

Effect of timed reading on Chinese undergraduates' EFL reading rates: Mixed-method analyses

Min Gui
Wuhan University
China

Yajie Shang
Lishui Foreign Language School
China

Xiaokan Chen
Haiyun School
China

Abstract

In this article, a three-phase mixed-methods study was conducted to investigate timed reading effects on Chinese university students' English as a foreign language (EFL) reading rate. First, two equivalent reading rate tests were designed and validated with 30 participants. Second, 81 university students from two intact classes participated in the main study. Quantitative analyses revealed that the timed reading group made significantly greater improvement in reading rate than the comparison group, while both groups progressed significantly in reading rate. Third, semi-structured interviews with 14 participants from the treatment group were conducted to investigate students' perceptions of the effects of the timed reading approach. Despite some positive comments, some negative effects were identified. The findings shed new light on the implementation of timed reading instructions.

Keywords: reading rate, timed reading, second language reading, reading rate measurement, reading fluency

The problem of having a slow reading rate is widespread among second language (L2) learners (Grabe, 2010). Many researchers have expressed concerns about the substantial gap between first language (L1) and L2 reading rates (Chang & Millett, 2015; Fraser, 2007; Grabe, 2009; Segalowitz et al., 1991; Suk, 2017). Grabe (2009) estimated that even L2 university students may only read at one-third the rate of L1 readers (p. 290). Fraser (2007) found significant L1/L2 rate gaps for five types of reading tasks, which include scanning, skimming, rauding, reading to learn, and reading to memorize. Despite the conspicuous deficiency of L2 readers, L2 teachers in general seldom design classroom activities to enhance students' reading rate (Grabe, 2010).

Reading rate is closely related to reading purpose and text characteristics. Carver (1990)

noted systematic variations in reading rate, and he categorized the variations into five reading processes or gears when readers are involved with different reading goals. The processes include scanning, skimming, rauding, learning, and memorizing. The present study focuses on rauding, or normal reading, as used by Fraser (2007), because it is the most typical process of reading. It is adopted when readers are “looking at each consecutive word of a prose passage in order to comprehend the complete thought contained in each sentence” (Carver, 1990, p. 15). This type of reading typifies the reading process for most Chinese college students when comprehending L2 passages during examinations.

The severe consequences of slow L2 reading speed have been illustrated by many researchers (e.g., Chang & Millett, 2015; Fraser, 2007; Shimono, 2018). Some instructional methods have been reported to improve L2 reading rate, including repeated reading, extensive reading, and timed reading. However, three issues have emerged from the literature. First, little attention has been paid to the L2 learners in the educational context of mainland China so far to the best of the authors' knowledge. Given that China currently educates the largest number of L2 learners in the world (Clark-Gareca & Gui, 2019), the lack of attention to this enormous body of L2 learners represents a gap in reading rate research agenda. Second, some of the studies contain methodological limitations, for instance, a lack of information about the design of speed tests raising questions about the asserted effects of the method of timed reading. Third, few studies have examined L2 learners' perceptions regarding the effect of the instructional approaches. In the present study, we will address these three issues by exploring the effects of the timed reading approach on L2 reading rate of Chinese college students.

Literature Review

Three major approaches have been utilized in different contexts for L2 reading rate improvement, namely, repeated reading, extensive reading, and timed reading. Repeated reading approach usually requires learners to read a short passage silently or orally several times until they can read and comprehend it with ease. It includes an array of modified approaches, such as repeated oral reading, assisted repeated reading, and paired reading (Gorsuch & Taguchi, 2010; Shimono, 2018). Second, the extensive reading approach normally requires learners to read a large volume of texts (Grabe, 2010; Suk, 2017). Although positive effects of extensive reading on reading rate improvement have been identified in previous studies, this approach requires students to spend much time reading after class.

The timed reading approach involves having learners read under time pressure. In a typical timed reading activity, students are required to quickly read a series of passages that are controlled for vocabulary and length, record the reading time, and answer multiple-choice comprehension questions. Several studies have reported on the effect of timed reading approaches. An early study was conducted by Cushing-Weigle and Jensen (1996). They employed a pre-post design using two passages (1,690 and 1,712 words, respectively) from an introductory astronomy textbook for the pre-test and the post-test. Two classes of ESL students (17 and 47 students, respectively) from the University of California at Los Angeles were involved. They found that the timed reading approach produced positive effects on reading rates for both classes. They also found that the approach decreased the reading comprehension performance for the class with lower language proficiency, but it did not affect the class with higher proficiency. They concluded that timed reading may benefit ESL

students' reading rate. However, only two passages in a specialized field were used to measure the participants' initial and final reading rates, which may raise questions about the reliability of the measures of reading rate and consequently, the conclusions that the researchers drew.

