EFFECTS OF TIME CONSTRAINT ON SECOND LANGUAGE READING COMPREHENSION

by

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A Thesis
Submitted in Partial Fulfillment of the Requirements for the
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This study aimed to investigate the role of time constraint on second language reading comprehension via the recruiting of 47 Saudi participants who were learning English as a second language. Subjects shared similar level of English proficiency; all participants were in their third semester of English at Aljouf University, Saudi Arabia, at the time of data collection. Participants were divided into three time groups; limited (20 minutes), extended (30 minutes), and unlimited (40 minutes). In terms of stimuli, a reading text was adapted from a standard English proficiency exam, TOEFL. The text consisted of 699 words and was of moderate level in difficulty, calculated as between 8th and 9th grade for native English speakers; passive structures comprised 6% of the text. Questions were also divided into three groups to elaborate the effect of time constraint on each type of questions.

The particulars of the study were as follows. Firstly, this study analyzed effect of time constraint on the overall performance on the TOEFL reading passage. Then, effect of time on the three groups, including vocabulary-based questions, literal comprehension questions, and higher order inferential questions. Results revealed that time constraint tends to be an affective factor in reading. In the overall comparison among the 3 different time groups, the unlimited time group showed the highest performance on the reading comprehension task.

In view of the categories of questions, no significant difference was found on the vocabulary-based questions between time condition groups. The overall low vocabulary scores across groups and the lack of significant effect for time constraint suggest that extended time does not compensate for poor vocabulary knowledge.

On the other hand, the unlimited time group demonstrated the best performance relative to the other two groups on the literal comprehension and higher order questions. Of all three categories, the higher-order questions were the most difficult for all three time constraint groups.

Overall, the results of this study show that time given to the reading task significantly affects overall reading comprehension scores, but they also suggest that this effect varies in relation to the types of questions.

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CHAPTER 1

1.1 THEORITICAL AND EMPIRICAL BACKGROUND TO THE STUDY

1.1.1 Introduction

Reading is one of the four language skills, together with writing, speaking, and listening, which is an important part of language teaching and assessment practices. Moreover, reading and its productive counterpart, writing, are two skills which need special attention even in L1 acquisition. It is also through reading that we add personal experiences to our knowledge. Reading grants us the opportunity to experience stories, events, feelings, and different types of information without leaving the present moment.

In so much as reading is a necessity of our everyday lives, it is nonetheless a mystery of cognition—the very processes that define what we take for granted as 'reading' remain elusive despite years of intensive study. The measurement and evaluation of reading endures similar lack of consensus. The traditional method of evaluating a subject's reading capacity has always been the testing of reading comprehension, especially under time-constrained circumstances. However, a growing body of literature has suggested that time in reading is an effective constraint. This study seeks to further shed light on one variable discussed above, namely time constraint.

Though a great deal of investigation has been conducted in this sector, the literature specifically exploring the dynamics of reading assessment of Arabic L1 learners of English is not so plentiful. Thus, this study attempts to further explore this issue, which is both pertinent to the current interests of the field of ESL, as well as to growing trends in ESL/EFL studies among

Arabic-speaking countries. The reading process and theoretical issues related to it as a psycholinguistics process will be discussed in this chapter.

1.1.2 Reading as a psycholinguistic process: What is reading comprehension?

Reading is a complex psycholinguistic process which involves more than the ability to decode or understand a text. Hudson (2007, p.7) wrote, "the capacity to read is a truly wondrous human ability." Goodman (1967) claimed that reading is both a "receptive language process", and a "psycholinguistic process" that involves language processing on all levels, including graphemic, phonemic, lexical, syntactic, and semantic. During reading the interaction between language and thought takes place to form the concept of comprehension (Carrell & Eisterholds, 1983). Indeed, reading theory has passed throughout levels of changes in order to construct the general development of learning theories.

Before the 1960s, reading was defined as decoding graphemes into phonemes which implies at that time reading was primarily considered a bottom-up process (Carrell & Eisterholds, 1983; Fries, 1945, 1963, 1972; Rivers, 1968). However, in the late 1960s reading comprehension started to receive more attention from linguists, psycholinguists and cognitive psychologists. Goodman (1971, p.135) defined reading by the term "psycholinguistic guessing game" to refer to the fact that reading is not simply a process of decoding, but it involves higher order mental processes and readers' prior knowledge. Thus, reading starts with readers' expectations and predictions about a text and then proceeds top-down to involve bottom-up processing of the linguistic elements of a text. In this light, Anderson and Pearson (1984) defined comprehension as the interaction between current and old knowledge.

Cline, Johnstone and King (2006) also emphasize on the top-down nature of reading as they observe that: "One's ability to understand a text is determined by the purposes for reading, the context, the nature of the text, and the readers' strategies and knowledge (p. 2).

At this point of time, we know that there are numerous factors that affect a reader's ability to derive meaning and pertinence from a text. In view of second language readers, these factors relate to a reader's language proficiency, previous knowledge, reading strategies, interest in a topic, L1 reading habits and skills, and overall motivation to read.

Through a recent personal communication with English teachers in Saudi Arabia (Alruwaili M, November 14, 2010) it was brought to the attention of the researcher that Saudi students' TOEFL scores show the lowest performance on the reading section among all other sections. This anecdotal evidence, in addition to the researcher's own observations and experiences with standardized reading exams in English, served as the motivation for the current study which aimed to examine the effect of time constraint on Saudi ESL learners' reading comprehension.

1.1.3 Effects of Constraints on Reading Assessment

It seems fair to say that individuals who lack proper training and experience in reading under time constraints are likely to perform poorly on timed reading exams and thus be considered ineffective readers. That is why, learning to read under timed conditions is a skill that needs systematic practice to be fully developed.

Snow (2002) maintains that the text itself is never a universal tool in terms of its ability to measure a person's reading comprehension capacity. In addition to the nature of the text itself, there are also questions as to how the text is implemented. Snow (*ibid*.) notes that there is no 'natural time constraint' in reading. However, on the other hand, almost all standardized tests

give a high importance to time limitations as an important independent variable in reading comprehension sections. Thus, it can be assumed that even good readers may not perform their best under time limitations if they have not been trained to work under the pressure of time constraint.

In sum, among the main factors which influence reading performance, time constraint is an important factor, especially in relation to the assessment of reading ability. That is why, this study takes time constraint as its focal point and aims to provide further empirical evidence about its impact on reading success.

1.1.4 Purpose of the Study

Until relatively recently, only a few studies have examined the consequence of time constraint on reading comprehension. Accordingly, the aim of this study is to explore this issue by investigating the effects of time constraint on the reading comprehension performance of Saudi learners of English as a second language. It provides three experimental conditions to investigate the effect of timing in a reading comprehension task; first, reading task with limited time; second, reading task with extended time; third, reading task with unlimited time. All these three experiments are hold to investigate which time limitations affect the performance scores of second language learners on reading tasks. Thus, the research question may be briefly stated as follows: "Which is the optimal time condition for the reading performance of Saudi learners of English as a second language?' The independent variable (i.e. time) includes three conditions, namely limited, extended, unlimited time reading tasks; and the dependent variable is the score of the reading comprehension task.

In addition to the effect of time constraint, the study also focuses on the following issues: a) the effect of types of reading questions, such as vocabulary related questions, literal

comprehension questions, inferencing questions, and b) learners' perceptions of the effect of time constraint on their performance.

So, far this section outlined the main theoretical framework of the study. The next section will focus on empirical findings related to the research interest of the present study.

1.2 Literature Review

A review of related empirical research reveals that research about the effect of time constraint on ESL learners' performance on reading comprehension tasks is insufficient and that it mostly focused on two time conditions, limited vs. unlimited with the exception of one study by Walczyk, Kelly, Meche, and Braud (1999) which examined three time conditions. For the sake of clarity, related findings will be presented in two sections: a) Studies that examined the effect of time on reading comprehension and b) Studies which have focused on understanding the relation between different time conditions on skills other than reading, such as solving math problems under time constraint.

