were placed into one of two sections as assigned by the institution. Participants were enrolled in 20 hours of intensive English instruction per week, which entailed the following classes: listening and speaking (six hours/week), content-based instruction class (six hours/week), reading and vocabulary (four hours/week), and writing and grammar (four hours/week).

Materials and Instruments

The reading materials used for this study came from digital books from Sonia Millett's university webpage, as recommended by Chang and Millett (2013, p. 142), because they were controlled for length, vocabulary, and grammar (see Appendix A). The vocabulary in these passages was controlled at the 2K BNC headword level, meaning passages were comprised of the 2,000 most frequently occurring headwords from the BNC. Each passage was approximately 400 words in length. Each book also claimed that the grammatical difficulty was controlled through the limited use of relative clauses, passive verb constructions, and difficult time references. Each text came with an accompanying set of ten multiple-choice questions aimed at global comprehension (e.g., the topic, main idea, and major details). Each comprehension question contained three answer options (See Appendix A for a link to the passages and comprehension questions). While comprehension was not the focus of the current study, the questions served to strengthen the validity of the readings because it held participants accountable to do the reading carefully. That is, because participants knew they were required to answer comprehension questions after reading, they read the texts carefully rather than reading superficially (e.g., skimming) to achieve a faster rate. The questions were informed by Nation's (2009b) recommendations for fluency-focused activities in that they focused on global understanding of main ideas and major details. The inclusion of comprehension questions in the current study is similar to inclusion of comprehension checks in self-paced reading research. A brief analysis of comprehension scores (see Appendix B) showed that participants were reading for meaning. However, no major conclusions should be drawn from those results because the questions were not necessarily designed to be a reliable measure of comprehension. In total, 24 texts were used in the study: one for practice, eighteen for the treatment, and five for data collection.

Data Collection

Participants' reading rates and background knowledge were measured at five testing checkpoints, which lasted between ten to fifteen minutes each. At each testing checkpoint, participants timed themselves while reading a given text and recorded the number of minutes and seconds taken to read the text on a Google Form distributed by the instructor to the students through email. To measure the time taken to read the pre-test passage, a digital stopwatch was displayed, and students recorded their time upon completing the reading. At subsequent testing checkpoints, the participants timed themselves using the stopwatch feature on their individual phones because this was the way in which they timed themselves during treatment texts. The time taken to read each passage was converted to words per minute. On the same Google Form, participants answered the ten multiple-choice comprehension questions accompanying each text without referring to the text. Finally, participants reported

the level of background knowledge they had prior to reading the text, using a Likert-type scale ranging from one (*I knew a little*) to six (*I knew a lot*). All student responses were saved automatically and compiled in a Google Sheet, which was then downloaded as an Excel Spreadsheet and converted to a *csv* file.

Procedure

The activities related to the study were carried out as part of the participants' reading and vocabulary class, which met two times per week for two hours per class and had the same instructor for both sections. RR intervention activities were completed at the beginning of each class period for both sections. Students received a completion grade for participating in the RR activities regardless of whether or not they were included in the study. The participants whose reading and vocabulary class section was labeled *Section A* (n = 15) comprised the treatment group which engaged in five readings per RR session (5x group, hereafter). The participants whose reading and vocabulary class was labeled *Section B* (n = 16) comprised the treatment group which engaged in three readings per RR session (3x group, hereafter). Apart from the difference in the number of readings per session between the two sections, classroom instruction, activities, homework, and assessments were parallel.

During the first class meeting of week 1, participants engaged in a practice pre-test. Before any activities were commenced, instructions were given regarding how to do the pre-test: (1) read the passage silently and quickly without stopping, (2) refrain from underlining and circling parts of the text, (3) record the time taken to read each passage, (4) answer the accompanying comprehension questions without referring to the text, and (5) report the level of background knowledge. At the conclusion of the practice pre-test, the task instructions were repeated because many students disregarded or did not follow them—especially the instruction of not referring back to the text when answering comprehension questions. During the second class meeting of week 1, the pre-test was administered to students with the same instructions as the practice pre-test.

During the first class meeting of week 2, students were given instructions regarding how to engage in the RR treatment. Before the RR treatment, students were given a RR log to record their reading rates and comprehension scores (see Appendix C). Instructions were then given: In step one, both the 3x group and the 5x groups read the passage one time, recorded the time taken to read, and answered the comprehension questions without referring back to the text. In step two, the 3x group reread the same passage once and recorded their time whereas the 5x group reread the passage three times without answering the comprehension questions and recorded their time for each reading. In the last step, both groups read the passage a final time, recorded the time taken to read, answered the comprehension questions without referring back to the text, checked their answers using an answer key written on the board, and recorded the percentage of correctly answered questions. Thus, the 3x group read each treatment passage three times while the 5x group read each passage five times. This process was repeated with a new text for each of the eighteen RR sessions during the semester. Students occasionally missed treatment sessions without making them up. The average number of treatment texts read for the 3x group was 16.9 and 17.5 for the 5x group. While there was some asymmetry in the administration of the treatment, the difference between the groups was small enough not to be a cause for concern.

The treatment procedure lasted for a total of fourteen weeks (see Table D2 in Appendix D). A typical RR session lasted roughly ten minutes for the 3x group and roughly fifteen minutes

for the 5x group. During the fourteen weeks, there were five testing checkpoints, which followed the same format as the pre-test outlined above: Test 1 (pre-test), Test 2, Test 3, Test 4, Test 5 (post-test). At the conclusion of Test 5, participants answered a short questionnaire regarding their perception of the RR treatment (see Appendix D for a link to the questionnaire). Between the testing checkpoints, participants engaged in five treatment sessions except for the period of time between Test 4 and the Test 5. In that space of time, participants engaged in only three treatment sessions because a holiday break was approaching, which would have created a large gap in the treatment. It is important to note that between the end of the tenth treatment session and Test 3, there was a one-week gap for an institutional midterm examination and preparation time, during which students did not engage in any RR activities.