Some other studies used multiple passages with controlled text length and readability. For instance, Chung and Nation (2006) asked 49 Korean college students to read 23 texts with 550 words each in nine weeks. They found that almost all learners increased their reading speed. However, comprehension scores were not reported in their study. Similarly, Macalister (2008) used 20 passages with 400 words each to examine the effect of timed reading on the rate of 29 pre-university students at a New Zealand university. It was found that 25 out of 29 students' reading rate increased by 5 to 143 words per minute (wpm). The author also examined whether the rate increase can be maintained after the practice. He employed a delayed post-test and found 15 out of 29 students showed no change or a decrease in reading rate. Macalister (2010) added a comparison group to further investigate the effect of the timed reading approach, and he found similar results. Macalister (2008, 2010) contributed to the reading rate research by examining whether the effect was able to be maintained after the training course. However, these two studies did not report students' comprehension scores either. It is possible that some readers would sacrifice comprehension for the sake of higher reading speed.

Chang (2010) rectified these weaknesses by using more sophisticated research designs with 84 college students in Taipei. In addition to reading rate, the study also examined reading comprehension and the perceptions of the participants. The results revealed that timed reading significantly improved students' reading rate and slightly enhanced comprehension. As for perceptions of timed reading, most of the students' remarks were positive, including improved confidence in reading and the large amount of reading that they completed. Few of them expressed negative attitudes, for example, the reading texts being too easy. Furthermore, Chang (2012) compared the effect of timed reading and repeated oral reading approaches on L2 reading rate, reading comprehension, and the delayed effects of 35 participants. Overall, the timed reading approach produced better results than repeated oral reading approach. Chang's studies accumulated more evidence about the effect of timed reading activities. However, a weakness for these two studies is that they used the same reading test for both the pre-test and the post-test. The reported effect of timed reading might be the result of rereading, thus casting doubts on the interpretation of the results.

Similarly, Shimono (2018) compared the effects of timed reading and the combination of timed reading and repeated oral reading approaches on the reading rate of 55 Japanese college students. The study found no significant difference between these two approaches. This study has extended reading rate research by exploring the effect of a compound method of timed reading and repeated oral reading. However, an apparent limitation of this study is that it did not control the comparability of the pre-test and post-test. Furthermore, the claimed effect of the timed reading approach has not been supported by other evidence, such as students' perceptions.

The review of literature has revealed that L2 reading researchers are interested in the issue of L2 reading rate, and they have endeavored to improve research designs to explore the most effective instructional approaches. However, given the importance of L2 reading rate, the number of studies is disproportionately small. Besides this problem, the educational contexts that these studies cover are also narrow. The biggest L2 learning region in the world,

mainland China, has almost been ignored. Another issue revealed by the literature review is that research methods still need to be strengthened. For instance, the examination of the comparability between the pre-test and post-tests has not been adequately treated. Finally, the voice of students has been neglected. Considering the limitations in previous studies as well as the importance of L2 reading rate to students' academic success, more studies are necessary. In the following passage, we will lay out the details of the design and validation of the reading speed assessment of the current study. Furthermore, the study will examine the effect of timed reading by gathering evidence of reading speed improvement as well as students' perceptions. The following two research questions guided the present exploration:

- (1) What are the effects of the timed reading approach on Chinese university students' English as a foreign language (EFL) reading rate?
- (2) How do students perceive the effects of timed reading on their EFL reading rate and EFL reading in general?

The Study

The present study was composed of three phases: (a) the design of two equivalent reading tests which were used for the pre-test and post-test; (b) the experimental phase which intended to explore answers to the first research question; and (c) the semi-structured interview phase which aimed to find answers to the second research question (see Table 1). In the first phase, 30 second-year college students were recruited from a large top-tier public university in central China. In the second phase, two intact classes were selected from the same university, one with 43 students for the treatment group, and the other with 38 students for the comparison group. In the last phase, a stratified sampling method based on degrees of progress was used to recruit participants from the treatment group. All participants had learned English for ten years, starting from primary school. Their average English proficiency was at an intermediate level, roughly at level B2 in terms of the *Common European Framework of Reference for Languages*.

Table 1

Three stages of the study

Stage	Time length	Purpose	Participants
1 Design & validation of pre-test and post-test	2 weeks	Design & validate measures for pre-test & post-test	30 students from the whole university
2 Experiment			
Pre-test	1 week	Explore answers to	Treatment: 1 class
Experiment	10 weeks	research question 1	with 43 students;
Post-test	1 week		Comparison: 1 class
			with 38 students
3 Semi-structured interviews	2 weeks	Explore answers to research question 2	14 students from the treatment group