1.2.1 Studies that examined the effect of time on reading comprehension

Walczyk, Kelly, Meche, and Braud (1999) have investigated the relation between different time constraints and reading comprehension by examining 89 undergraduate volunteers. Their study consisted of two sections, semantic access and reading comprehension tasks. Both tasks were given under different degrees of constraint; severe, mild, and unlimited to investigate the effect of time constrain on participants performances. Walczyk et al. met with a relatively surprising conclusion; the participants under mild time pressure achieved the best performance among the three conditions, even better than participants who were in the unlimited time condition. This implied that mild time limitations positively boosted the participants' performance in reading comprehension.

This study demonstrated that participants who are mindfully engaged in a learning task show a high degree of concentration, which has a direct impact and their performance. Conversely, if participants are not mindfully engaged in the task at hand, then the "automatic process predominates," and hence, the consequence is a weaker performance (Walczyk et al., 1999, p.157).

In a recent study, Nguyen (2012) examined the impact of background knowledge and time constraint on second language reading comprehension. She recruited thirty one Vietnamese second language learners and tested these participants under four conditions: familiar and unfamiliar topics, each under two different time constraints, limited and unlimited. Nguyen's findings revealed that background knowledge and unlimited time constraint yielded the best performance on the reading task.

The effect of training to read under restricted time was investigated by Chang (2010). Participants consisted of 84 college students who received 13- week timed reading activity before they were exposed to the experiment. The results showed that the participants who were trained during the 13-week timed reading activity had better performance. Chang concluded that students doing the timed reading activity increased their reading speed by 29 words per minute (25%) and comprehension by (4%). The difference between the two time conditions for the experimental groups was statistically significant. Students who did the timing activity showed more confidence in performance and hence gained higher improvement. It was observed that students who had not been trained to work under time pressure conditions were likely to show lower performance on a reading task with time limited.

1.2.2 Studies which examined the effect of time constraint on skills other than reading

Wild, Durso and Rubin (1982) examined the effect of extra time accommodation on test scores by groups of different ethnicity, age and sex. This study investigated the effect of the extended time on reducing the "speededness" of the verbal and quantitative experimental sections of the Graduate Record Examinations (GRE) Aptitude Test. In December 1976, at 550 domestic centers, the new experimental version of the test (were 20- and 30- minute) were administered to the operational test.

Wild et al. (1982) examined the effects of testing time on scores for minority-group versus majority-group examinees, on male versus female examinees, and on examinees by years elapsed since they received the baccalaureate degree. Although the 20-minute experimental tests were generally more speeded than the 30-minute tests, the ten additional minutes resulted in a small score gain for all groups, and differential score gains were not found between the subgroups. This study concluded that the additional 10 minutes did not have a significant effect on the participants' performance and that extended time was relatively an ineffective factor in examinees' scores.

Falke (2008) measured the effects of text type and time limits on students' performance. She proposed that although reading comprehension is a crucial skill for all students, other factors should be taken into the account. The author examined the effect of the text difficulty and different time conditions on the students' performance on the reading comprehension tests. Falke concluded that there are similarities between performance with narrative and expository texts and across time limit conditions for all of the assessments. The results showed that imposing time limit on the three participants on the multiple-choice questions, cloze passages, sentence

verification and recall tests did not significantly affect participants' rate of correct and incorrect responses per minute.

Elliot and Marquart (2004) examined the effect of the extra time accommodation on students with disabilities, students who were at risk in mathematics, and students without disabilities. They tried to understand whether this extra time accommodation implied an improvement in performance in these three groups, or this extra time accommodation tended to be less important factor. Ninety-seven eighth- grade students completed two equivalent versions of Standardized Mathematics Test, each under two different time conditions; standard time 20 minutes; extended time 40 minutes.

Elliot and Marquart (2004) predicted that both disability status and mathematical skill level would be positively affected by this extra time accommodation. That is, students with disability, students with lower level in mathematics would show a significant improvement more than the other group without disabilities. However, results showed that there was no significant difference in the performance of groups with a disability status. Elliot and Marquart concluded that there was evidence showing that the three groups performed differently according to the time they were given. Follow-up surveys observed that that more than half of the students performed more positively under the extra time condition.

Bridgeman, McBride, and Monaghan (2004) proposed that time is not a crucial factor that significantly affects students' scores on standardized tests. They tried to find an optimal answer to the following questions; "what happens when test takers are given more time to complete a standardized test? Do test takers' scores improve when they are given more time?" For this purpose, Bridgeman, Trapani, and Curley (2003) placed SAT Reasoning Test section with a fewer number of questions into the standard 30-minute variable section of two national

test administrations. The results showed that those scores improved very minimally, less than 10 points on the 200-800, SAT scale. The authors indicated that extra time had a very minimal effect on overall scores

1.2.3. Summary of findings regarding the effect of time constraint

The review of related empirical literature shows two trends. First, studies in the domain of reading comprehension provide evidence that suggests that extended time conditions and unlimited time conditions elicit significantly better reading comprehension performance as compared to limited time conditions. It should also be noted that the study by Walczyk et al. (1999) found that the extended time group had better performance in the reading comprehension task than the unlimited and limited time groups. This finding may be attributed to the fact that the brain is more actively engaged under some time pressure than under no time pressure.

The second trend originates from studies outside reading which have found that time constraint is of minor importance. Thus, it can be concluded that the effect of time constraint is rather controversial and the findings are inconclusive. In addition, it is difficult to draw direct comparisons among studies since the operationalization of limited, extended, and unlimited time conditions have differed among studies.

The current study aimed to bring further evidence in this controversial framework of existing empirical literature by investigating the effect of different time constraints on second language reading comprehension in more elaborated method. Specifically, this study looked not only at the overall comprehension success within three time conditions, but also at the relationship between time constraint and reading performance on three separate types of reading comprehension questions, vocabulary-related, literal, and higher order questions. The next chapter presents the methodology of the study.

CHAPTER 2

METHODOLOGY

2.1 Statement of the problem

Many students, specifically Saudis who learn English as a second language, encounter severe problems in reading comprehension of standardized tests (e.g. TOEFL). Typically, they achieve very low reading scores; whereas the same students obtain higher scores in the other sections: listening, speaking, and writing. Through practice, learners show an improvement in sections other than reading and while exploring the problem, they admit the timing provided in reading section is insufficient to complete the reading questions. Hence, this study explores the effect of time constraint through investigating different levels of time constraints on reading comprehension scores.

2.2. Research methodology

This study used quantitative methods of data collection and analysis, except for a follow-up question which asked the participants to express their opinions about the sufficiency of the time they were given to complete the task. The follow-up question elicited narrative data that was processed through content analysis.

2.2.1. Research questions

The research questions which guided the process of data collection and analysis were stated as follows:

1) Which time limit elicits the best reading comprehension performance by Saudi learners of English as a second language on the following?
    a. Overall reading performance
    b. Performance on vocabulary-based questions

c. Performance on the literal comprehension questions

d. Performance on the higher order questions

2) How do participants perceive the influence of time on their reading performance?

2.2.2 Variables

The independent variable was time, with three conditions: limited, extended, and unlimited time. The dependent variable was the test score on a reading comprehension task. Each group was given the test under different time conditions. The first group had 20 minutes; the second group, 30 minutes; the third group, 40 minutes. This study defined limited, extended and unlimited time either according to previous studies (e.g. Nguyen, 2012; Walczyk, Kelly, Meche & Braud, 1999) and to the TOEFL website. Limited time was 20 minutes for a text of 700 words; extended was "one-and-a-half (1.5) times the standard time limit," which implies 30 minutes for a text of 700 words long, following Bridgeman, Trapani, and Curley (2003); and unlimited, was defined as twice the standard time limit, amounting to a time limit of 40 minutes for a 700 word text.

2.2.3 Participants

Participants were forty five male (Mean age; 21) college students selected randomly. Their ages were between 19 and 24 years- old. All participants were males in their 2nd year, specifically 3rd semester in the English department at one of the Northern Saudi universities. Their level of proficiency in English could be equated with high intermediate since they all had been studying English for six years in the Saudi school system prior their college study.

