

## **The Effect of Lexical Collocational Density on the Iranian EFL Learners' Reading Comprehension**

S. Sadighi \*

Ph.D. Student, TEFL

Zand Institute of Higher Education

email: shiva\_fan@yahoo.com

R. Sahragard

Associate Professor, TEFL

Shiraz University

email: rsahragard@rose.shirazu.ac.ir

### **Abstract**

The present study aims at investigating the effect of different levels of lexical collocational density on EFL learners' reading comprehension. Eighty sophomore students with different levels of proficiency studying at Zand Institute of Higher Education in Shiraz, Iran were chosen from among eighty five learners based on their score distribution on a reduced TOEFL test constructed by Educational Testing Service (ETS, 1998). Forty participants were randomly assigned to the control group, while the other forty made the experimental group. Another instrument used in this study was a lexical collocation test containing two texts (as pre- and post-tests): A high and a low lexical collocational density tests designed by the researchers. A few paired/independent sample t-tests, and a two-way repeated measure were used to answer the five research questions. Results indicated that texts with high lexical collocational density influenced learners' comprehension positively. Although the instruction of lexical collocation did not have any effects on answering the vocabulary items significantly, teaching lexical collocations affected learners' reading skills positively. Finally, different proficiency levels of the participants did not affect their performance on lexical collocation test with different lexical collocational density significantly.

**Keywords:** lexical collocation, lexical collocational density, reading comprehension

## 1. Introduction

The significance of learning a language through words and word combinations was attended to by some researchers during the 1990s, and since then many researchers have considered teaching and learning lexicon and word combinations as a proper way to learn a second or foreign language. These researchers include Natinger and DeCarrico (1992) who talked about lexical phrases and language teaching, and Lewis (1993) who proposed the lexical approach.

Likewise, collocation as a dimension of textual structure giving cohesion to the body of a text has been regarded as an integral part of language learning. Lewis (1993) defines collocation as a subcategory of multi-word items, which is made up of individual words that habitually co-occur. He believes collocations are different from “institutionalized expressions” which indicate what a language user does rather than what a language user expresses. In recent years, many applied linguists have emphasized the importance of drawing language learners’ attention to standardized multi-word expressions, such as collocations and idiomatic expressions (Celce-Murcia, 2001; Huang, 2001; Zhang; 1993, Pouralvar, 2007; Lewis, 1993). Halliday and Hasan (1985) elaborated on “cohesion” and “coherence” as having a great role in hanging the elements of a text together. In addition, he stated that in lexical cohesion the relations between vocabulary items in texts are of two kinds: collocation, the one which is the focus of this study and is defined as co-occurrence of words, and reiteration.

According to Lauder (n.d., p.6), “In corpus linguistics, to improve clarity of description when talking about collocation, the word in a concordance line which is the subject of interest is referred to as the node and the co-occurring word is the collocate. Gorjani (1996) classified nodes into two categories: pairs of words and lexical chains. “Ill, doctor”, and “sky, cloud, rain” are instances of different categories of nodes, respectively.

Lexical collocational density is the extent to which collocation of words have been used in a text. Gorjani (1996) stated that lexical collocational density is calculated by dividing the total number of nodes by the total number of words of the text multiplied by 100.

### 1.1 Statement of the problem

One of the major problems of Iranian students in learning a foreign language, especially English, is their low comprehension of reading texts as well as reading comprehension tests. Akbari and Mirhassani (2000) claim that “The majority of Iranian students are poor readers in English. They waste a great deal of time and effort, and their comprehension is not proportionate to the trouble they go through” (p. 49).