Phase 1: Design and Validation of the Pre-test and Post-test

Regarding the test design, first, a pool of 30 passages from the Chinese College English Test (Band 4) (CET-4) was collected. The CET-4 is a national test aiming to measure Chinese college students' English proficiency after they have completed four-semester College English courses (Jin & Wu, 2017). These passages were used because one major goal of the students in this research context is to pass the CET-4. Another reason is that some studies have validated the quality of the CET-4 (e.g., Jin & Wu, 2017; Yang & Weir, 1998). All passages were expository tests, and each consisted of 300-400 words, followed by five multiple-choice comprehension questions. Second, three measures, used by Fraser (2007), were employed to select six passages: (a) different topics of the passages to counterbalance test takers' background knowledge; (b) readability of the passages; and (c) vocabulary difficulty levels, including measures of percentages of high-frequency words and words from the Academic Word List (Coxhead, 2000). Finally, these six passages were split into two matched tests. The topics of test one included education, business, and health. The topics of test two were food, family, and psychology; the lengths were 1,013 and 1,018 words respectively; the Flesch-Kincaid grade levels were both 10.6, and the average high vocabulary frequency levels (the first 2,000 words) were 92.4% and 92.0% respectively. Other characteristics, which include syntactic features and number of words, paragraphs, and sentences are presented in Table 2.

Table 2*Characteristics of the passages of the reading tests*

Statistics	Test 1				Test 2			
	P1 ^a	P2	P3	Total	P1	P2	P2	Total
<i>Counts^b</i>								
Words	327	326	360	1,013	349	326	343	1,018
Paragraphs	7	6	2	15	4	4	8	16
Sentences	16	18	15	49	18	19	15	52
<i>Averages</i>								
Sentence per paragraph	2.2	3.0	7.5	3.2	4.5	4.7	1.8	3.2
Words per sentence	20.4	18.1	24.0	20.6	19.4	17.1	22.8	19.5
Letters per word	4.7	5.0	4.5	4.9	4.7	4.8	5.1	4.8
<i>Readability</i>								
Flesch-Kincaid grade level	10.5	10.5	11.0	10.6	10.3	9.4	11.9	10.6
Flesch reading ease	51.5	51.6	58.1	54.3	55.3	57.8	50.1	53.3
<i>Vocabulary frequencies^c</i>								
(<i>%</i>)								
K1-K2 (1-2,000)	92.8	90.6	93.8	92.4	92.7	92.4	91.8	92.0
Academic word list	5.6	8.2	5.4	6.4	7.1	4.5	9.4	7.1

Note. ^a P is short for passage. ^b Microsoft Word 2010 was used to calculate the counts, averages and readability. ^c Vocabprofile provided the vocabulary frequency estimates.

A small-scale validation study was implemented. Thirty first-year students (16 female and 14 male) were recruited from the university where the main study was conducted, but they were

excluded from the main study. They were 18 to 19 years old, majoring in law, biology, and business. Before the test, researchers of the study informed the participants of the test's purpose, requirements, and procedures of the test. The test was administered in paper and pencil. A software timer was shown on the classroom screen. Participants were required to read one passage, record the reading time, answer comprehension questions (referring to the text was not allowed), and record question answering time. The last requirement was to remind students not to spend an unreasonably long time in answering questions if they do not know the answer. The timer was then set at "start" again, and the participants read another passage, and repeated the procedure until they completed all the six passages. The six passages were delivered in a counterbalanced way.

As for scoring, reading rate and comprehension were both measured. The reading rate of each passage was calculated by dividing the number of words by its reading time. The reading rate of each test was the average of the three reading rates. Reading comprehension was measured by the percentage of correct answers.

Table 3

Descriptive statistics of the validation study (N = 26)^a

Tests	Items	Min	Max	Mean	Std. Deviation
One	Reading rate (<i>wpm</i>)	69	173	107	25.47
	Comprehension (%)	60	93	76	0.11
Two	Reading rate (<i>wpm</i>)	71	164	106	21.90
	Comprehension (%)	60	100	76	0.14

Note. ^a Four participants whose comprehension scores were lower than 60% were excluded from analyses.

Concerning the results of the validation study, the reading rates of the two tests were very close, i.e., 107 and 106 words per minute (*wpm*), respectively. As shown in Table 3, the average correct answer percentages were both 76%. The Pearson correlation of the reading rate between the two tests was .915 ($p < .01$). The correlation of two tests' reading comprehension scores was .800 ($p < .01$). The Cronbach's alpha reliability estimates for the comprehension items of the two tests were .783 and .791, respectively. To sum up, based on the average reading rates and their high correlation, the two tests were comparable to a high degree and appropriate to be used as the pre-test or the post-test of the main study.

Phase 2: Experiment Examining Timed Reading Effects on Reading Rate Development

The main study was to examine the effects of the timed reading approach on Chinese university students' EFL reading rate. Participants' initial reading rate and comprehension were measured by one of the two tests designed previously. Then a 10-week timed reading experiment was conducted, followed by a post-test.