Participants were divided into three groups; limited group 16; extended group 16 and unlimited time group was consisted of fifteen students. They were at the same level of English

proficiency depending on both their previous GPA and instructors' recommendations. Each student who participated in this study was given bonus points towards their reading class grades.

2.2.4 Research Instrument

The instrument was one reading comprehension task from the reading section of a standard TOEFL test (see appendix A). In addition, readability statistics were calculated in order to establish the level of difficulty of the text through the Proofing function of Microsoft Word 2007. These are summarized in Table 1.

Table 1: *Readability Statistics for the Reading Text*

Words	699
Passive	6%
Flesch Reading Ease	48.2
Flesch-Kincaid Grade Level	8.4

The text consisted of 699 words and was of moderate level of difficulty, appropriate for 8th and 9th grade for native English speakers according to Flesch readability statistics (Vacca & Vacca, 2008). The passive structures comprised only 6% of the text. The comprehension questions included 14 questions as they were stated in the TOEFL original. The questions were divided into three categories; vocabulary- based (5 questions); literal comprehension (4 questions); and higher order questions (5 questions).

After the reading task, participants answered one Yes- No (questions number 15) and one open ended question as follows:

Q1: Do you think the time you were given to complete this task was sufficient?

YES NO TO SOME EXTENT

Please explain your answer above _____

The test was administered as paper-based and strict time was observed during each time condition.

2.2.5 Data Analysis

The data from the reading comprehension task were analyzed through the SPSS software, version 18. The scoring of the reading comprehension questions involved assigning a score of 1 to each correct answer for questions 1 through 13, as each one of them had one possible correct answer. In question 14, there were 3 possible correct answers as it was a more complex question which tested reader's comprehension and discourse competence. Total mean scores were calculated for each of the three time condition groups on their overall reading comprehension performance, and separately for their performance on the vocabulary-based questions, the literal comprehension questions, and the higher order questions. The overall mean scores and the mean scores for each type of questions were examined for significant differences across the three time conditions through 4 one-way ANOVAs. Tukey multiple comparisons were also performed in order to identify how the three time conditions differed from each other.

The follow-up question about participants' satisfaction with the given time, included Yes-NO responses and also required the participants to explain their satisfaction (or lack of it) toward the time they were given. The Yes-No responses were tabulated and reported as percentages, whereas participants' explanations were analyzed through content analysis for patterns of reasons which were then collapsed into main themes. Illustrative quotes were selected to exemplify each theme. The results of the study are presented in the next chapter.

CHAPTER 3

RESULTS

The present study investigated the impact of different time conditions on the second language reading comprehension ability of Saudi learners of English. For this purpose, three time groups were employed, including limited (20m), extended (30m) and unlimited (40m). The subjects were Saudi learners of English as a foreign language in their third semester in an English undergraduate program. The subjects were tested through a reading passage of a standardized TOEFL test and also answered an open-ended question.

This chapter presents the results of the data analysis. It is organized in the following order. First, the results for the overall performance on the TOEFL reading passage are presented. Then, the test questions are categorized into three groups, including vocabulary-based questions, literal comprehension questions, and higher order inferential questions. Each of the three categories is examined in view of the three time conditions through statistical analysis, including descriptive statistics and 4 one-way ANOVAs. The first one-way ANOVA was performed on the overall reading scores at alpha = .05. The other three ANOVAs were conducted to examine the effect of time constraint on the three categories of reading questions. To reduce the risk of a Type I error, the alpha level for the three ANOVAs was adjusted to 0.016 against which significance was then established. The chapter finishes with the results of the open-ended question which asked for participants' opinions about the sufficiency of the time they were given to complete the task.

3.1. Overall reading performance in relation to time condition

The reading test included 14 questions in total. In scoring the data, 1 point was awarded for each correct answer, and 0 points were given for each incorrect response. Since question 14 was a compound question with three correct answers, the scores on question 14 could range between 0 and 3. Therefore, the total possible score on all 14 questions was 16; the minimum 0. The main research question was formulated as: *Does time constraint affect second language reading ability?* The test scores were analyzed through descriptive statistics and a one-way analysis of variance (ANOVA). Table 2 summarizes the descriptive statistics for the correct answers for the different time groups.

Table 2: *Descriptive statistics for reading comprehension within time condition*

Time group	N	Mean	SD	% Correctness	95% Confidence Interval	
					Lower Bound	Upper Bound
20 minutes	16	2.44	1.82	15%	1.46	3.40
30 minutes	16	3.56	1.93	22%	2.53	4.59
40 minutes	15	5.47	3.48	34%	3.53	7.39

Note: % correctness was calculated by dividing the group Means by the total score of 16.

Prior to conducting the one-way ANOVA, Levene's test was performed in order to check for a violation of the assumption of homogeneous variances. The result revealed that this assumption was observed, F (2, 44) = 1.622, p = .209, and the ANOVA results could be interpreted without concern for their validity.

The one-way ANOVA showed that the independent variable time constraint had a significant effect on subjects' comprehension of the reading passage, F (2, 44) = 347.872, p = .006. According to the descriptive statistics, the Mean scores showed an increase from the

limited time group to the unlimited time group (Table 2). The ANOVA results can be interpreted to mean that performance on a reading comprehension test increases as the time given for the task increases too.

However, because the study examined three time conditions, it was necessary to perform a multiple comparison *post hoc test* in order to find out which conditions were significantly different from each other, and in this way to find whether there is an optimal time for reading performance. For this purpose, a Tukey *post hoc* test was performed.

The results showed that the two groups, limited (20 minutes) and extended (30 minutes), were not significantly different from each other ($p = .419$) since both groups had a very close mean score. The correctness rate on the written passage task for the limited time group was 15%, whereas 22% for the extended time group (see Table 2). Thus, the unlimited time group (40 minutes) showed the highest accuracy (34%) on the TOEFL reading passage among all of the other groups as shown by the Tukey *post hoc* test analysis (see Figure 1).

Specifically, the results revealed a significant difference between the extended time group and unlimited time group, $p < .001$, where the extended time group showed a significantly lower accuracy in the responses to the reading test (22% correctness) than the unlimited time group (34% correctness). The unlimited time group also had a significantly higher score on the written passage task than the limited time group, $p < .001$, 15% correctness rate.