Data Analysis

Participants' responses at each testing checkpoint were downloaded, compiled, and converted to a *csv* file. To answer research question one, which was concerned about the impact of RR intensity on rate, the two treatment groups were contrasted based on change in reading rate from pre-test to post-test. Means, standard deviations, and 95% mean confidence intervals were calculated. After an independent *t-test* was conducted, mean differences, 95% mean difference confidence intervals, effects sizes (Cohen's *d* values), and a *p* values were reported. Cohen's *d* values were interpreted using Plonsky and Oswald's (2014, p. 889) benchmarks: Values of 0.4, 0.70, and 1.00 are roughly considered small, medium, and large respectively for between group comparisons.

To answer the second research question, which addressed the impact of treatment duration on reading rate, means, standard deviations, and 95% mean confidence intervals, effects sizes (Cohen's *d* values), and *p-values* were calculated without dividing the participants into treatment groups. Thus, reading rates could be compared to another at various points in time. Plonsky and Oswald's (2014, p. 889) benchmarks for within group comparisons were applied in these calculations: small, medium, and large labels corresponded to values of 0.60, 1.00, and 1.40 respectively.

To examine research questions one and two more fully, the data were also organized by time and treatment group to make between group comparisons at the various checkpoints and to make within group comparisons across testing checkpoints. For these calculations, the differences in pre-test reading rates between the two groups needed to be controlled for. Therefore, change in reading rate was calculated by subtracting the reading rate at the pre-test from the reading rate at each subsequent testing checkpoint. Thus, all change in reading rate figures were relative to the pre-test.

Finally, to answer the third research question, which focused on the impact of background knowledge, individual variation, and text variation, a mixed methods RM-ANCOVA model was created. Background knowledge refers to the extent of a participant's knowledge of the topic, individual variation refers to the potential variance in reading rate across participants, and text variation refers to the potential variation across the multiple texts used to assess RR. For the model, the fixed effects were treatment group (3x and 5x) and duration (measured at five testing checkpoints), the covariate was background knowledge, and the random effects were individual variation and text variation. The dependent variable was reading rate. An omnibus ANOVA using Sattherwaite's method was conducted to determine if the fixed effects, interaction between the fixed effects, and covariate significantly contributed to the

model. The *lme4* package in R was used for these calculations (Bates et al., 2015). A marginal R^2 value was calculated to determine the amount of variance that could be explained by the fixed factors and covariate. A conditional R^2 value was also calculated to determine the amount of variance that could be explained by a combination of the fixed factors and the random effects. To pinpoint the amount of variance each random effect could explain, the conditional R^2 value was subtracted from the marginal R^2 value to arrive at the amount of variance explained by the random effects combined. Then, each random effect's proportion of that variance was determined (see Nakagawa & Schielzeth, 2013). For these calculations the *MuMIn* package was used (Barton, 2019).

The stats program R (R Core Team, 2019) and RStudio (R Studio Team, 2019) were used for data analysis. Figures were generated using the *ggplot2* package (Wickham, 2016). Before any statistical analyses were conducted, statistical assumptions were checked. Because most data met all the assumptions, cautiously proceeding with the data analysis was deemed to be acceptable.

Results

The aims of the current study were to evaluate the effects of intensity, treatment duration, background knowledge, individual variation, and text variation on reading rate in a silent unassisted RR treatment in a post-secondary ESL setting. This section is organized based on the three research questions. Before the data pertaining to those questions are explored, a quick explanation of general results is given.

Table 2 contains the descriptive statistics for reading rates organized by time and level. At Test 1 (pre-test), the 3x group had a higher reading rate (119.3 wpm) than did the 5x group (106.8 wpm) with a small to medium effect size (12.5 wpm, $d = 0.51$, $p = .17$). To account for differences in pre-test reading rates between the two treatment groups, change in reading rate was also calculated by subtracting pre-test reading rates from the reading rates at each subsequent testing checkpoint (see Table 3). From the data presented in Table 3, it can be seen that the largest gains made for both treatment groups occurred at Test 2, after five treatment sessions were completed. The standard deviations were also largest at this testing checkpoint, with several participants reading well above 300 words per minute, a phenomenon that did not occur at any other testing checkpoint. The smallest gains for both groups were realized at Test 5 (the post-test). Overall, because all of the 95% confidence intervals at all testing checkpoints for both groups cross zero, it is likely that none of the within group gains were statistically significant. Furthermore, because the observed means of the 3x treatment group fall within the 95% confidence intervals of the 5x group and vice versa, it is likely that none of the between group differences were statistically significant either.

Table 2

Raw Reading Rates Organized by Time and Group

Time	Group	*n*	*M*	*SD*	95% Confidence Intervals Lower	Upper
1	3x	16	119.3	22.2	107.5	131.1
	5x	15	106.8	26.5	92.1	121.5
2	3x	15	134.9	80.1	90.6	179.3
	5x	15	134.1	66.9	97.0	171.2
3	3x	15	125.8	34.9	106.5	145.1
	5x	15	111.9	30.7	94.9	128.9
4	3x	12	125.3	22.6	110.9	139.6
	5x	12	122.1	40.2	96.5	147.7
5	3x	16	125.7	40.4	104.2	147.2
	5x	15	108.0	26.1	93.5	122.4

Table 3

Change in Reading Rate Organized by Time and Treatment

Time	Group	*n*	*M*	*SD*	95% Confidence Intervals Lower	Upper
2	3x	15	19.7	83.2	-26.4	65.8
	5x	15	27.3	74.1	-13.7	68.4
3	3x	15	7.8	31.2	-9.5	25.5
	5x	15	5.1	29.0	-11.0	21.2
4	3x	12	8.0	22.8	-6.4	22.5
	5x	12	13.1	39.8	-12.2	38.4
5	3x	16	5.7	40.7	-16.0	27.3
	5x	15	1.9	27.7	-16.6	12.9

The Effect of Intensity

Table 4 shows the descriptive statistics for change in reading rate from the pre-test to the post-test for both groups (see also Figure 1). The 3x group read at an average of 119.3 wpm at the pre-test and at an average of 125.7 wpm at the post-test, resulting in an increase of 5.7 wpm. The 5x group's average reading rate at the pre-test was 106.8 wpm with an average reading rate of 108.0 wpm at the post-test, resulting in an increase of 1.9 wpm. Overall, the 3x group improved 3.8 wpm minute more than the 5x group from pre-test to post-test with a negligible effect size ($d = 0.11$, $p = .76$). That the effect size was small and the difference between treatment groups was not statistically significant demonstrated that there was no significant or meaningful difference between treatment groups. Results from the mixed effects models confirmed this by showing that that treatment group did not contribute significantly to change in reading rate: $F(1,103) = 0.171$, $p = .68$.