Participants. The participants were 81 first-year undergraduates from two intact classes. These two classes were categorized into the same foreign language proficiency level, intermediate, by a school-based placement test which consists of listening, reading, and writing tasks. They were required to take the four-semester College English course for credits. The classes met for three sessions per week with the same syllabus and textbooks, and would take the same final examinations to earn the credits. One class, with 43 students,

served as the treatment group; the other, with 38 students, was the comparison group. Table 4 presents the profile of the 81 participants.

Table 4

Profile of the participants in the main study

Groups	Major	Age	Male	Female	Total
Comparison	Politics & Management	18.6	14(37%)	24(63%)	38
Treatment	Philosophy & Psychology	18.5	16(37%)	27(63%)	43

Experimental Design. The experiment was embedded in one semester of a regular College English course for the intermediate language proficiency level classes. This course lasted for four semesters, 16 weeks per semester, three sessions per week, 45 minutes per session. Students used three textbooks, *New College English*, Book 2 (Ying et al., 2005), *College English Fast Reading*, Book 1 (Liu & Zhu, 2010), and *College English Creative Reading*, Book 1 (Martin, 2002). Only the first one was taught intensively in class and the other two were for self-learning out of class. They took the school-based final examination at the end of each semester to earn the credits. They were also required to take the national CET-4 in the fourth semester. Regular instructional approaches included lecturing and integrated activities of listening, speaking, reading, and writing. The same three textbooks were used for both groups.

Table 5

Activities of the treatment and comparison groups

Activities	Treatment group	Comparison group
<i>Pre-test</i>	Yes	Yes
<i>In-class</i>		
Lecturing & integrated activities	120 minutes per week; 12 weeks	135 minutes per week; 12 weeks
Timed reading	15 minutes per week for 10 weeks 10 passages (830 to 1,092 words), one per week	No
<i>Out-of-class</i>		
<i>Fast Reading</i>	Required to read as fast as possible, record reading time of each passage and turn in the record; 40 passages (30,913 words)	Asked to read 40 passages (30,913 words)
<i>Creative Reading</i> ^a	Read 6 passages (6,185 words)	Read 16 passages (16,412 words)
<i>Post-test</i>	Yes	Yes

Note. ^a *Creative Reading* is the title of the after-class reading textbook.

The experiment was operationalized in both ways. First, the treatment group incorporated a 15-minute per week timed reading session for 10 weeks into the in-class activities, but the

comparison group did not have this treatment. Second, students from the treatment group were required to read four passages in *College English Fast Reading* and record the reading time of each passage each week. They were also asked to calculate their reading rate by using the number of words of each passage provided by the textbook. These two types of information were collected each week. The comparison group was just asked to read the passages from *College English Fast Reading* and *College English Creative Reading*. Two groups were informed that two passages would be included in the final examination to encourage the completion of reading tasks. The two groups had the same in-class time (135 minutes per week) and similar reading amount, namely, 56 passages with 48,000 words. Table 5 presents the details of the activities of the two groups. The treatment group was taught by one researcher of the present study, and the comparison group was instructed by a teacher from the same teaching cohort of the researcher.

Materials for Timed Reading in Class. Two standards guided the selection of the materials for timed reading: (a) The difficulty levels should not challenge their comprehension; and (b) Topics should be related to the in-class readings and activities. Regarding difficulty levels of the text, indices of Flesch-Kincaid Grade Level readability, reading ease, and vocabulary profile of texts were employed. Ten passages were prepared, ranging from 830 to 1,092 words each in length.

Treatment Procedure and Data Collection. A pre-test was administered to both classes in the week before the experiment. The in-class treatment session was arranged in the last 15 minutes of the class. Participants in the treatment group were instructed to read a passage, record the reading time, and answer comprehension questions. Their reading rate and comprehension were calculated after each session, and the feedback was given in the following class. During these 15 minutes, the comparison group did the regular class activities, including lecturing, discussion, listening, or writing.

Finally, a post-test was delivered to the treatment and comparison groups after the 10-session treatment was completed. The post-test was administered in the same way as the pre-test. When the post-test was completed, an invitation to the third phase of the present study, the semi-structured interview, was given to the treatment group. The purpose of the interview and time length were explained to the whole group.

Quantitative Data Analysis. To investigate the effects of 10-week timed reading on Chinese university students' EFL reading rate, the reading rates of the treatment and comparison group in the pre-test and post-test were compared. It was measured in the unit of words read per minute (wpm). Reading comprehension scores were also gathered. The data was used to examine the change before and after the experiment, but the major purpose was to judge whether the corresponding reading rate is valid or not. If a participant's reading comprehension on either the pre-test or the post-test was lower than 60% (a commonly used passing score in China indicating adequate reading comprehension), the person's reading rate would be excluded from analysis because increased reading rate should not be at the expense of comprehension (e.g., Nation, 2005; Oller & Tullius, 1973).