Despite the problems identified, very few studies have been done on the degree of lexical collocational density of a text and its interplay with the comprehension of texts. Moreover, little attention has been paid to explore the significant difference between different groups of students with different proficiency levels in terms of the effect of collocational density on reading comprehension. A few studies have investigated the topic of interest in an EFL context. Rahimi (2005) stated that a systematic teaching of lexical collocations effects vocabulary learning by Iranian EFL learners positively. Haung (2001) indicated that free combinations created the least amount of difficulty for his participants, whereas pure idioms were the most difficult. Zhang (1993) found a correlation between the quality of college freshmen's writing and the knowledge and use of collocations. Having reviewed the previous studies on collocations and their impact on ESL/EFL learners' reading comprehension, what seems necessary is an attempt to fill these gaps by studying the effects of collocative items and their corresponding types on understanding the reading texts and guessing the unknown vocabularies.

This study, in general, aims at investigating the effect of the collocative items on Iranian EFL learners' reading comprehension of texts. In other words, this study is to find out whether instruction of lexical collocation helps EFL learners develop their reading skills. Finally, this study aims at finding out whether or not there is a difference between different groups of students with different proficiency levels in terms of the effect of collocational density on their reading comprehension. In line with the above objectives, answers to the following research questions are sought:

1. Do different levels of lexical collocational density affect EFL learners' comprehension of English texts?
2. How can different levels of lexical collocations affect guessing the unknown vocabulary items?
3. Does instruction of lexical collocation help EFL learners to answer the vocabulary items correctly?
4. Does instruction of lexical collocation help EFL learners develop their reading skills?
5. Is there any significant difference between different groups of students with different proficiency levels in terms of the effect of collocational density on their reading comprehension?

## **1.2 Theoretical framework**

The present study has based its theoretical foundations on a newly developed approach called the lexical approach. This approach, as an alternative to grammar-based approaches, has gained interest in recent years.

The lexical approach to second language teaching has become an alternative to grammar-based approaches. The lexical approach develops learners' proficiency with lexis, or words, and word combinations. It is based on the fact that an important issue in language acquisition is the ability to comprehend and produce lexical phrases as unanalyzed wholes, or "chunks," and that these chunks were perceived traditionally as grammar (Lewis, 1993, p. 95). In the lexical approach, instruction emphasizes fixed expressions that occur frequently in spoken language, such as, "I'm sorry," "I didn't mean to make you jump," or "That will never happen to me," rather than creating novel sentences (Lewis, 1997, p. 212).

In the present study, the framework for lexical collocational analysis is taken from Gorjani's (1996), originally proposed by Aitchison (1987). According to them, there are three kinds of lexical collocations: coordination, superordination and marked nodes. For instance, "air" and "Hydrogen, Neon, Krypton, Helium, Ozone, Xenon, and Carbon Dioxide" are instances of superordination in the lexical collocation text with high lexical collocational density which were used in this study. "Salt and pepper", "light and heavy" are examples of coordination. Marked nodes as exemplified above are of two types: pair of words and lexical chains. This framework was used to calculate the lexical density of texts by counting the nodes which exist in the text. The degree of lexical collocational density has been claimed to have an effect on reading comprehension of the students (Gorjani, 1996).

## 2. Literature Review

There is first a discussion on the definition and types of collocation and then some studies on the issue is reviewed.

### 2.1. Definition and Types of Collocation

Celce-Murcia (2001) defines collocation as go togetherness of lexical items in combinations, which differs in frequency or acceptability. Items which collocate frequently with each other are called 'habitual', e.g. *tell a story*, whereas those which cannot go together are called 'unacceptable', e.g. \**powerful tea* instead of *strong tea*.

Collocation is the combination of words that co-occur more often which is not based on chance in a text and that are more restricted than free combinations (e.g. *very cold*) and less restricted than idioms (e.g. *get the cold shoulder*). They are common in technical genres in English, and their length differs from two to six words, which can be interrupted by other words. Different types of collocation depend on the degree of flexibility, the way they are combined together, and the number of words (Smadja, 1993; Sinclair, 1991).