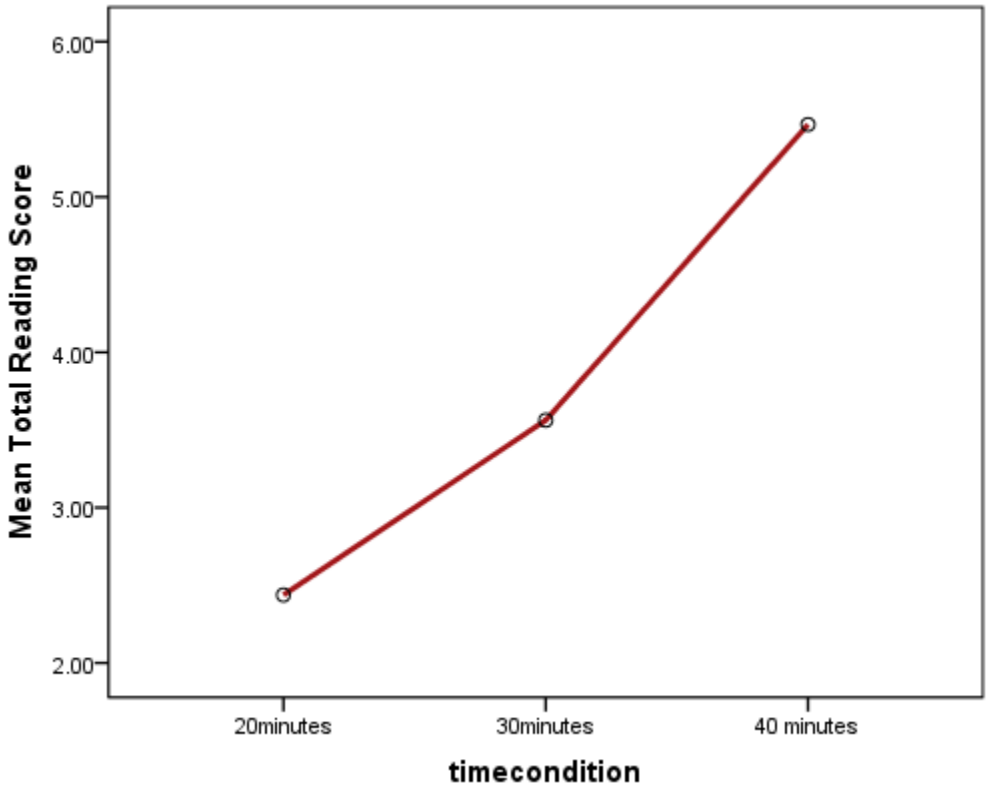


Figure 1: Mean reading scores per time condition

3.2 Performance on the vocabulary-based questions in relation to time constraint

Among the 14 questions on the reading passage, there were 5 questions which aimed to test lexical knowledge. The scores from these questions were summed up into a total vocabulary score, with a maximum of 5 and a minimum of 0. The three time constraint groups were then compared on their performance on the vocabulary-based questions. For this purpose, descriptive statistics were calculated and further examined through a one-way ANOVA. The level of significance was set at 0.016. Table 3 summarizes the descriptive statistics for performance on the vocabulary-based questions in relation to the three time conditions.

Table 3: *Descriptive statistics for time groups on the vocabulary-based questions*.

Time group	N	Mean	SD	% Correctness	95% Confidence Interval	
					Lower Bound	Upper Bound
20 minutes	16	1.25	1.12	25%	.650	1.84
30 minutes	16	1.00	.894	20%	.523	1.47
40 minutes	15	1.66	1.39	33%	.892	2.44

Note: % correctness was calculated by dividing the group Means by the total vocabulary-based score of 5.

The data were examined through calculating descriptive statistics and a one-way ANOVA order to address the question of whether the Saudi English learners' ability to respond correctly to vocabulary-based questions is influenced by time. Examining the distribution of vocabulary-based scores within each group, it was found that all the three time groups met the assumption of normality. The lowest success rate of 20% was observed in the extended time group, followed by the limited time group of 25% success rate, and the unlimited time group showing the highest success rate (See Table 3)

Prior to conducting the one-way ANOVA, Levene's test revealed that the assumption of homogeneity of variances was observed, F (2, 44) =.95, p = .278. Despite the slight difference in the performance of the three time groups, the ANOVA results showed a lack of significant relationship between time condition and performance on the vocabulary-based questions, F (2, 44) = 61.830, p=.278.

3.3. Performance on the literal comprehension questions in relation to time constraint

Among the 14 reading questions, there were 4 questions which aimed to test literal comprehension. The scores from these questions were summed up into a total literal

comprehension score, with a maximum of 4 and a minimum of 0. The three time constraint groups were, then, compared on their performance on the literal comprehension questions. For this purpose, descriptive statistics were calculated and further examined through a one-way ANOVA. As already mentioned, the level of significance was set at 0.016. Table 4 summarizes the descriptive statistics for performance on the literal comprehension questions in relation to the three time conditions.

Table 4: *Descriptive statistics for time groups on the literal comprehension questions*.

Time group	N	Mean	SD	% Correctness	95% Confidence Interval	
					Lower Bound	Upper Bound
20 minutes	16	0.75	.683	18%	.386	1.11
30 minutes	16	1.18	.910	29%	.702	1.67
40 minutes	15	1.73	1.03	43%	1.16	2.30

Note: % correctness was calculated by dividing the group Means by the total literal comprehension score of 4.

Prior to conducting the one-way ANOVA, Levene's test was performed and the result showed that this assumption of homogeneity of variances was observed, F (2, 44) = 1.093, p = .344. Levene's test was followed by a one-way ANOVA which revealed that the independent variable time constraint had a significant effect on subjects' ability to correctly respond to the literal comprehension questions, F (2, 44) = 41.872, p = .013 < .016. According to the descriptive statistics, the mean scores showed a significant improvement from the limited time to the unlimited time group (Table 4) as the percentage of correctness increased from 18% to 29% to 43% with each time condition.

Since ANOVA was significant, the three time conditions were further examined through Tukey multiple comparison *post hoc* test in order to find which conditions were significantly different from each other. The results showed that of all comparisons, the only significant difference was between the limited (20 minutes) and unlimited (40 minutes) time groups (p = .009), where the unlimited time group showed a significantly higher accuracy in the responses to the literal comprehension (43% correctness) than the unlimited time group (18% correctness). The rest of the comparisons were not significantly different. That is, there was no significant difference between the limited and extended time groups (p =. 350) and between the extended and unlimited time groups (p = .210). The mean scores of the three time conditions are illustrated by Figure 2.

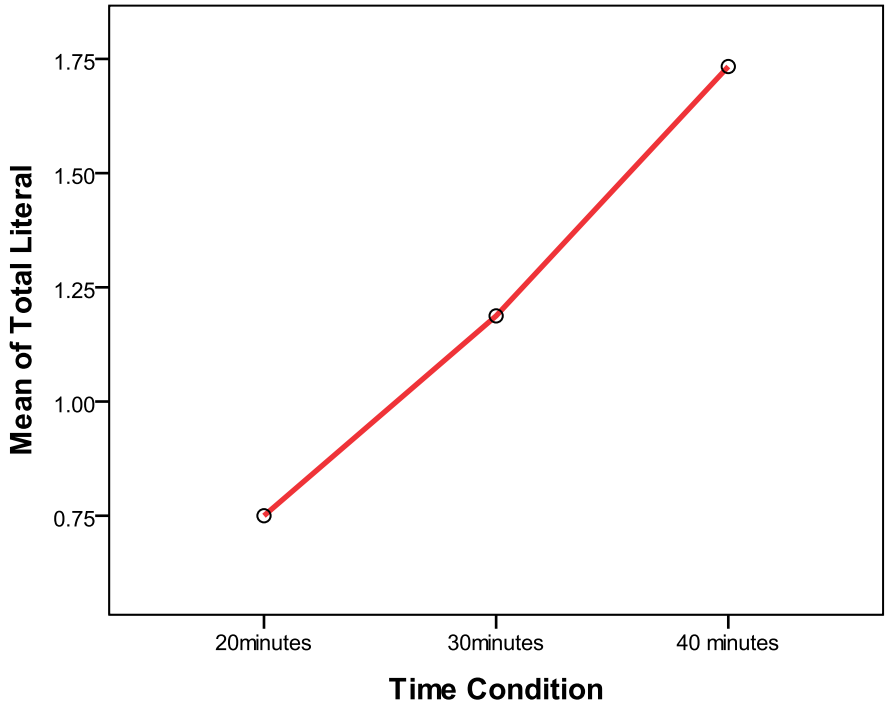


Figure 2: Mean scores on the literal comprehension questions per time condition

3.4. Performance on the higher-order questions in relation to time constraint

The remaining 5 questions aimed to test higher level reading skills, and included inferential questions about implied meanings, whole text main ideas, and discourse-related questions. For example, question 13 required test takers to choose the most appropriate place for a sentence in one paragraph of the text, whereas in question 14, they have to select three statements that best convey the main ideas of the whole passage.

The scores from these questions were summed up into a total score, with a maximum of 7 since question 14 requested three correct responses related to the main idea, and a minimum of 0. The three time constraint groups were, then, compared on their performance on the higher order questions. For this purpose, descriptive statistics were calculated and further examined through a one-way ANOVA. The level of significance was set at .016. Table 5 summarizes the descriptive statistics for performance on the higher order questions in relation to the three time conditions.

Table 5: *Descriptive statistics for time groups on the higher-order questions*

Time group	N	Mean	SD	%	95% Confidence Interval	
				Correctness	Lower Bound	Upper Bound
20 minutes	16	0.44	.81	6%	.003	.871
30 minutes	16	1.37	1.0	19%	.795	1.95
40 minutes	15	2.06	1.6	29%	1.16	2.96

Note: % correctness was calculated by dividing the group Means by the total higher order score of 7.