Between-group and within-group reading changes were investigated. An independent *t*-test was employed to examine whether the treatment and the comparison groups were comparable in terms of reading rate and comprehension on the pre-test. If the two groups were comparable on the pre-test, an independent *t*-test was utilized to examine whether reading rate and comprehension were different on the post-test. Furthermore, two dependent *t*-tests

were employed to examine the reading rate change within the two groups.

Phase 3: The Semi-structured Interview

In this phase, we investigated answers to the second research question (i.e., *How do students perceive the effects of timed reading on their EFL reading rate and EFL reading in general?*). A stratified sampling method was employed to recruit participants among those who were willing to attend. Proportionate numbers of students were selected from those who achieved substantial progress, moderate progress, minimal progress, and nearly no progress. The purpose was to maximize the representativeness of the participants. Interview data were collected in weeks succeeding the post-test. Each interview was conducted in Chinese by two researchers of the present study. The order of the interview sessions was arranged by appointment. Each session lasted for about 15 minutes and was conducted with a single participant to prevent possible peer influence. The interviews were recorded and then transcribed. Two open-ended questions guided the interview:

- (1) How do you view the effect of the timed reading activity on your English reading rate? Explain.
- (2) How do you view the effect of the timed reading activity on your English reading in general? Explain.

The transcription of interviews was then analyzed by a two-cycle coding system (Miles & Huberman, 1994). The first cycle, provisional coding, involved using preliminary codes to label students' each identified comment. The second cycle, pattern coding, was to group similar codes into themes. Finally, the frequency of each theme was counted.

Results

Between-group Analyses

To explore the effects of timed reading on Chinese university students' reading rate, participants' performance on the pre-test and post-test were compared. Data from the two groups of the pre-test were first examined and compared with the purpose to decide the type of statistical analysis that would be used. The means of reading rate for the comparison and treatment groups on the pre-test were 113.42 wpm and 119.15 wpm, respectively (see Table 6). The means of reading comprehension for the two groups were 74.66 and 76.49, respectively.

Table 6

Descriptive statistics of the two groups on the pre-test

	Mean	SD	95% CI	
<i>Comparison (n₁ = 35)^a</i>				
Rate (wpm)	113.42	17.00	[108.49	118.35]
Comprehension (%)	74.66	0.12	[71.18	78.14]
<i>Treatment (n₂ = 39)</i>				
Rate (wpm)	119.15	21.40	[113.28	125.02]
Comprehension (%)	76.49	0.11	[73.47	79.51]

Note. ^a The participants in the comparison and treatment groups were 38 and 43; 3 and 4

participants' scores were excluded respectively, either because their reading comprehension scores were lower than 60%, or they missed one of the two tests.

Table 7 displays the results of the comparisons between these two variables. The result revealed no statistical differences between the two groups in either reading rate measurement ($t = -1.26, p = .21$) or in comprehension ($t = -0.67, p = .51$). Therefore, the two groups were considered comparable before the experiment.

Table 7

Comparisons between the two groups' reading rate and comprehension on the pre-test

	test for equality of variances		t-test for equality of means				
	<i>F</i>	Sig.	<i>t</i>	<i>df</i>	Sig.	Mean Difference	SD of Difference
Reading rate	1.32	0.25	- 1.26	72	0.21	- 5.73	4.53
Comprehension	0.70	0.41	- 0.67	72	0.51	- 0.02	0.03

Table 8 presents the means of reading rate and comprehension on the post-test. The means of reading rate for the comparison and treatment groups were 141.43 wpm and 160.18 wpm, respectively. The means of reading comprehension correct answer percentages were 76.3% and 78.1%, respectively.

Table 8

Descriptive statistics of the two groups on the post-test

	Mean	SD	95% CI	
<i>Comparison (n₁ = 35)</i>				
Rate (wpm)	141.43	24.90	[134.21	148.65]
Comprehension (%)	76.37	0.11	[73.18	79.56]
<i>Treatment (n₂ = 39)</i>				
Rate (wpm)	160.18	26.18	[153.00	167.36]
Comprehension (%)	78.13	0.10	[75.39	80.87]

Table 9 shows the results of the independent samples *t*-test for equality of the post-test's means of reading rate and comprehension. The result of the *t*-test showed that there was significant difference between the two group in reading rate measurement ($t = -2.98, p = .004 < 0.05$). However, reading comprehension did not differ significantly ($t = -0.68, p = .503 > 0.05$).

Table 9*Comparisons between the two groups' reading rate and comprehension on the post-test*

	test for equality of variances		<i>t</i> -test for equality of means				
	<i>F</i>	Sig.	<i>t</i>	<i>df</i>	Sig.	Mean Difference	SD of Difference
Rate	0.08	0.78	- 2.98	72	0.00	- 17.75	5.96
Comprehension	0.49	0.49	- 0.68	72	0.50	- 0.02	0.03

The effect size index, Cohen's *d*, was calculated to further explore the magnitude of the significant difference in reading rate. This index also allows a comparison between the treatment effect of the present with those of other related studies. Cohen's *d* was 0.704, which is of a medium effect (Spatz, 2011).