According to Lewis (2000), some kinds of combinations are part of the native speaker's mother tongue who can use them easily and unconsciously. Schmitt (2000) advocates the Lexical Approach by saying that lexical chunks are stored and processed as individual wholes in the mind rather than combinations of single words. He believes that because the mind has limited short-term capacity, it is better for the brain to store 'chunks' of language as one piece of information than single words. Among different types of 'chunks', collocation is the "single most important kind of chunk", as Lewis (2000, p. 8) suggests.

Two kinds of collocations are lexical and grammatical collocations. However, the present study focuses only on lexical collocations. One main reason is that grammatical collocations can be found easily in dictionaries whereas lexical collocations are more difficult for second language learners to find in dictionaries (Čeh, 2005).

Hammer (1991) has stated that word meaning can be affected by the meaning of other words which come in its environment. In fact, in order to use a word receptively and productively, one should know what words can accompany it (Hammer, 1991).

It has been claimed that collocations are important for learners who want high competence in a language (Nesselhauf, 2003) and also for those who even have "less ambitious aspirations" (Nesselhauf, 2003, p. 223). The reason is that knowing how to use collocations improves both accuracy and fluency. McCarthy (1990) believes that an important factor that distinguishes a native speaker from a non-native speaker is the knowledge of collocations. An immediate pedagogical implication is that collocation should be given "the same kind of status in our methodology as other aspects of language such as pronunciation, intonation, stress, and grammar" (Hill, 2000, p. 59).

Howarth (1996) classifies lexical collocations into four categories: free combinations, restricted collocations, figurative idioms, and pure idioms. The meaning of free combinations can be understood from the literal meaning of individual words which can be substituted freely. An example provided by Howarth (1996) is *blow a trumpet*. A restricted collocation cannot be substituted freely and usually has an element that is used in a specialized context, e.g., *blow a fuse*. Howarth (1996) divides idioms into two categories: figurative and pure idioms. A figurative idiom has a metaphorical meaning which can be guessed from its literal interpretation, whereas a pure idiom has a fixed meaning, which cannot be understood from the meaning of its components. The examples Howarth (1996) gives for the two types are *blow your own trumpet* and *blow the gaff*, respectively.

Lewis (1997) proposes the following categories for collocations:

1. Strong: A large number of collocations are strong. For example, we say *rancid butter*, but that does not mean that other things cannot be rancid.

2. Weak: There are words which go together with random frequency; for example, *white wine* or *red wine*.

3. Medium strength: There are words that go together with a greater frequency than weak collocations. Some examples are: *hold a meeting*, *carry out a study*.

There exists a correlation between the degree of cohesiveness of a text and the extent to which lexical collocations are related to the textual background information (i.e. not too many and not too few collocative nodes) used by the writer. This would help the writer and the reader to negotiate meaning (Van Dijk & Kintsch, 1983; Lotfipour, 1997). In this case, the writer and the reader interact through the text as a dynamic process (Lotfipour, 1997). Both interlocutors use different kinds of strategies such as "elaborative" and "reductive" strategies. The writer's elaborative strategies and the reader's reductive ones are activated mostly through lexical collocations (Aitchison, 1987).

The role of lexical collocation gets clearer when we consider that collocations hang the elements of the text together and create cohesion among the sentences of a text which help the reader comprehend the meaning of the text more easily (Halliday, 1975; Halliday & Hasan, 1976; Van Dijk, 1977; Van Dijk & Kintsch, 1983).

## 2.2 Studies done on collocation

The available relevant literature on collocation and English language learning and teaching is displayed in Table 1 below:

Table 1. Studies done on collocation

Author(s)	Participants	Instruments	Collocation	Findings
<b>Bonk (2000)</b>	98 university students in USA	a 16-item multiple-choice test & two 17-item blank-filling tests, a version of the TOEFL test, a questionnaire	lexical collocations	A strong correlation between collocation knowledge & overall English proficiency
<b>Huang (2001)</b>	60 students from a college in Taiwan	a completion test	Lexical collocations	free combinations were not difficult for the participant, but pure idioms were the most difficult ones