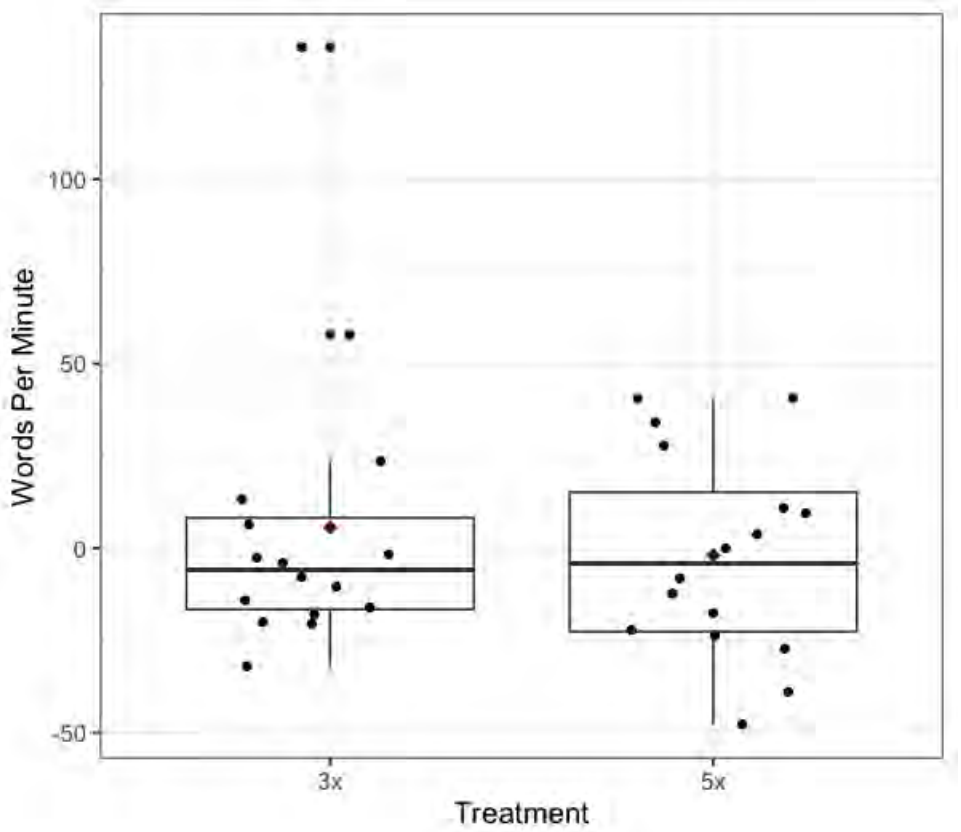
Table 4

Differences in Reading Rate Gains from Pre- to Post-test between Treatment Groups

Treatment	*M*	*SD*	95% CI	Difference	95% CI	*d*	*p*
3x	5.7	40.7	[-16.0, 27.3]	3.8	[-21.7, 29.3]	0.11	.76
5x	1.9	27.7	[-16.6, 12.9]				

Figure 1

Boxplots Showing Group Differences in Reading Rate between Pre-test and Post-test



The Effect of Duration

Table 5 shows reading rates at every testing checkpoint, regardless of treatment group (see also Figure 2). Reading rates were the lowest at the pre-test (113.2 wpm) and highest at time 2 (134.5 wpm), or a difference of 21.3 wpm with a small effect size ($d = 0.40$, $p = .14$). The difference in reading rate between the pre- and post-test was 3.9 wpm ($d = 0.13$, $p = .62$), which showed that the student rate gains over the course of the entire treatment were negligible. This was confirmed by the mixed effects model, which showed that treatment duration did not have a significant effect on reading rates: $F(1,3) = 0.048$, $p = .84$.

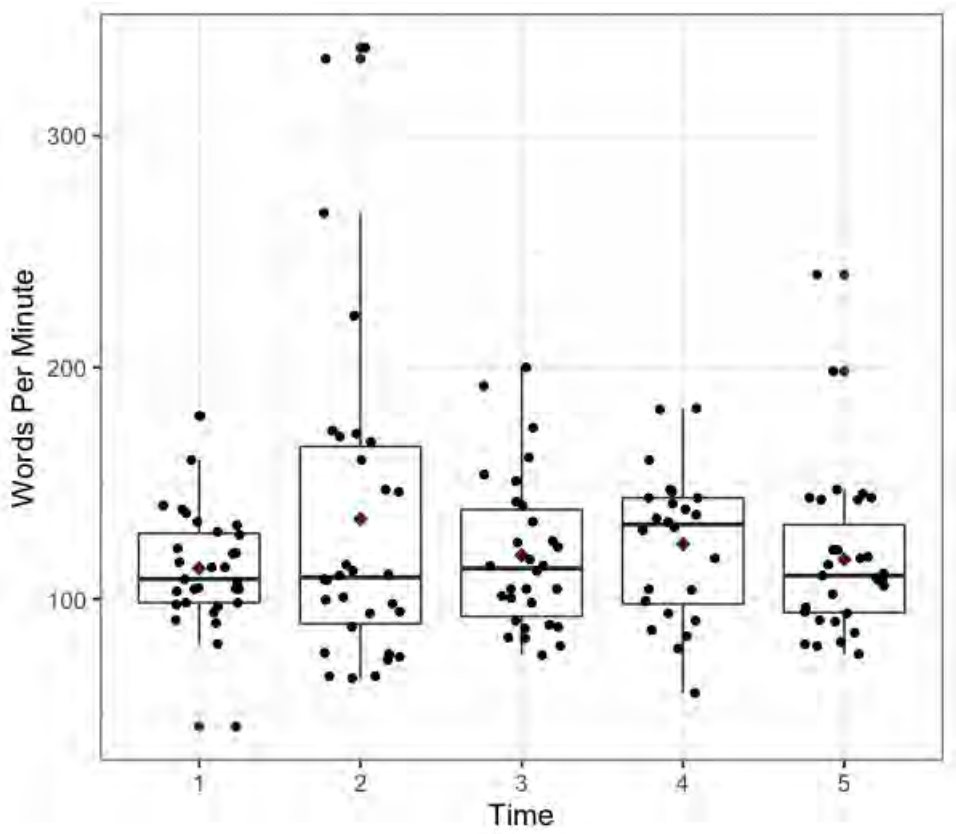
Table 5

Reading Rates at the Five Testing Checkpoints Regardless of Treatment Group

Time	*n*	*M*	*SD*	95% Confidence Intervals	
				Lower	Upper
1	31	113.2	24.8	104.2	122.3
2	30	134.5	72.6	107.4	161.6
3	30	118.9	33.0	106.5	131.2
4	24	123.7	32.0	110.2	137.2
5	31	117.1	34.9	104.4	130.0