Prior to conducting the one-way ANOVA, Levene's test was performed and the result showed that the assumption of homogeneity of variances was observed, F (2, 44) = 1.999, p = .148. Levene's test was followed by a one-way ANOVA which revealed that the independent

variable time constraint had a significant effect on subjects' ability to correctly respond to higher order questions, F (2, 44) = 85.404, p = .002< .016. According to the descriptive statistics, the Mean scores showed a significant improvement from the limited time to the unlimited time group (Table 5) as the percentage of correctness increased from 06% to 19% to 29% with each time condition.

Since ANOVA was significant, the three time conditions were further examined through Tukey multiple comparison *post hoc* test in order to find which conditions were significantly different from each other. The results showed that among all comparisons, the only significant difference was between the limited and unlimited time groups (p = .002), where the unlimited time group showed a significantly higher accuracy in the responses to the higher order questions(29% correctness) than the unlimited time group (6% correctness). The rest of the comparisons were not significantly different. That is, there was no significant difference between the limited and extended time groups (p =. 084) and between the extended and unlimited time groups (p = .216). The mean scores of the three time conditions are illustrated by Figure 3.

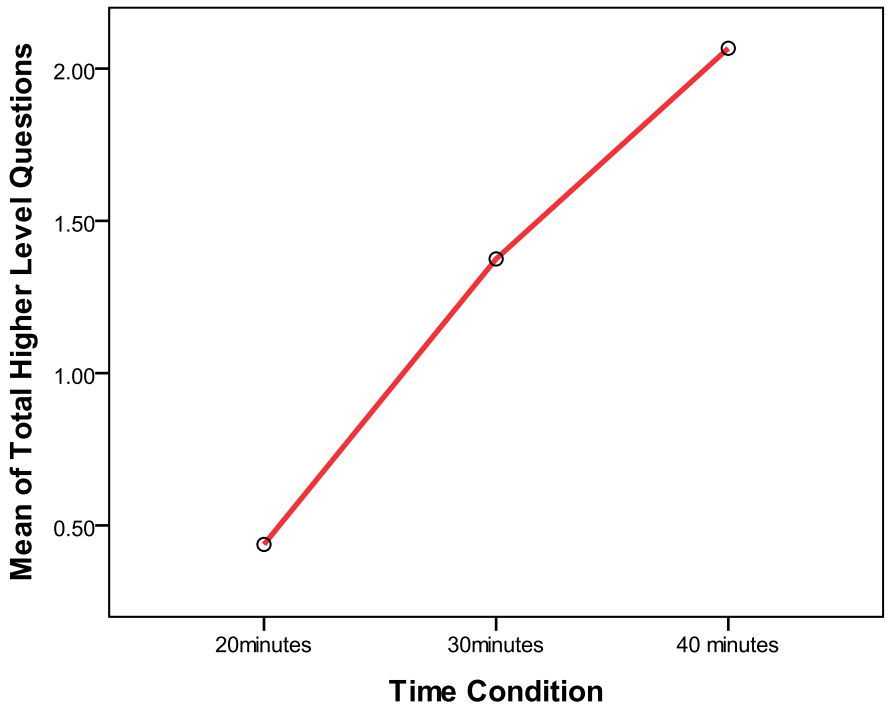
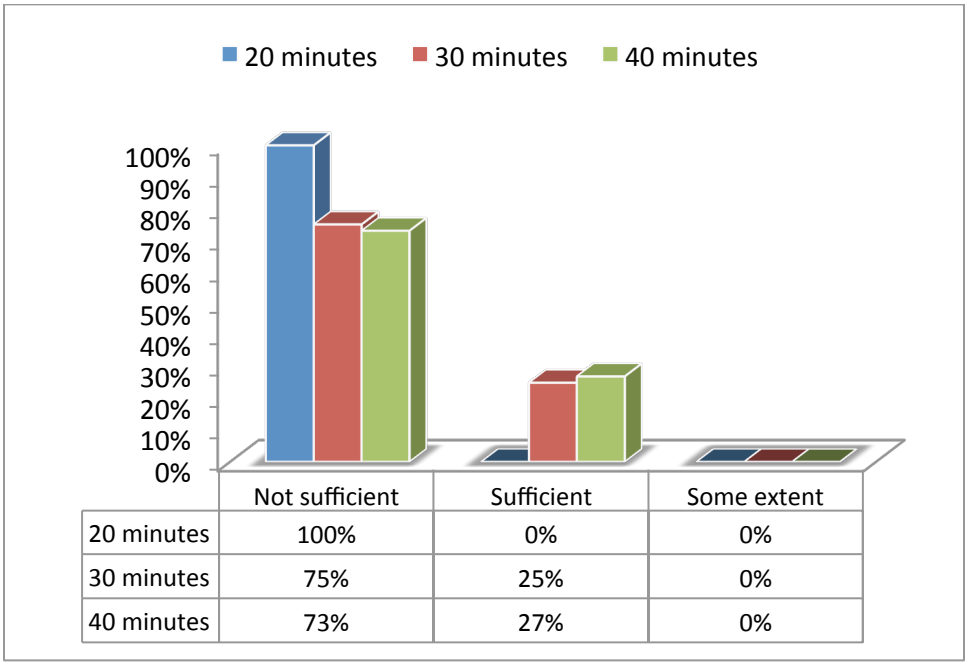


Figure 3: Mean scores on higher order questions per time constraint group

3.5. Participants' feedback on time sufficiency

In addition to the TOEFL reading passage, participants also answered a question related to the sufficiency of the time they were given to complete the reading test. The first part of the question included three possible answers: *Yes,* if they reported that the time was sufficient; *No*, if they found that the time was not sufficient; and *To Some Extent*. The second part of the question asked participants to elaborate in words on their *Yes*, *No* or *To Some Extent* responses. All 47 participants provided answers to this question. The results for the *Yes*, *No*, *To Some Extent* responses were tabulated for each time condition and presented in percentages as summarized in Figure 4.



	Not sufficient	Sufficient	Some extent
20 minutes	100%	0%	0%
30 minutes	75%	25%	0%
40 minutes	73%	27%	0%

Figure 4: Participants' feedback on time sufficiency per time group

As seen from Figure 4, the responses were divided between *Yes* and *No* and no participant selected *To Some Extent*. Of the *Yes* and *No* responses, the high majority were *No* for the entire sample. In view of the time groups, none of the participants in the limited time group answered that the time they were given was sufficient. However, 25% (N=4) in the extended time group and 27% (N=4) in the unlimited time group 27% found that the time they were given was sufficient.

Participants' elaborations on the sufficiency of time were analyzed and coded into six major themes (See Table 6). Overall, 28 participants (60%) provided narrative comments. The most common comment made by 13 participants was regarding the advanced level vocabulary words used in the TOEFL passage. Overall, the participants mentioned that their reading speed was slowed down by the number of unknown or difficult words in the passage.

For example, participant # 3 from the limited time group wrote *"The test includes too much new vocabularies"* and participant # 21 from the extended time group commented on the difficulty of the words in the reading passage *"The words used here are so difficult"*.

Nine of the participants who found time to be not sufficient were self-critical and pointed out that the main reason for this was their own poor reading ability as illustrated by the following quote provided by participant # 11 from the limited time group: "*My reading in English is bad*".

A few of the participants referred to the complexity of the reading passage as they mentioned the high difficulty level of the text and the ambiguity of some of the options which they found to be similar to each other and difficult to distinguish. For example, participant #23 from the extended time group wrote: "*The answers were much similar*". Two of the participants who reported that the time was sufficient, nevertheless found the level of the text difficult. One participant (#31) from the extended time group wrote that he "*could not focus well under pressure*".