Author(s)	Participants	Instruments	Collocation	Findings
<b>Lin (2001)</b>	89 senior high school students in Taiwan	a 15-item blank-filling test & a 15-item multiple-choice test, a 40-item self-developed English proficiency test, a questionnaire	lexical collocations (V + N)	A strong correlation between collocation knowledge & overall English proficiency
<b>Zughoul &amp; Hussein (2001)</b>	70 university students in Jordan	a 20-item multiple-choice a translation task	lexical collocations (V + N)	EFL learners have insufficient knowledge of English collocations
<b>Tseng (2002)</b>	94 senior high school students in Taiwan	two 50-item blank-filling tests & two compositions a questionnaire	lexical collocations (V + N)	The positive effects of collocation instruction on collocation knowledge
<b>Martyńsk a (2004)</b>	53 high school students in Poland	word matching, collocation completing, correct option selecting, error identifying and correcting	lexical collocations	The importance of learning chunks
<b>Tang (2004)</b>	96 first-year university students in Taiwan	a revised speaking and writing tests (General English Proficiency Test)	lexical collocations & grammatical collocations	No direct relationship between collocation competence & overall English proficiency
<b>Mahmoud (2005)</b>	42 university students in Sultanate of Oman	42 essays	lexical collocations & grammatical collocations	The importance of collocation instruction
<b>Wang (2005)</b>	75 university students in Taiwan (senior English majors)	a modified, in-depth vocabulary knowledge measure & 3 oral elicitation tasks, a questionnaire	lexical collocations	No direct relationship between collocation competence & depth of vocabulary knowledge
<b>Keshavarz &amp; Salimi (2007)</b>	100 university students in Iran	a 36-item multiple-choice cloze test & a 36-item open-ended	lexical & grammatical collocations	EFL learners have insufficient knowledge of English collocations

Author(s)	Participants	Instruments	Collocation	Findings
		cloze test, a TOEFL test		A strong correlation between collocation knowledge & overall English proficiency
<b>Zhang (1993)</b>	60 college freshmen native and non-native speakers of English	fill-in-the-blank collocation test and a writing task	Lexical collocations	native English writers outperformed non-native writers on the collocation test, native writers performed better than non-native writers in the writing task
<b>Rahimi (2005)</b>	60 Iranian EFL students	A multiple-choice test of vocabulary	Lexical collocations	systematic teaching of lexical collocations has positive effects on the Iranian EFL learners' vocabulary learning
<b>Chen (2008)</b>	355 first-year non-English major university students	50-item multiple-choice collocation test	lexical & grammatical collocations	A positive correlation between collocation knowledge & overall English proficiency & participants did not demonstrate sufficient collocation knowledge

Table 1 shows that different methodologies and different participants (high school students' and university students) were used examining collocational competence and their types (cf. Bonk, 2000; Tang, 2004; Mahmoud, 2005; Keshavarz and Salimi, 2007; Lin, 2001; and Zughoul and Hussein, 2001; Chen, 2008), in various studies. All researchers focused on students at one high school or university, except Lin's (2001) study which was done on two high schools.

With regard to the diverse instruments, multiple-choice tests, blank-filling tests (or cloze test), composition writing tasks, questionnaires, etc., were used to examine the participants' knowledge of English collocations. The findings of the above studies show that EFL learners' collocation



knowledge is quite insufficient (e.g. Zughoul and Hussein (2001), Tseng (2002), Keshavarz and Salimi (2007)).

Some researchers explored the relationship between collocation competence and overall English proficiency. Other researchers, such as Bonk (2000), Lin (2001), Tseng (2002), and Keshavarz and Salimi (2007) stated that there is a significantly positive relationship between collocation competence and overall English proficiency except for Tang (2004), who did not find any significant correlation between collocation competence and overall English proficiency. With regard to collocation teaching, researchers such as Lin (2001), Tseng (2002), and Tang (2004) found a close correlation between instruction of collocations and the learners' collocation knowledge increase. Our study's departure from the above studies is that we mainly focused in the collocational density of reading comprehension texts.