Figure 2

Boxplots Showing Reading Rates at the Five Testing Checkpoints Regardless of Treatment Group



The Effect of Intensity and Duration

Table 6 shows change in reading rates organized by treatment group and time (see also Figure 3). As seen in Table 6, at each testing checkpoint, the differences in reading rates between the two groups were negligible. The mixed effects model confirmed these results by showing that the interaction of treatment and duration did not significantly impact change in reading rate: $F(1,84) = 0.306$, $p = .58$.

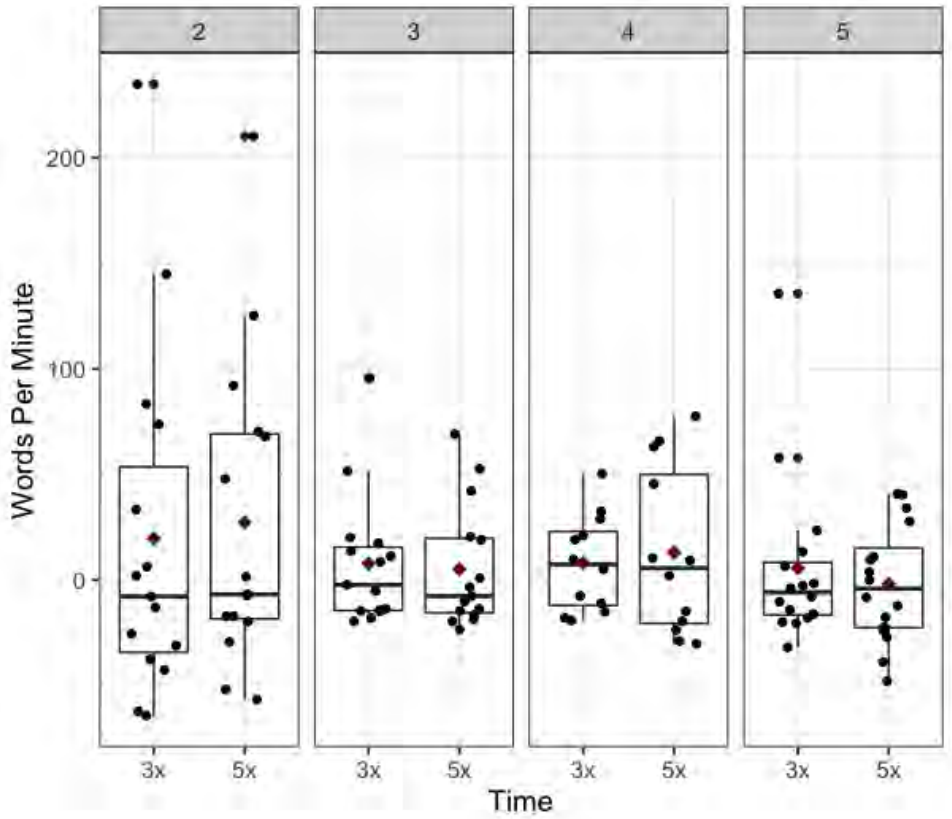
Table 6

Change in Reading Rate Organized by Time and Treatment

Time	Group	*n*	*M(SD)*	95% CI	Diff	95% CI	*d*	*p*
2	3x	15	19.7(83.2)	[-26.4, 65.8]	-7.6	[-51.4, 66.6]	-0.10	.80
	5x	15	27.3(74.1)	[-13.7, 68.4]				
3	3x	15	7.8(31.2)	[-9.5, 25.0]	2.7	[-19.8, 25.2]	0.09	.81
	5x	15	5.1(29.0)	[-11.0, 21.2]				
4	3x	12	8.0(22.8)	[-6.4, 22.5]	-5.1	[-22.8, 33.0]	-0.16	.71
	5x	12	13.1(39.8)	[-12.2, 38.4]				
5	3x	16	5.7(40.7)	[-16.0, 27.3]	3.8	[-21.5, 29.1]	0.11	.76
	5x	15	1.9(27.7)	[-16.6, 12.9]				

Figure 3

Boxplots Showing Change in Reading Rate Organized by Time and Treatment



The Effect of Background Knowledge, Individual Variation, and Text Variation

Table 7 contains results for the omnibus ANOVA test for fixed effects and covariate of the mixed effects model using Satterthwaite's method with effect sizes. For reference, the fixed effects were treatment group and duration, and the covariate was background knowledge. A marginal R^2 value was calculated to indicate the amount of variance that could be explained by the fixed factors and covariate in the model. As is seen in Table 7, the only significantly

contributing variable was background knowledge. Overall, the fixed effects and the covariate explained 8.1% of the variation of reading rates.

Table 7

Omnibus ANOVA Test for the Fixed Effects and Covariate in the Mixed Effects Model

	Mean Sq	Df	F	p	R^2
Treatment	598.8	1	0.36	.55	.081
Time	80.2	1	0.05	.84	
Treatment*Time	83.9	1	0.05	.82	
Background	7871.2	1	4.69	.03	

The proportion of variance explained by each random effect is displayed in Table 8. The random effects of student and text had minimal explanatory power: 0.9% (R^2 = .009) and 0.3% (R^2 = .003) respectively. Overall, the fixed factors and random effects explained 9.3% of the variation in reading rates, leaving over 90% of the variation unexplained.