Table 6: *Content-Analytic Summary of Participants' Explanations for the Insufficiency of Time*

Themes	"Illustrations"	Number of participants
Many new words	"the test includes too much new vocabularies"	13
My poor reading ability	"I have to improve my reading skill"	9
Complicated text	" most parts of the text are very scientific and advanced"	2
Options which appear similar	" the given options were make me confused, they were similar"	2
Time is sufficient, but the text is difficult.	"If I used a dictionary I would responded much better"	2
Lack of focus under pressure	"I cannot focus under pressure"	1

3.6 Chapter summary

This chapter presented the results of the data analysis. Overall, it was found that time constraint had a significant impact on Saudi ESL learner's reading performance. In addition, the results revealed that time constraint was also significantly associated with subjects' scores vis-à-vis type of reading comprehension questions. Specifically, time constraint was not a significant factor on the vocabulary-related questions, but it showed significant effect on the literal and higher order questions.

In addition, the significant differences on the literal and higher order questions were observed between the unlimited time group vs. the other two groups which did not show statistically different performance. It should also be noted that the highest scores were achieved on the literal comprehension questions with 18% for the limited time group, 29% for the

extended time, and 49% for the unlimited time. On the other hand, the lowest scores were observed on the higher order questions, where even the unlimited time group hardly reached 29% accuracy. Participants' perceptions of the sufficiency of time were also examined and the major themes were identified and illustrated by relevant quotes from the data. These results will be discussed and elaborated on in the next chapter.

CHAPTER 4

DISCUSSION, LIMITATIONS, PEDAGOGICAL IMPLICATIONS AND CONCLUSIONS

The primary goal of this study was to explore the effect of time constraint on second language reading comprehension. For this purpose, 47 Saudi learners of English as a second language from Aljouf University in Saudi Arabia were tested on a reading comprehension task and also asked to provide feedback on the sufficiency of the time they were given to complete the task. This chapter offers a discussion of the results of the data analysis in view of related theory and empirical findings. It also outlines the pedagogical implications of this study's results both for teaching reading in a second language and for the purposes of preparing students to take standardized language tests.

The chapter also acknowledges some of the limitations of the study and makes recommendations for future research. It closes with the main conclusions derived from the findings of this research.

4.0. Discussion

It was mentioned in chapter 1 that time constraint has not been sufficiently studied as a reading factor in second language reading (Elliot, Braden, & White, 2011). Moreover, the findings of existent research have raised some controversy about the optimal time constraint that will elicit the best reading performance from second language students. This controversy and the insufficient empirical evidence served as the rationale for the present study which aimed to provide further evidence on the effect of time constraint without making a priori hypothesis about the outcomes of the results.

For this purpose, time constraint was operationalized into three conditions; limited time (20 minutes), extended time (30 minutes), and unlimited time (40 minutes). The statistical analysis of the data revealed that time constraint was a significant factor in participants' overall reading scores. Specifically, the Tukey multiple comparison *post hoc test* showed that the limited and unlimited time groups differed significantly in their reading comprehension performance with a priority for the unlimited time group which showed a significantly higher accuracy in their responses to the reading comprehension questions (limited 15% accuracy vs. unlimited 34% accuracy). These results supported the findings of some previous studies which found that the more time participants had the better their scores on a reading comprehension test were (e.g. Lesaux, Pearson, & Siegel, 2006; Meyer, Talbot, & Florencio, 1999). This study also provides supporting evidence for the results of Nguyen's (2012) study, which revealed that background knowledge and unlimited time constraint yielded the best performance on the reading task.

On the other hand, the findings of this study contradict some of the previous studies whose results showed that participants under extended time constraint revealed better performance in reading comprehension than limited or unlimited time conditions (Chang, 2010; Cushing-Weigle & Jensen, 1996). The difference between this study's findings and those in Chang (2010) and Cushing-Weigle and Jensen (1996), according to which the extended time constraint rather than the unlimited time constraint elicits better reading comprehension, could be explained by the fact that their participants were exposed to a long training procedure within time constraints, whereas participants in this study were not exposed to any kind of prior training.

The current findings are also in contradiction to Falke's results (2008), according to which time constraint has no impact on reading comprehension because in Falke's study the revealed scores were not significantly different under time pressure and no time pressure. One possible reason for the observed differences is that Falke's study used a variety of assessment tools whose combined results may have averaged the differences on separate tasks.

Such results, while not being directly comparable to the results of other time constraint-based studies in the field due to a fundamental difference in the constructs tested, do offer a certain kind of insight. One may conclude that the effect of the independent variable (i.e. time) differs significantly with respect to the chosen dependent variable (reading score) on the basis of construct(s) tested. Apart from this difference, the inability to select a perfectly homogeneous group of subjects with respect to background and schema is an additional confounding factor which may explain the inconsistency of outcomes across such studies. As such, future studies continuing in this vein should strive to account for additional independent variables surrounding the predisposition of the participants, as well as the nature of the task items themselves (e.g. constructs assessed, testing methods, etc.).

The effect of time constraint was further examined by participants' feedback on the sufficiency of the time they were given. As explained earlier, this study employed a follow-up question, asking participants at the end of the reading test whether they found the time to be sufficient or not and to explain in words the reasons for their opinions. In terms of self-report assessment, the responses to the yes/no and open-ended questions reveal that in most parts the participants were not satisfied with the time they were given as this level of satisfaction was the lowest in the limited time (0% sufficient; 100% insufficient), followed by the extended time (25% sufficient; 75% insufficient), and the unlimited time (27% sufficient; 73% insufficient).

The level of satisfaction with the given time in part corroborates the results from the reading comprehension task, where the lowest accuracy of performance was observed in the limited time group (15%) as compared to the accuracy of the extended time group (22%), and the accuracy of the unlimited time condition group (34%). Yet, it should be noted here that both in reading performance and satisfaction level with time given, the percentages were rather low, that is even the unlimited time group showed only 34% success on the reading task and 27% satisfaction with the time they were given to do the task. This observation raises a question as to why these percentages were so low. Some explanations are found in participants' narrative comments to the follow-up question where they identified reasons for their dissatisfaction with the time they were given.

The main reasons for why participants considered time to be insufficient can be grouped in three categories: a) stemming from the participants' own deficiencies in vocabulary knowledge, reading skill, and reading strategies to work under pressure; b) the confusing nature of the options in the multiple choice questions, and c) the difficulty level of the text. The majority of the participants indicated reasons within the first group, that is deficiency in their language proficiency and reading strategies. In fact one of the participants elaborated on this by making the following self-critical observation, "*I have to improve my reading skill*".

While other comments as "text is difficult/complicated" reflect circumstances which may be inevitable, particularly in the case of standardized testing and assessment, participants' self-critical comments and their overall poor performance on the reading task across conditions, point to a serious deficiency in their overall language proficiency and in their reading skill in particular. These results are partially supportive of the observations made by Chang (2010) and Cushing-Weigle and Jensen (1996) and suggest that Saudi English learners need to expand their

vocabulary knowledge and develop their reading skill to a level where they would be able to understand a text without the help of a dictionary as pointed out by one of the participants who wrote, " *If I used a dictionary I would responded much better"*.

The need for a serious focus on vocabulary building is further implicated by the fact that time condition showed no significant effect on participants' performance on the vocabulary-related questions. This can be explained by the fact that a deficiency in vocabulary knowledge cannot be compensated by additional time. The reader should be reminded here that the performance of all three time groups on the vocabulary task were very low, with mean scores of 1.25 (limited), 1 (extended), and 1.66 (unlimited). When we consider the fact that the maximum score on the vocabulary questions was 5, the difference between time groups was very small and the overall success rate was far below the 50% (25% limited, 20% extended, 33% unlimited).

In view of the other two types of questions, the literal and higher order questions, significant differences were found between the unlimited time group vs. the other two groups which did not show statistically different performance. It also noted that the highest scores were achieved on the literal comprehension questions with 18% for the limited time group, 29% for the extended time, and 49% for the unlimited time. This result has two implications. First, it showed that the literal comprehension questions were the easiest to answer of all three types since they produced the highest success rate. Second, the fact that the unlimited time group had a significantly better performance shows that given more time participants can perform better on literal comprehension questions, unlike vocabulary-related questions where time did not compensate for lack of knowledge.