The above literature review shows that most of the studies focused on the type of collocations that posed difficulty for the learners. Furthermore, it was found out that systematic teaching of lexical collocations affects vocabulary learning by Iranian EFL learners positively (cf. Rahimi, 2005). No other study could be found that has investigated the issues dealt with here in this study, however. Therefore, the issue is further investigated to provide more insights to the picture of lexical collocational studies in relation to understanding the meaning of unknown vocabularies and its effects on the learners' reading comprehension. Lexical collocational analysis is used as a tool in this research in order to identify the effectiveness of lexical collocations in activating the adult readers' cognitive processes in comprehending texts with different lexical collocational density.

### 3. Method

#### 3.1 Participants

To carry out the research, 85 sophomore students with different levels of proficiency studying at Zand Institute of Higher Education were chosen. They were all Persian native speakers majoring in English Language and Literature. These students had already been placed into two sections: One section served as the control group (CG, N. 40) randomly, and the other as the experimental (EG, N. 40). Due to ethical reasons the collocation tests with high and low lexical collocational density were given to all of the subjects in the two groups because we could not ignore some students and give the test only to those students who did better on the reduced TOEFL test. To ensure homogeneity of the two groups, the participants whose scores on the reduced TOEFL test fell between -1 SD and +1 SD were chosen from

among the learners as the selected participants whose test results would be analyzed.

### 3.2 Instruments

In order to gather the data, two instruments were employed in this study. The first one was a reduced TOEFL test constructed by the Educational Testing Service (ETS, 1998) which was administered to all the participants to screen subjects for the study so that their results on the tests with high and low lexical collocational density could be analyzed. The reduced TOEFL test included 15 structure items, 15 items on written expressions, and 30 reading comprehension items. The rationale behind administering a reduced form of the TOEFL test was to lessen the possibility of the participants' losing their patience as a result of staying too long in the test session, and hence, the probability of obtaining unreliable results is reduced.

The second instrument was a lexical collocational test containing two texts, with high and low lexical collocational density each followed by twelve multiple choice items constructed by the researcher. The two texts were similar in all aspects except the lexical collocational density. The length of the two texts, the topic, and their level of the difficulty was similar. Four items dealt with guessing the unknown vocabularies, two items with understanding the references, and six items required comprehension of the text using cohesive ties in the text. The distribution of the test items is represented in Table 2.

Table 2. Distribution of test items in lexical collocational test with high and low lexical collocational density

	Vocabularies	Reference	Comprehension
High	7, 8, 9, 10	11, 12	1, 2, 3, 4, 5, 6
Low	6, 7, 8, 11	9,10	1, 2, 3, 4, 5, 12

The texts with high and low lexical collocational density and the related test items were used twice in this study: As a pre and post-test examining the participants' level of collocational knowledge. The reliability of the tests was calculated using test re-test method of estimating of reliability by administering the tests to 30 students other than the subjects participating in the experiment. The test was administered twice with the time interval of one month. Since the subjects of this study were homogenous the practice effect can be attributed to the treatment of the study. The reliability coefficients were within an acceptable range (test of lexical collocation with high lexical density: 0.86 and test of lexical collocation with low lexical density: 0. 89). The content validity of the collocation test was determined

by asking the views of 3 experts in the field. They unanimously reiterated that the content taps the issue under investigation. The construct validity of the test was sought through exploratory factor analysis where the results of principal component analysis returned higher loadings on one factor, suggesting collocation knowledge. Moreover, to further investigate item characteristics of the two collocation tests, the results of the same test were used to examine item facility, item discrimination and choice distribution of the items. The item facility for both tests fell within an appropriate range (0.37 and 0.63, respectively).