Within-group Analyses

The changes of reading rate and comprehension accuracy within each group were also investigated to further examine the instructional effect of the timed reading approach and the traditional instructional approach. Four separate paired *t*-tests were conducted to compare the two groups' reading rate and comprehension scores between the pre-test and the post-test. A Bonferroni correction was used for the *p* value for multiple comparisons. For the comparison group, the reading rate improved significantly from 113.42 wpm to 141.43 wpm ($t = 7.50$, $p < 0.01$). This result revealed that traditional reading activity, in which teachers just require students to read an adequate amount of materials without the pressure of time, can also enhance students' L2 reading rate. Table 10 shows that the group's reading comprehension accuracy did not change significantly after a semester ($t = 0.69$, $p = 0.494$).

Table 10*Within-group comparison*

	Pre-test	SD	Post-test	SD	<i>t</i>	Sig.
Comparison ($n1 = 35$)						
Rate (wpm)	113.42	17.01	141.43	24.91	7.50	0.00
Comprehension (%)	74.66	0.12	76.37	0.11	0.69	0.49
Treatment ($n2 = 39$)						
Rate (wpm)	119.15	21.44	160.18	26.18	10.59	0.00
Comprehension (%)	76.49	0.11	78.13	0.10	0.70	0.49

For the timed reading group, the reading rate improved significantly from 119.15 wpm to 160.18 wpm ($t = 10.59$, $p < 0.01$). This result provides further evidence about the effect of the timed reading approach on reading rate when compared with the traditional free reading group. As to the reading comprehension accuracy, the result of the treatment group was similar with the comparison group. No significant change was found ($t = 0.70$, $p = 0.487$). Although both the timed reading approach and the traditional reading instruction produced significant effects on the students' reading rates, their effect sizes were different. The effect

size (indexed by Cohen's *d*) for the traditional reading approach was 1.27, while the effect size for timed reading was 1.70. Overall, the within-group analysis revealed that the timed reading approach produced a greater effect on reading rate increase than the traditional reading approach, while by reading the same amount of materials, the comparison group also increased their reading rate significantly.

Semi-structured Interview Analyses

In this phase, we intended to find answers to the second research question (i.e., how do the students perceive the effects of timed reading on their EFL reading rate and EFL reading in general). Regarding reading rate increase percentage, five (13%) participants improved more than 60%, 12 (31%) improved greater than 40%, and 11 (28%) improved higher than 20%, and the remaining 11 (28%) participants' reading rate increase percentage was lower than 20%. Based on these four scales (> 60%, > 40%, > 20%, and < 20%), a total of 14 participants (with 2, 4, 4, and 4 from each scale) were recruited. Among them five were male, and nine were female.

Eight themes emerged from these qualitative analyses (see Table 11). The first four themes were about students' positive attitudes towards timed reading. The last four were negative comments.

Table 11

Students' perception of the timed reading effects (N = 14)

Theme	Representative comment	Frequency
1. Improved reading rate	"I read faster."	11
2. Increased awareness of reading rate	"I didn't know I read so slowly."	10
3. Improved reading strategy	"I used to translate when I read, but in this training, I had no time to do it"; "I just read through with no pause."	6
4. Enhanced motivation	"This training is kind of game; I like it."	5
5. No effect on comprehension	"These passages were too easy to improve my reading comprehension."	7
6. Hard to improve further after a period of progress	"This training only helped me in the first several times."	3
7. Problem with information recall	"I read faster but it's like water running on the duck's back"; "I forgot what I had just read quickly."	5
8. Increased anxiety	"I was worried when I read slower than others."	4

Positive Comments. Most of the students reported that the timed reading training improved their reading rate and raised their awareness of the importance of reading rate. Six out of 14 commented that the training improved their reading strategy. One student commented that “[During the training] I just read through. I didn’t stop to check the dictionary; I didn’t stop to mark the unfamiliar words because I had to read fast.” Five out of 14 students said they became more interested in reading than before. They liked the sense of competition induced by the training.

Negative Comments. Four themes indicated students’ negative comments on the timed reading training. First, seven out of 14 students remarked that the timed reading approach exerted “no effect on comprehension.” Given that the primary purpose of timed reading was to improve reading rate, little effect on reading comprehension was expected by the researchers of the present study.

Second, some students mentioned that it was hard to break the upper limit of their reading rate. They commented that the training improved their reading rate only in the first several sessions, but they could not improve further even though they tried very hard. One participant reported that “To improve my reading speed is very similar to increasing my running speed. If you ask me to run fast, I can do it. If you ask me to run even faster, perhaps I couldn’t because I have already reached my limit.”