As already mentioned in chapter 3, the lowest scores were observed on the higher order questions, where even the unlimited time group hardly reached 29% accuracy although this

group showed a significantly better performance than the other groups. The fact that higher order questions elicited the lowest success rate is not surprising since such questions require well developed bottom-up and top-down skills and put higher demands on processing. In this light, the better performance of the unlimited time group is entirely logical. However, the fact that all groups showed their lowest performance on higher order questions pinpoints the fact that Saudi learners of English who strive to do well on a standardized test should give special attention to higher order questions and systematically develop the skills and strategies that they need in order to do well on such tests.

Unfortunately, the results of this study regarding participants' performance on specific reading tasks, such as vocabulary-related, literal comprehension, and higher order questions, can not be compared to any previous findings since no study, at least to the knowledge of this researcher, has examined reading performance in view of the of reading questions within the framework of time constraint. Yet, these findings provide valuable insights for Saudi teachers and learners of English and they will be outlined in the next section.

4.1 Pedagogical implications

Although this study found a significant effect of time constraint on Saudi English learners' performance on a standardized reading task, the effect of time constraint should not be viewed without a deeper look at the participants' overall low success rate and their performance on the three different types of questions.

First of all, the fact that participants in the unlimited time constraint showed a significantly better performance suggests that students who are preparing to take a standardized test need to develop strategies to work under time constraint. Thus, the present study implicates a greater need for conditioning at the level of the student. Such implications also point to a

recommendation in the spirit of Chang (2010) and Cushing-Weigle and Jensen (1996), whose studies found a significant increase in performance following a pre-test conditioning program. This pre-test conditioning was found to increase test performance in subjects as contrasted to the control group. Though test constructs and experimental items were not comparable to those of the present study, it is nonetheless expected that the administering of practice tests or construct-focused training would prove beneficial to performance.

Future studies running in this vein might avail themselves to the student of psychological phenomena associated with the perception of time and its impact on testing and performance. For example, the effect of limited vs. unlimited time might be applied to the scope of in-class vs. take-home examinations. Future studies following the vein of standardized testing might explore a possible correlation between perceived and imposed time constraints and their effect on test performance.

The results also show a need for a greater focus on vocabulary building. The participants overall low vocabulary scores and their own sell-deprecating comments about “too much new vocabularies” and need of a dictionary suggest that their curriculum and in depend learning practices do not provide sufficient attention to vocabulary building.

Another area that both teachers and learners need to focus, as suggested by the results of this study, is answering questions of a higher order difficulty, such as making inferences about implied meanings or the place of sentences in a particular discourse structure. It was obvious from the participants’ comments that they need to work on their own reading skills.

The study also makes some suggestions to standardized testing services who may want to revisit their own operationalization of time and carry out construct validation studies in order to establish a better rationale for the time limit they impose on the test takers. The participants also

mentioned that some of the options were confusing and if one critically examines the reading questions and options, it is likely that one may agree with these participants' observations.

4.2. Limitations

The present study included a sample of 47 subjects, attending Aljouf University in Saudi Arabia at the time of the data collection. In interpreting the results of the present study, the author is aware that the results of this study cannot be generalized to make inferences about a population of ESL learners outside Saudi Arabia. So, it should be specified that the results of this study are delimited to Saudi ESL students in the Saudi educational system,

Further, due to certain sociopolitical impingements on the process of recruiting subjects for the study, all subjects in the present study were of the male gender. Thus, the results are further delimited to male Saudi ESL learners and should not be extended to include female Saudi ESL learners. Thus, it is highly recommended that future studies with Saudi ESL learners examine the same or similar issues with female subjects.

Finally, the present author is aware that a number of other confounding variables may have affected the nature of the results obtained from this investigation. In particular, one limitation of this study is that it did not have a pre-test in order to make sure that the three groups were not statistically different in their reading ability. In a more controlled study, a pre-test is highly recommended as the pre-test results are used as a covariate in order to rule out against confounding differences between groups

4.3. Conclusion

This study has contributed to the growing body of literature that has arisen in recent years primarily in response to the controversy concerning the impact of time on the evaluation of second language reading skills. Crucially, the results of this study lend support to the conclusions

of Nguyen (2012), Chang (2010) and Cushing-Weigle and Jensen (1996). On the other hand, the results offer contrary evidence to those reported by Walczyk, Kelly, Meche and Braud (1999), Wild, Durso and Rubin (1982), Falke (2008), and Bridgeman, McBride and Monaghan (2004). However, the present study was fundamentally different from previous studies investigating the effect of time constraints on reading comprehension. First and foremost, this study incorporated different time-constraint groups (limited, extended, and unlimited), which added the potential for greater analytical insight by using smaller variations in time constraint. Further, the present study incorporated three distinct task items (vocabulary, literal and higher-order/inferential) to explore the effect of time constraints on specific types of questions, which lent greater scope to the analysis. The results and implications of this study offer insight into the effects of time constraint on performance in English-based reading tasks for ESL/EFL learners.

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APPENDICES

APPENDIX A

Instrument

Dear participant,

Thank you for your time in taking this test. I would like to remind you that this is not a test or any other form of evaluation. I need this information for my research which examines issues related to *second language reading comprehension*. That is why, it is important to get responses that reflect **your real** reading comprehension ability. Be

1. What is your AGE?

   _____

2. How would you rate your reading skill in English?

   A (Excellent) _____B (Very good) _____C (Good) _____D (other) _____

3. Have you ever taken a TOEFL test?

   Yes_____ circle which type PBT, IBT, CBT Year 20___ my score was _____

   No _____

4. Approximately, how much time per week do you spend reading in English? Give a rough estimate of hours spent in reading in English. For example, "2 hours per week".

Reading Section

Directions: These sample questions in the Reading section measure your ability to understand academic passages in English. You will read one passage and answer questions about it. You would have 20 minutes to read the passage and answer the questions.

Meteorite Impact and Dinosaur Extinction

There is increasing evidence that the impacts of meteorites have had important effects on Earth, particularly in the field of biological evolution. Such impacts continue to pose a natural hazard to life on Earth. Twice in the twentieth century, large meteorite objects are known to have collided with Earth.

If an impact is large enough, it can disturb the environment of the entire Earth and cause an ecological catastrophe. The best-documented such impact took place 65 million years ago at the end of the Cretaceous period of geological history. This break in Earth's history is marked by a mass extinction, when as many as half the species on the planet became extinct. While there are a dozen or more mass extinctions in the geological record, the Cretaceous mass extinction has always intrigued paleontologists because it marks the end of the age of the dinosaurs. For tens of millions of years, those great creatures had flourished. Then, suddenly, they disappeared.

The body that impacted Earth at the end of the Cretaceous period was a meteorite with a mass of more than a trillion tons and a diameter of at least 10 kilometers. Scientists first identified this impact in 1980 from the worldwide layer of sediment deposited from the dust cloud that enveloped the planet after the impact. This sediment layer is enriched in the rare metal iridium and other elements that are relatively abundant in a meteorite but very rare in the crust of Earth. Even diluted by the terrestrial material excavated from the crater, this component of meteorites is easily identified. By 1990 geologists had located the impact site itself in the Yucatán region of Mexico. The crater, now deeply buried in sediment, was originally about 200 kilometers in diameter.

This impact released an enormous amount of energy, excavating a crater about twice as large as the lunar crater Tycho. The explosion lifted about 100 trillion tons of dust into the atmosphere, as can be determined by measuring the thickness of the sediment layer formed when this dust settled to the surface. Such a quantity of material would have blocked the sunlight completely from reaching the surface, plunging Earth into a period of cold and darkness that lasted at least several months. The explosion is also calculated to have produced vast quantities of nitric acid and melted rock that sprayed out over much of Earth, starting widespread fires that must have consumed most terrestrial forests and grassland. Presumably, those environmental disasters could have been responsible for

the mass extinction, including the death of the dinosaurs.