Table 8

R^2 Values for the Fixed Effects and Random Effects

Variable	Fixed Effects	Student	Text	Total
Reading Rates	.081	.009	.003	.093

Discussion

Summary

The results from this section are meant to answer three research questions: (1) To what extent does intensity of a RR treatment affect reading rate? (2) To what extent does duration of a RR treatment affect reading rate? and (3) To what extent do background knowledge, individual variation, and text variation affect reading rate in a RR treatment? Two treatment groups, the 3x group and the 5x group, engaged in a fourteen-week RR program in which eighteen treatment passages were read. The 3x treatment group read each treatment text thrice per session while the 5x treatment group read each treatment text five times per session. Participant reading rates were measured while accounting for background knowledge at five different times during the treatment intervention. The results from the study as organized by research question can be summarized as follows:

1. Treatment group had a negligible and non-significant impact on reading rate. For example, the 3x group outgained the 5x group by 3.8 wpm (d = 0.11, p =.76) from pre-test to post-test (refer to Table 4 and Figure 1).

2. The length of treatment did not impact reading rate. The largest gain was between the pre-test and Test 2 (+21.3 wpm, d = 0.40, p = .14), and the smallest gain was realized between the pre-test and post-test (+3.9 wpm, d = 0.13, p = .62) (refer to Table 5 and Figure 2).

3. Treatment, duration, and background knowledge explained 8.1% of the variation in reading rate (R^2 = .081) (refer to Table 7). Background knowledge was the only significant predictor to the model. The random effects of student and text explained very little variation in reading rates: 0.9% (R^2 = .009) and 0.3% (R^2 = .003) respectively (refer to Table 8). Overall, the model could account for 9.3% of the variation in reading rate (R^2 = .093).

The Effects of Intensity

This was the first study that investigated the effect of intensity on reading rate in a RR program in a post-secondary ESL setting and was therefore the first to furnish empirical evidence showing that a RR treatment of three repetitions per session yielded slightly better results than five repetitions per session. Due to the results found, engaging in a RR program with three repetitions seemed to be more efficient than a RR program with five repetitions, although differences were found to be negligible and statistically nonsignificant, because participants achieved slightly better results with less effort.

Previous studies attempted to address intensity indirectly through anecdotal observations. For example, Chang and Millett (2013) reported that because some participants felt that reading a text five times was boring, three times might be a better option. Taguchi et al (2012) also reported a similar qualitative finding that six readings were disengaging and demotivating. During the current study's RR intervention period, anecdotal findings supplemented the empirical evidence and corroborated previous worries about the negative effects of excessive rereading: Some students in the 5x group tried to skip the fifth reading during the treatment. Another student in the 5x group considered one reading to be sufficient by attempting to read only one time. This is in contrast to the 3x group in which all participants completed all three readings for every treatment session without issue. Furthermore, while most students in the 5x group had reported on an end-of-treatment questionnaire that RR was a useful activity, two students reported that they did not find it to be useful. This differs from the responses from participants in the 3x group, who unanimously agreed that RR was useful. The 3x group also responded more positively than the 5x group to questions regarding RR's effect on specific aspects of reading (e.g., main ideas, details, vocabulary, and grammar). Evidence from this study combined with that from other studies suggests that students can have too much of a good thing—too many readings of the same text.

The Effects of Duration

Once again, this study was the first to evaluate the role of RR treatment length on reading rate in a post-secondary ESL setting. While previous studies conducted only pre-test to post-test comparisons, the current study featured five testing checkpoints: a pre-test and post-test with three during-treatment tests. The data showed that treatment duration did not have a significant impact on reading rates. From this, it could be concluded that a shorter treatment could be more efficient if equivalent reading rates are to be attained.

That treatment duration did not have an impact overall indicates that perhaps the treatment did not provide enough practice to yield positive results observed in previous studies. Additionally, it is possible that the variable of duration could be a proxy for the number of treatment sessions and subsequently the overall number of readings. At the end of the eighteen-session treatment, participants in the 3x group engaged in 54 total readings, and those in the 5x group engaged in 90 total readings, which is much fewer than previous studies

(refer to Table 1). The treatment group in Chang and Millett's (2013) study, which is most comparable to the current study, concluded the treatment period with 130 readings, 40 more than the 5x group and 76 more than the 3x group from the current study. However, gains in reading rate were found in timed reading studies (Chung & Nation, 2006; Macalister, 2008), in which participants essentially engaged in a repeated reading treatment of one reading per session.

That treatment duration had a minimal impact in the current study also corroborates findings from three previous RR studies, which found a decrease in reading rate (Taguchi et al., 2004; Gorsuch & Taguchi, 2008). While a lack of text equality was cited as the reason for those findings, the current study carefully controlled for textual equality yet found similar results. Perhaps the findings from the previous studies should not be dismissed due to their linguistic limitations. Other moderating variables ought to be considered in tandem with linguistic variables.

An explanation for the minimal rate gains observed in the current study could be student engagement and motivation, which were not empirically measured. Anecdotally, it was noted by several instructors that student behavior in both treatment groups was a cause for concern. Many students displayed apathetic and indifferent attitudes, which could be explained by the disappointment of being placed in level 4 rather than in level 5 of the university to which the intensive English program corresponded. The lack of personal choice in coming to study at the institution could have also lowered some of the student motivation levels. Additionally, it is likely that Chinese and Japanese ESL learners in the United States may not find readings on New Zealand interesting or relevant. Like most pedagogical practices, results from RR could be, at least in part, contingent upon student motivation and engagement.

The Effects of Background Knowledge, Individual Variation, and Text Variation

The mixed effects model showed background knowledge to be the only significant predictor. The importance of background knowledge in reading rate was once again empirically demonstrated, which supports the findings of Birkmire (1985), Shimoda (1993), and Priebe et al. (2012). Such a finding should motivate future reading studies, using RR or not, to measure background knowledge, an important factor in reading rate that cannot be overlooked. It was also found that the random effects of student and text did not explain much variation in reading rates. This could suggest that adult ELLs' reading rates as measured by words per minute are a reliable measure because they are not prone to individual variation across participants in the study. This finding could also imply that the texts chosen in the current study were reliable in that they were linguistically equitable after background knowledge was controlled for. Overall, that the mixed effects model only accounted for roughly 9% of the variation suggests that there are other, more explanatory variables than those measured in the current study.