Third, five out of the 14 students reported that they forgot what they had read quickly. One participant reported that “I read faster but it’s like water running on the duck’s back,” a Chinese proverb meaning little information can be recalled after learning, just like water can hardly be absorbed when it runs on the duck’s back. Another student said that “I forgot the topic of the reading passages when I stepped out of the classroom. I can hardly recall the topics of what I had read in this training, which is different from the lessons we learned in the intensive reading textbook.” Still another student commented that “The messages of the reading passages have left little mark on my memory.” These remarks imply that information from the reading materials has been retained very little, both in short-term memory or long-term memory.

The last type of negative perception about the effect of the timed reading is about anxiety. Different from those who enjoyed the sense of competition induced by timed reading, some students disliked the pressure because they were worried that they were slower than others. These negative comments about the effects of timed reading should be addressed seriously for the sake of future reading rate research design as well as in-class implementation of the timed reading approach.

Discussion

Research question 1: What are the effects of the timed reading approach on Chinese college students’ EFL reading rate?

Between-group and within-group analyses were employed to address the first research question, namely what are the effects of the timed reading approach on Chinese college students’ EFL reading rate. The results of between-group analyses revealed that the treatment group’s reading rate on the post-test (160.18 wpm) was significantly higher than the comparison group (141.43 wpm) although the initial reading rates for the comparison and

treatment groups were nearly equivalent (119.15 and 113.42 wpm, respectively). The treatment group increased their reading rate by 34.5%, and the comparison group increased by 24.8%, resulting in a nearly 10% significant difference. When the two groups read the same amount of materials in a semester, the effect of the timed reading approach was significantly greater than free reading under no explicit time pressure. The results were similar to Chang (2010; 2012). Although some previous studies also reported the benefits of timed reading to reading rate development (e.g., Cushing-Weigle & Jensen, 1996; Chung & Nation, 2006; Macalister, 2010), they did not involve a control group which read the same amount of material under no time restrictions. Therefore, their reported effects were not a pure effect of timed reading over reading under no explicit time pressure. In the present study, the two groups read the same amount of texts, 56 passages with 48,000 words, so the difference between their effects can be interpreted as the benefit of timed reading. In this sense, the findings of our study provided stronger evidence for the benefits of timed reading.

The possible mechanism for the effect of timed reading on reading rate development might be explained by readers' mindfulness and reading rate awareness that time pressure engenders. First, time pressure may enhance mindfulness in students (Walczyk et al., 1999). When a student is engaged in a demanding task (e.g., L2 reading), attention is more sharply focused, cognitive resources are more efficiently deployed, and mental efforts are more intensively exerted. Therefore, time pressure is supposed to be mediated by mindfulness to promote reading speed. Second, the effect of timed reading might have from students' higher reading rate awareness. The treatment group had higher awareness of the importance of reading rate than the comparison group after they were repeatedly involved in timed reading activities. Awareness is usually the first step for adult learners toward developing a concrete action plan for improving a skill (Carrell, 1989). It could be assumed that the students in the treatment group were more active and more engaged in activities while trying to increase their L2 reading rates.

Furthermore, within-group analyses have found that both groups have increased their reading rates significantly. The treatment group has improved on average from 119.15 wpm to 160.18 wpm (34.5%), whereas the comparison group has increased from 113.42 wpm to 141.43 wpm (24.8%). This finding differs from that of Chang's (2010) study. She did not find a significant increase in the control group. The discrepancy between the present study and Chang's study is likely due to the different amounts of reading for two groups involved in the research design. In Chang's study, the control group only reviewed content taught in the previous week (p. 291) during the class time which was allotted for timed reading training for the experiment group. The control group did not read the materials read by the treatment group. However, in the present study, the two groups read the same amount of texts. The different results from the within-group analyses between the present study and Chang's suggest that while timed reading is effective to improve students' reading rates, involving students to read an adequate amount of materials itself leads to reading rate increase. The amount suggested by Beglar and Hunt (2014) was to read 200,000 standard words annually. The reading load in the present study was approximately half of that, taking different metrics used into account. It could be inferred if a larger amount of reading was involved, greater effects of reading might be identified. When researchers attempt to seek the most effective L2 reading approach for readers, guiding and motivating students to read, in whatever manner, is essential (Grabe, 2009, p. 290).

Research question 2: How do students perceive the effects of timed reading on their EFL reading rate and EFL reading in general?

Students' perceptions of the effects of timed reading on their EFL reading rates and reading in general were explored by semi-structured interviews. The results revealed manifold comments. Most of the participants reported that the timed reading approach raised their awareness of reading rate; it has also improved their reading strategy and motivation. These positive comments on the effects of the timed reading approach are aligned with the findings in previous studies (e.g., Chang, 2010; Cushing-Weigle & Jensen, 1996).