Several other mass extinctions in the geological record have been tentatively identified with large impacts, but none is so dramatic as the Cretaceous event. But even without such specific documentation, it is clear that impacts of this size do occur and that their results can be catastrophic. What is a catastrophe for one group of living things, however, may create opportunities for another group. Following each mass extinction, there is a sudden evolutionary burst as new species develop to fill the ecological niches opened by the event.

Impacts by meteorites represent one mechanism that could cause global catastrophes and seriously influence the evolution of life all over the planet. According to some estimates, the majority of all extinctions of species may be due to such impacts. Such a perspective fundamentally changes our view of biological evolution. The standard criterion for the survival of a species is its success in competing with other species and adapting to slowly changing environments. Yet an equally important criterion is the ability of a species to survive random global ecological catastrophes due to impacts.

Earth is a target in a cosmic shooting gallery, subject to random violent events that were unsuspected a few decades ago. In 1991 the United States Congress asked NASA to investigate the hazard posed today by large impacts on Earth. The group conducting the study concluded from a detailed analysis that impacts from meteorites can indeed be hazardous. Although there is always some risk that a large impact could occur, careful study shows that this risk is quite small.

1. The word “pose” on line 2 is closest in meaning to

a. claim

b. model

c. assume

d. present

2. In paragraph 2, why does the author include the information that dinosaurs had flourished for tens of millions of years and then suddenly disappeared?

a. To support the claim that the mass extinction at the end of the Cretaceous is the best documented of the dozen or so mass extinctions in the geological record

b. To explain why as many as half of the species on Earth at the time are believed to have become extinct at the end of the Cretaceous

c. To explain why paleontologists have always been intrigued by the mass extinction at the end of the Cretaceous

d. To provide evidence that an impact can be large enough to disturb the environment of the entire planet and cause an ecological disaster

3. Which of the following can be inferred from paragraph 3 about the location of the meteorite impact in Mexico?

a. The location of the impact site in Mexico was kept secret by geologists from 1980 to 1990.

b. It was a well-known fact that the impact had occurred in the Yucatán region.

c. Geologists knew that there had been an impact before they knew where it had occurred.

d. The Yucatán region was chosen by geologists as the most probable impact site because of its climate.

4. According to paragraph 3, how did scientists determine that a large meteorite had impacted Earth?

a. They discovered a large crater in the Yucatán region of Mexico.

b. They found a unique layer of sediment worldwide.

c. They were alerted by archaeologists who had been excavating in the Yucatán region.

d. They located a meteorite with a mass of over a trillion tons.

5. The word "excavating" on line 25 is closest in meaning to

a. digging out

b. extending

c. destroying

d. covering up

6. The word "consumed" on line 32 is closest in meaning to

a. changed

b. exposed

c. destroyed

d. covered

7. According to paragraph 4, all of the following statements are true of the impact at the end of the Cretaceous period EXCEPT:

a. A large amount of dust blocked sunlight from Earth.

b. Earth became cold and dark for several months.

c. New elements were formed in Earth's crust.

d. Large quantities of nitric acid were produced.

8. The phrase "tentatively identified" on line 36 is closest in meaning to

a. identified after careful study

b. identified without certainty

c. occasionally identified
d. easily identified

9. The word “perspective” on line 46 is closest in meaning to

a. sense of values
b. point of view
c. calculation
d. complication

10. Paragraph 6 supports which of the following statements about the factors that are essential for the survival of a species?

a. The most important factor for the survival of a species is its ability to compete and adapt to gradual changes in its environment.

b. The ability of a species to compete and adapt to a gradually changing environment is not the only ability that is essential for survival.

c. Since most extinctions of species are due to major meteorite impacts, the ability to survive such impacts is the most important factor for the survival of a species.

d. The factors that are most important for the survival of a species vary significantly from one species to another.

11. Which of the sentences below best expresses the essential information in the following sentence?

Earth is a target in a cosmic shooting gallery, subject to random violent events that were unsuspected a few decades ago.

Incorrect choices change the meaning in important ways or leave out essential information.

a. Until recently, nobody realized that Earth is exposed to unpredictable violent impacts from space.

b. In the last few decades, the risk of a random violent impact from space has increased.

c. Since most violent events on Earth occur randomly, nobody can predict when or where they will happen.

d. A few decades ago, Earth became the target of random violent events originating in outer space.

12. According to the passage, who conducted investigations about the current dangers posed by large meteorite impacts on Earth?

a. Paleontologists
b. Geologists
c. The United States Congress
d. NASA

13. Look at the four letters (A, B, C, and D) that indicate where the following sentence could be added to the passage in paragraph 6.

This is the criterion emphasized by Darwin's theory of evolution by natural selection.

Where would the sentence best fit?

Impacts by meteorites represent one mechanism that could cause global catastrophes and seriously influence the evolution of life all over the planet. (A) According to some estimates, the majority of all extinctions of species may be due to such impacts. (B) Such a perspective fundamentally changes our view of biological evolution. (C) The standard criterion for the survival of a species is its success in competing with other species and adapting to slowly changing environments. (D) Yet an equally important criterion is the ability of a species to survive random global ecological catastrophes due to impacts.

Choose the place where the sentence fits best.

a. Option A
b. Option B
c. Option C
d. Option D

14. An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

Write your answer choices in the spaces where they belong. You can write in the number of the answer choice or the whole sentence.

Scientists have linked the mass extinction at the end of the Cretaceous with a meteorite impact on Earth.
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•

•

Answer choices

(1) Scientists had believed for centuries that meteorite activity influenced evolution on Earth.

(2) The site of the large meteorite impact at the end of the Cretaceous period was identified in 1990.

(3) There have also been large meteorite impacts on the surface of the Moon, leaving craters like Tycho.

(4) An iridium-enriched sediment layer and a large impact crater in the Yucatán provide evidence that a large meteorite struck Earth about 65 million years ago.

(5) Large meteorite impacts, such as one at the end of the Cretaceous period, can seriously affect climate, ecological niches, plants, and animals.

(6) Meteorite impacts can be advantageous for some species, which thrive, and disastrous for other species, which become extinct.[1]

Please stop now and complete the following question:

Q15: Do you think the time you were given to complete this task was sufficient?

YES NO

Please explain your answer above _____

[1] This reading task is retrieved On February 10th, 2011 From

http://www.ets.org/Media/Tests/TOEFL/pdf/SampleQuestions.pdf

APPENDIX B

Summary of Collected Data

Subject	Class	Total Voc.	Total Lit.	Total Higher	Σ	Subject	Class	Total Voc.	Total Lit.	Total Higher	Σ
1	20m	2	1	1	4	24	30m	1	1	2	4
2	20m	2	0	3	5	25	30m	0	0	1	1
3	20m	0	0	0	0	26	30m	2	1	3	6
4	20m	3	1	0	4	27	30m	0	1	1	2
5	20m	0	0	0	0	28	30m	1	0	0	1
6	20m	1	1	1	3	29	30m	2	2	2	6
7	20m	3	2	0	5	30	30m	2	2	1	5
8	20m	0	0	0	0	31	30m	0	2	1	3
9	20m	0	0	0	0	32	30m	2	0	1	3
10	20m	1	1	0	2	33	40m	4	4	4	12
11	20m	1	2	0	3	34	40m	3	2	1	6
12	20m	2	1	1	4	35	40m	1	2	4	7
13	20m	0	1	1	2	36	40m	2	2	2	6
14	20m	3	1	0	4	37	40m	1	1	2	4
15	20m	1	0	0	1	38	40m	1	2	1	4
16	20m	1	1	0	2	39	40m	2	1	3	6
17	30m	1	1	2	4	40	40m	1	0	1	2
18	30m	0	0	0	0	41	40m	1	1	2	4
19	30m	2	1	1	4	42	40m	0	1	0	1
20	30m	1	2	0	3	43	40m	1	1	1	3
21	30m	2	1	1	4	44	40m	5	3	6	14
22	30m	0	3	4	7	45	40m	2	1	0	3
23	30m	0	2	2	4	46	40m	0	3	2	5
						47	40m	1	2	2	5

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