Limitations

There are three limitations to this study worth noting. The first is in regard to conducting classroom-based research with students. For example, self-reported reading rates may not always accurately reflect how long it took to read a passage, and they may serve as a proxy for reading behaviors. Self-reported background knowledge is also prone to misrepresentation. In addition, students did not always follow instructions: not to underline or circle any part of the text and most especially not to refer to the text while answering

comprehension questions. Several students were caught referring back to text when answering questions even after multiple reminders in their L1, which could have affected the rate at which students read the texts. That is, some students may have tried to read quickly knowing that they could refer back to the text while answering the questions. Additionally, absences resulted in some students missing treatment sessions and testing periods, which resulted in uneven sample sizes across the five testing periods.

The second limitation is the sample collected and its relatively small size ($N = 31$). Therefore, due to the nature and size of the sample attained, the results can be only generalized to a narrow target population: academically oriented adult Chinese ELLs in a post-secondary ESL context. Despite this sampling limitation, the target population of the sample is highly relevant because according to the Institute of International Education (2020a) (IIE, hereafter), the largest country of origin for students in intensive English programs in the USA in 2018 came from China: 17,700 students (22.7% of all students). The IIE (2020b) also reported that in the academic year of 2018-2019, 33.7% of all international students studying in the USA came from China, which totaled 369,548 pupils. With regard to the sample size, while a larger number of participants in the current study could have increased statistical power and generalizability, the number of participants was higher than similar previous studies: eighteen overall with nine per treatment group (Taguchi & Gorsuch, 2002); 20 overall with ten per treatment group (Taguchi et al., 2004); 26 overall with thirteen per treatment group (Chang & Millett, 2013). Such small sample sizes, inherent in classroom-based research, can be overcome through future meta-analytic research, which would aggregate all findings.

The third and final limitation is the instrument used to measure fluency. As an anonymous reviewer highlighted, the answering of the ten comprehension questions at the end of each reading could have impacted students' reading rates. That is, while the comprehension questions were aimed at global comprehension, they may have overemphasized reading for detail and encouraged the participants to read the text too carefully, which may have slowed down their reading rate. However, such an approach has been recommended (Millett, 2008; Nation, 2009b) and has resulted in increases in reading rates in previous research (Chung & Nation, 2006; Macalister, 2008, 2010). The presence of comprehension questions could also in part explain the decrease in reading rates reported in previous RR studies (Gorsuch & Taguchi, 2008; Taguchi et al., 2004). Thus, future studies could employ and/or compare alternative instruments to measure fluency.

Future Research

There are five major potential avenues of fruitful future RR research in ESL/EFL settings that build on the conclusions and limitations mentioned previously. First, measuring comprehension in an analysis of reading rates would increase the field's understanding of RR's efficacy. If comprehension is included as a dependent variable, ensuring that reliable and valid measures are used is critical (see Purpura et al., 2015). Second, future RR studies could investigate the efficacy of other variations of RR, which include additional components such as goal setting and reflecting on previous performance (see Lynn, 2018). Other innovative variations of RR could break from the traditional paradigm of reading quickly for general understanding by having participants reread texts for multiple, meaningful purposes because "[u]nlike some common beliefs, fluency is not achieved when L2 students reach a certain number of words per minute (e.g., 200 words per minute)" (Grabe & Stoller, 2020, p. 146). A third direction of future research could help overcome the crude measures of self-reported reading rate by investigating the impact of RR on objective reading behaviors

measured by eye-tracking technology. A fourth consideration for future research would be to include other variables such as motivation, metacognitive awareness, topic interest, and self-efficacy. A final important variable to consider for future research is participant L1 and culture because the L1 of participants in the current study was nearly homogeneous (Mandarin Chinese), and each previous EFL RR study's participants were also from completely homogenous L1 backgrounds.

Conclusion

This study intended to investigate the role of intensity, treatment duration, background knowledge, individual variation, and text variation in a fourteen-week unassisted silent RR treatment in an ESL setting. The findings showed that the 3x group slightly outgained the 5x group, although such differences were negligible and not statistically significant, indicating that the 3x RR treatment was more efficient than a 5x RR treatment. The largest gains occurred between the pre-test and Test 2, in which time participants only engaged in five RR treatment readings. From pre-test to post-test, which entailed eighteen RR treatment sessions, the gains were miniscule. Background knowledge significantly predicted reading rates, but the random effect of individual variation and text variation did not have much explanatory power. Of these variables, background knowledge ought to be considered and measured in future reading studies. Overall, more research is still needed to assess the efficacy of RR in post-secondary ESL/EFL contexts.

References

Anderson, N. J. (1991). Individual differences in strategy use in second language reading and testing. *The Modern Language Journal*, *75*(4), 460–472.

Anderson, N. J. (2014). Developing engaged second language readers. In Celce-Murcia, M., Brinton, D., & Snow, M. (Eds.) T*eaching English as a second or foreign language* (pp. 170–188). National Geographic Learning.

Ashby, J., Rayner, K., & Clifton, C. (2005). Eye movements of highly skilled and average readers: Differential effects of frequency and predictability. *The Quarterly Journal of Experimental Psychology Section A*, *58*(6), 1065–1086.

Barton, K. (2019). *MuMIn: Multi-model inference*. R package version 1.43.17.

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48.

Birkmire, D. P. (1985). Text processing: The influence of text structure, background knowledge, and purpose. *Reading Research Quarterly*, 314–326.

Blum, I. H., Koskinen, P. S., Tennant, N., Parker, E. M., Straub, M., & Curry, C. (1995). Using audiotaped books to extend classroom literacy instruction into the homes of second-language learners. *Journal of Reading Behavior*, *27*(4), 535–563.

Carver, R., & Hoffman, J. (1981). The effect of practice through repeated reading on gain in reading ability using a computer-based instructional system. *Reading Research Quarterly, 16*, 374–390.

Chang, C-S. (2012). Improving reading rate activities for EFL students: Timed reading and repeated oral reading. *Reading in a Foreign Language*, *24*, 56–83.

Chang, C-S., & Millett, S. (2013). Improving reading rates and comprehension through timed repeated reading. *Reading in a Foreign Language*, *25*, 126–148.