### 3.3 Data collection

Data collection took place during the Fall of 2010 in the participants' reading comprehension course. The reason for choosing this course was to give the treatment during the course. To make the subjects familiar with the test-taking procedure, the instructions were orally given both in English and Persian by the instructor of the course. She was aware of how to employ the method of giving treatments to the students. Then, the reduced TOEFL test was administered having 60 minutes to perform the task. After that, the two texts with high and low lexical collocational density were administered at the same time as a pre-test. The time allocated for the administration of the tests was 30 minutes. The same tests were administered in interval of one month as a post-test. The learners in the experimental group were given 6 sessions of 2 hour treatment during which the learners' attention was directed to collocations. The course instructor used four passages of their text book, *English through Reading* by W.W.S Bhasker and N.S. Prabhu (1975), attempting to increase the students' awareness of lexical collocation and how they can be useful for reading comprehension. .

The lexical collocational density of the two lexical collocation tests was calculated by dividing the total number of nodes by the total number of words multiplied by 100 following Gorjani (1996). The students were given 30 minutes to do the test. This pre-test was used to assess the students' reading comprehension ability before the treatment. The same test was used as a post-test with an interval of 1 month to see the effect of treatment on the students' reading comprehension.

### 3.4 Data analysis

The participants' reading comprehension test answer sheets were collected and scored by the researchers. The means and the standard deviations of the scores of the experimental and control groups were calculated using SPSS Computer Software (version 16). Furthermore, two paired sample t-test was used, aiming at responding to the first research question of the present

experiment in order to measure the significance of the growth in the performance of the experimental group on the lexical collocational test with high and low lexical collocational density from the pre- to the post-test. In other words, this was used to see whether different levels of lexical collocational density affect EFL learners' comprehension of English texts or not. A t-test aimed at comparing the performance of the control and the experimental groups on the lexical collocational test with high and low lexical collocational density. Four paired sample t-tests aimed at responding to the third research question of this experiment to find out if instruction of lexical collocation had any significant effect on guessing the meaning of the unknown vocabularies. Another t-test was run to see if instruction of lexical collocation had any significant effect on developing reading skills.

In order to answer the fifth research question, the participants were divided into three groups of highly, moderately, and poorly proficient, according to their TOEFL grades. 27% of the scores from the beginning were considered as high, 27% of the scores from the end as poor, and the scores between these two groups as moderate. Then, a two-way repeated measure was run to investigate the difference, if any, between different groups of the participants with different proficiency levels in terms of the effect of lexical collocational density on their reading comprehension.

#### 4. Results and Discussions

##### 4.1 Results of descriptive statistics

Table 3 presents the descriptive statistics of the different tests used in this study. The mean, standard deviations (SD), maximum and minimum of the scores are tabulated.

Table 3. Basic descriptive statistics for the tests used in the study

	N	Min.	Max.	Mean	SD
Pretest-CG	40	12.00	20.00	16.225	1.544
Pretest-EG	40	9.00	20.00	16.125	2.563
Proficiency-CG	40	18.00	51.00	32.500	7.805
Proficiency-EG	40	21.00	50.00	35.775	7.674
Posttest-CG	40	13.00	20.00	16.100	1.614
Posttest-EG	40	12.00	23.00	17.575	2.659

The above table shows the range of scores on a pre-test from 12-20 with a mean of 16.22 and a standard deviation of 1.54. While scores of the participants in the experimental group ranged from 9.00 to 20.00 with a mean of 16.12 and a standard deviation of 2.56. As could be seen, the

closeness of the means of the two groups is an indicator of homogeneity of the two with respect to their collocational knowledge. However, the dispersion of the scores is wider for the experimental group. Based on the third and fourth rows of the table, the resulting SDs show that the two sets of scores are fairly similarly scattered along the horizontal axis.

The fifth and sixth rows of the above table on the post-test demonstrate that the difference between the means of the two groups can be an indicator of the effectiveness of the treatment of instruction of lexical collocations in reading comprehension of the texts. However, further research is needed to examine the effectiveness of this treatment in the long run. A marked difference can be seen in the two SDs. This suggests that the scores of the experimental group are more widely scattered along the horizontal axis.