As for the negative effects, some students reported that they disliked the pressure induced by being forced to read at an uncomfortable speed. The number of students who disliked the pressure and those who enjoyed the competitive atmosphere is almost equivalent. The results agree with the findings of Cushing-Weigle and Jensen (1996). It is likely that individual differences play a role in their perceptions of time constraints engendered by the timed reading approach.

Furthermore, some students reported that timed reading only improved their reading rates in the first several sessions of the training. After they progressed to a high reading rate, it was hard to improve further. This result is in line with the findings of Chung and Nation (2006). They also reported that most of the increase in reading rate was found in the first half of the training course, although some progress was observed in the second half.

Finally, about one third of those who were interviewed commented that they forgot the content of the reading materials quickly, and little information could be retrieved after the training. The cause of this problem might involve the information processing mechanism in short-term and long-term memory. To process information from short-term memory into long-term memory, readers must engage in elaborative rehearsal (Sternberg & Sternberg, 2012). The rehearsal helps learners integrate newly obtained information into their former knowledge, or helps learners connect the pieces of newly obtained information in a meaningful way and therefore the new information becomes more memorable. However, when learners read at a fast speed, they have little time or cognitive resource to rehearse. Information stored in short-term memory must be moved out quickly because its capacity is limited, and it should make room for the incoming new information. Since little information has been stored when reading under the pressure of time, little information could be recalled. However, considering the primary goal of the timed reading approach for the present study is to improve reading speed rather than reading to memorize, this negative comment might not prevent teachers from implementing the approach.

The findings of the present study suggest that timed reading can be used in class for the purpose of reading rate improvement in the context of Chinese universities. Furthermore, the findings also suggest that involving students with reading activities even without time pressure improves students' reading rate too, although the effect is not as great as the timed reading approach. Finally, the qualitative investigation indicates that students have both positive and negative perceptions of the timed reading approach. Teachers need to be sensitive to students' responses in the course of implementing the approach.

Conclusion and Limitations

L2 researchers have stressed the significance of developing L2 learners' reading fluency and reading rate for at least four decades (Grabe, 2009, 2010; Nation, 1991, 2005, 2009). The present study has investigated the effect of the timed reading approach on Chinese university students' EFL reading rate with a mixed-method research design. The results show that the timed reading group has made significantly greater improvement in reading rate than the comparison group. By reading the same amount of materials, although involving no explicit time pressure, the comparison group also increased their reading rate significantly. Semi-structured interviews were conducted to investigate students' perceptions of the effects of timed reading approach. Despite some positive comments, some debilitating effects were identified.

The present study has contributed to the enquiry of L2 reading fluency in three aspects. First, the present study is one of the few L2 reading rate studies that focus on students in the Chinese educational context. Considering the large size of L2 learners in China, further studies in reading rate and reading fluency are needed in that context. Second, the present study employed quantitative and qualitative analyses to explore the effect of the timed reading approach. Students' perceptions of the timed reading effect was explored. The qualitative analysis revealed a dimension that was reported in previous research, which was that students forget what they read quickly when reading under the pressure of time. Finally, different from previous studies, the present study devoted much space to the design and validation of two parallel reading tests, which were used for the pre-test and post-test. This phase controlled the memory effect compared with the studies that employed the same test for both the pre-test and the post-test. The improved measurement of reading rate may shed insights into the research design in future studies.

Despite its contributions, the present study has a few limitations. First, although the design and validation of the pre-test and post-test were vigorously carried out, the length and readability of the passages used in the 10-week experiment were not strictly controlled. Therefore, we employed the traditional pre- and post-test design, failing to capture the dynamic developmental trajectories of students' progress in reading rate. Another limitation involves the measurement of passage length. In the present study, we used the traditional number of words as the metric of text length. However, the lengths of words differ. To ensure a more accurate measurement, text lengths need to be measured in terms of the number of standard words (i.e., six letter spaces) (Beglar & Hunt, 2014; Shimono, 2018). An additional benefit of this metric is that it allows for comparisons across studies. Insights might be revealed by comparing L2 reading rate research on various language proficiency learners in different educational contexts.

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About the author

Min Gui is an associate professor at Wuhan University, China. She has obtained her doctoral degree in Foreign Language Education from the University of Texas at Austin. Her major research interests include foreign language education, second language reading, and language assessment. E-mail: guimin@whu.edu.cn

Yajie Shang has obtained her master's degree in applied linguistics from Wuhan University, China. Her research interest is Foreign Language Education. E-mail: shangyajie1990@163.com

Xiaokan Chen has graduated from Wuhan University, and she is working in Shenzhen Haiyun School. Her research interests include Foreign Language Education and Second Language Reading. E-mail: chenxk319@163.com