Chung, M., & Nation, P. (2006). The effect of a speed reading course. *English Teaching*, *61*(4), 181–204.
Dowhower, S. L. (1987). Effects of repeated reading on second-grade transitional readers' fluency and comprehension. *Reading Research Quarterly, 22*, 389–406.
Gorsuch, G., & Taguchi, E. (2008). Repeated reading for developing reading fluency and reading: The case of EFL learners in Vietnam. *System, 36*(2), 253–278.
Grabe, W., & Stoller, F. (2020). *Teaching and researching: Reading* (*3rd ed.*). Routledge.
Herman, P. (1985). The effect of repeated readings on reading rate, speech pauses, word recognition accuracy. *Reading Research Quarterly, 20*, 553–564.
Hollingsworth, P. M. (1970). An experiment with the impress method of teaching reading. *The Reading Teacher*, *24*(2), 112–187.
Hollingsworth, P. M. (1978). An experimental approach to the impress method of teaching reading. *The Reading Teacher*, *31*(6), 624–626.
Inhoff, A. W., & Rayner, K. (1986). Parafoveal word processing during eye fixations in reading: Effects of word frequency. *Perception & Psychophysics*, *40*(6), 431–439.
Institute of International Education. (2020a, March 19). Places of Origin. Retrieved from https://www.iie.org/Research-and-Insights/Open-Doors/Data/Intensive-English-Programs/Places-of-Origin
Institute of International Education. (2020b, March 19). Places of Origin. Retrieved from https://www.iie.org/Research-and-Insights/Open-Doors/Data/International-Students/Places-of-Origin
Jackson, M. D. (1980). Further evidence for a relationship between memory access and reading ability. *Journal of Verbal Learning and Verbal Behavior*, *19*(6), 683–694.
Koskinen, P. S., Blum, I. H., Bisson, S. A., Phillips, S. M., Creamer, T. S., & Baker, T. K. (2000). Book access, shared reading, and audio models: The effects of supporting the literacy learning of linguistically diverse students in school and at home. *Journal of Educational Psychology*, *92*(1), 23–36.
Kuhn, M. (2005). A comparative study of small group fluency instruction. *Reading Psychology*, *26*(2), 127–146.
LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology*, *6*, 293–323.
Laufer, B., & Ravenhorst-Kalovski, G. C. (2010). Lexical threshold revisited: Lexical text coverage, learners' vocabulary size and reading comprehension. *Reading in a Foreign Language*, *22*, 15–30.
Lynn, E. M. (2018). Developing reading fluency by combining timed reading and repeated reading. *English Teaching Forum*, *56*(3), 28–31.
Macalister, J. (2008). The effect of a speed reading course in an English as a second language environment. *TESOLANZ Journal*, *16*, 23–32.
Macalister, J. (2010). Speed reading courses and their effect on reading authentic texts: A preliminary investigation. *Reading in a Foreign Language, 22*, 104–116.
Millett, S. (2008). A daily fluency programme: The key to using what you know. *Modern English Teacher, 17*, 21–28.
Nakagawa, S., & Schielzeth, H. (2013). A general and simple method for obtaining R2 from generalized linear mixed-effects models. *Methods in Ecology and Evolution*, *4*(2), 133–142.
Nation, I. S. P. (2009a). Reading faster. *International Journal of English Studies*, *9*(2), 131–144.
Nation, I. S. P. (2009b). *Teaching ESL/EFL reading and writing*. New York: Routledge.
Plonsky, L., & Oswald, F. L. (2014). How big is "big"? Interpreting effect sizes in L2 research. *Language Learning*, *64*, 878–912.

Priebe, S. J., Keenan, J. M., & Miller, A. C. (2012). How prior knowledge affects word identification and comprehension. *Reading and Writing*, *25*(1), 131–149.

Purpura, J. E., Brown, J. D., & Schoonen, R. (2015). Improving the validity of quantitative measures in applied linguistics research. *Language Learning*, *65*(S1), 37–75.

Quiroga, T., Lemos-Britton, Z., Mostafapour, E., Abbott, R. D., & Berninger, V. W. (2002). Phonological awareness and beginning reading in Spanish-speaking ESL first graders: Research into practice. *Journal of School Psychology*, *40*(1), 85–111.

R Core Team (2019). *R: A Language and Environment for Statistical Computing*, *Reference Index Version 3.6.1 (El Capitan Build)*. Vienna: R Foundation for Statistical Computing. Available at: http://www.R-project.org/.

Rashotte, C. A., & Torgesen, J. K. (1985). Repeated reading and reading fluency in learning disabled children. *Reading Research Quarterly, 20*, 180–188.

Rasinski, T. (1990). Effects of repeated reading and listening-while reading on reading fluency. *Journal of Educational Research, 83*, 147–150.

Rayner, K., Abbott, M. J., & Plummer, P. (2015). Individual differences in perceptual processing and eye movements in reading. In Afflerbach, P (Ed.), *Handbook of individual differences in reading: Reader, text, and context* (pp. 348–363). Taylor and Francis.

R Studio Team (2019). *RStudio: Integrated Development for R.* RStudio, PBC, Boston, MA. Available at http://rstudio.com/.

Samuels, S. J. (1979). The method of repeated readings. *The Reading Teacher*, *32*(4), 403–408.

Shimoda, T. A. (1993). The effects of interesting examples and topic familiarity on text comprehension, attention, and reading speed. *The Journal of Experimental Education*, *61*(2), 93–103.

Shimono, T. R. (2018). L2 reading fluency progression using timed reading and repeated oral reading. *Reading in a Foreign Language*, *30*(1), 152–179.

Shin, J., Dronjic, V., & Park, B. (2019). The interplay between working memory and background knowledge in L2 reading comprehension. *TESOL Quarterly*, *53*(2), 320–347.

Staub, A., & Benatar, A. (2013). Individual differences in fixation duration distributions in reading. *Psychonomic Bulletin & Review*, *20*(6), 1304–1311.

Stoddard, K., Valcante, G., Sindelar, P., O'Shea, L., & Algozzine, B. (1993). Increasing reading rate and comprehension: The effects of repeated readings, sentence segmentation, and intonation training. *Literacy Research and Instruction*, *32*(4), 53–65.

Taguchi, E. (1997). The effects of repeated readings on the development of lower identification skills of FL readers. *Reading in a Foreign Language*, *11*(1), 97–119.

Taguchi, E., & Gorsuch, G. (2002). Transfer effects of repeated EFL reading on reading new passages: Silent reading rate and comprehension. *Reading in a Foreign Language*, *14*, 1–18.

Taguchi, E., Gorsuch, G. J., & Sasamoto, E. (2006). Developing second and foreign language reading fluency and its effect on comprehension: A missing link. *The Reading Matrix*, *6*(2), 1–18.

Taguchi, E., Gorsuch, G., Takayasu-Maass, M., & Snipp, K. (2012). Assisted repeated reading with an advanced-level Japanese EFL reader: A longitudinal diary study. *Reading in a Foreign Language*, *24*, 30–55.

Taguchi, E., Melhelm, L., & Kawaguchi, T. (2016). Assisted reading: A flexible approach to L2 reading fluency building. *The Reading Matrix*, *16*(1), 106–118.

Taguchi, E., Takayasu-Maass, M., & Gorsuch, G. J. (2004). Developing reading fluency in EFL: how assisted repeated reading and extensive reading affect fluency development. *Reading in a Foreign Language*, *16*, 70–96.

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis (2nd ed.)*. Springer-Verlag.

Appendices

Appendix A: Reading Passages

The text passages used in the study were downloaded from Sonia Millett's faculty webpage, which is no longer in use. However, they can be accessed at https://www.wgtn.ac.nz/lals/resources/speed-reading-and-listening-fluency

The books used for data collection are listed below in Table A1. The treatment texts and questions came from passages labeled 1-18 from Book 1. The texts and questions used for data collection (see Table A2), came from both Books 1 and 2. The number in parentheses next to each passage title indicates the book from which the passage came.

Table A1

Summary of Books Used for Data Collection and Treatment Procedure

Title	Total Readings	BNC Headword level	Words per passage	Questions per passage (choices per question)
New Zealand Speed Readings for ESL Learners Book 1	20	2,000	400	10 (3)
New Zealand Speed Readings for ESL Learners Book 2	20	2,000 + AWL	400	10 (3)

Table A2

Analysis of Vocabulary Coverage of Texts Used for Data Collection

Title	Test	1K Band	2K Band	3K Band	Off-list
The New Zealand Economy (2)	1	342 (86.1%)	33 (94.4%)	17 (98.7%)	1 (0.3%)
Endangered Species (2)	2	348 (86.8%)	30 (94.3%)	17(98.5%)	0 (0%)
Earthquakes (2)	3	320 (80.6%)	37 (89.9%)	13 (93.2%)	0 (0%)
Volunteers (2)	4	347 (86.1%)	43 (96.1%)	5 (97.3%)	4 (1.0%)
New Zealand's Largest Neighbour (1)	5	321 (79.7%)	45 (90.9%)	12 (93.9%)	10 (2.5%)

Note. The number in parentheses next to the titles presented in the first column corresponds to the book to which each passage belonged (see Table A1 for a description of the books)

Appendix B: Comprehension Scores

Table B1 contains the descriptive statistics for reading rates organized by time and treatment group. At every testing checkpoint for each group, comprehension scores were above 70% with the exception of the 5x group at Test 3. That both groups had their lowest comprehension scores at Test 3 could be explained in part by the fact that there was a week-long gap between the final treatment session and the testing checkpoint due to an institutional examination and examination preparation time. Achieving 70% comprehension on fluency-focused reading activities, like RR, has been established as the threshold for sufficient comprehension (see Anderson, 2014; Nation, 2009a). Therefore, these data indicate that students were comprehending at a sufficient level throughout the entire treatment. It is important to note that these comprehension questions were utilized to ensure students read texts carefully and were based on Nation's (2009b) recommendations for fluency-focused activities in that they focused on global understanding of main ideas and major details. No major conclusions should be drawn from these data as the questions were not necessarily designed to be a reliable measure of comprehension.

Table B1

Raw Comprehension Scores in Percentage Points Organized by Time and Group

Time	Group	n	M	SD	95% Confidence Intervals	
					Lower	Upper
1	3x	16	83.1	8.77	78.5	87.8
	5x	15	78.0	14.2	70.1	85.9
2	3x	15	84.7	16.9	75.3	94.0
	5x	15	78.0	13.7	70.4	85.6
3	3x	15	73.3	11.8	66.8	79.8
	5x	15	68.0	19.0	57.5	78.5
4	3x	12	83.3	12.3	75.5	91.2
	5x	12	82.5	12.9	74.3	90.7
5	3x	16	76.8	17.4	67.6	86.1
	5x	15	78.0	18.2	67.9	88.1

Appendix C: Repeated Reading Log

RR Log: 3x Group

	Date	Title	Time #1	Comp	Time #2	Time #3	Comp
1							
2							
3							

RR Log: 5x Group

	Date	Title	Time #1	Comp	Time #2	Time #3	Time #4	Time #5	Comp
1									
2									
3									

Appendix D: Procedure and Schedule Details

Table D1

The RR Treatment Procedure Organized by Treatment Group

Step	3x Group	5x Group
1	Read the passage one time. Record the time taken to read. Answer the comprehension questions.	Read the passage one time. Record the time taken to read. Answer the comprehension questions.
2	Reread the text one time. Record the time taken to read.	Reread the text three times. Record the time taken to read for each rereading.
3	Read the passage a final time. Record the time taken to read. Answer the comprehension questions. Check the comprehension questions. Record the comprehension score	Read the passage a final time. Record the time taken to read. Answer the comprehension questions. Check the comprehension questions. Record the comprehension score
	This process was repeated eighteen times with a new text for each session	

Table D2

Summary of the Treatment Procedure

Week	Procedure
1	Instructions. Practice Pre-test: Pre-test. Vocabulary tests.
2–4	Treatment passages 1–5
4	Test 2
5–7	Treatment passages 6–10 (gap for exams and preparation)
8	Test 3
9–11	Treatment passages 11–15
11	Test 4
12–13	Treatment passages 16–18
13	Post-test & questionnaire

The questionnaire administered at the end of the treatment can be accessed here: https://docs.google.com/forms/d/e/1FAIpQLSdqai_xDgcTLD9ue7B32niP9796gnM8PyYgFU-QKzpmV61VQ/viewform?usp=sf_link

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