As the first and the second rows in Table 3 show that the participants did not demonstrate a very high knowledge of lexical collocation which is in line with Ceh (2005), Zughoul & Hussein (2001), Keshavarz & Salimi (2007), and Chen (2008) who proposed that lexical collocations are problematic for learners and difficult to find in dictionaries. The reason is that there is no explicit rule for lexical collocations. They are recurrent patterns of one's language which is in line with Zhang (1993) indicating that native writers performed better on lexical collocational test than non-native writers.

Table 4 below shows basic descriptive statistics for the high and low lexical collocational tests.

Table 4. Basic descriptive statistics for the high and low lexical collocational tests

	N	Min.	Max.	Mean	Std. Dev.
Pre-EG-hi	40	7.00	11.00	9.650	1.210
Pre-CG-hi	40	4.00	11.00	9.025	1.440
Pre-CG-low	40	4.00	9.00	6.900	1.277
Pre-EG-low	40	2.00	10.00	6.550	2.024
Post-EG-hi	40	7.00	12.00	10.200	1.136
Post-CG-hi	40	7.00	11.00	8.975	.946
Post-EG-low	40	2.00	11.00	7.225	2.270
Post-CG-low	40	4.00	11.00	7.525	1.568

As the above table indicates, not much difference is observed in the dispersion of scores between the two groups. The same is also true for their means.

The third and the fourth rows of the above table represent that the two groups have fairly similar means with slightly different SDs. Likewise, the fifth and sixth rows reveal that the mean gain in the experimental group can be contrasted with the mean loss in the control group when compared with the scores in the pretest. The SDs are not much affected but the control group is a bit more homogenous.

The seventh and eighth rows in the table convey that the mean scores for both groups have dropped similarly and the dispersion of the scores is quite different. Results of both groups are in harmony with the expectation to have scores being more widely scattered compared with the scores for the high lexical collocation test.

As is evident from Table 4, the means of the two groups on high lexical collocational test as a pre-test (9.65 and 9.02, respectively) were higher than the means of the two groups on low lexical collocational test (6.55 and 6.90). This shows that participants performed better on the test with high lexical collocational density. The result is in line with (Halliday & Hasan, 1976; and Martyńska, 2004) contending that collocational knowledge is effective in overcoming the problems of understanding the text and guessing the unknown vocabularies due to the degree of lexical collocational density. Comparing the mean scores of the two groups on high lexical collocational test, we can say that the treatment had an effect on the comprehension of the text and consequently on the performance of the participants on the post-test.

Table 5 presents the descriptive statistics of the number of the students who answered the four items (7, 8, 9, and 10 in the collocation test with high lexical collocational density) and four items (6, 7, 8, and 11 in the collocation test with low lexical collocational density) of guessing the unknown vocabulary items correctly.

Table 5. Basic descriptive statistics for vocabulary items in the high and low lexical collocational test

	N	Maximum	Mean	Std. Deviation
High	80	4.00	2.212	.923
Low	80	4.00	1.587	.806
Valid N (listwise)	80			

High= the number of students who answered four questions of vocabularies correctly on collocation test with high lexical collocational density

Low= the scores of the students who answered four questions of vocabularies correctly on collocation test with low lexical collocational density

As shown in the table, the mean score of the participants who answered the four vocabulary questions correctly in the collocation test with high lexical collocational density is 2.21 with a standard deviation of .92. Similarly, the mean score of the same participants who answered the four vocabulary questions correctly, in the collocation test with low lexical collocational density, is 1.58 with a standard deviation of .80.

As Table 5 indicates the mean score of the participants who answered four vocabulary questions correctly is higher (2.21) on the lexical collocation test with high lexical collocational density than the mean scores of the participants who answered the four vocabulary questions correctly on the lexical collocation test with low lexical collocational density (1.58). This shows that the participants had less difficulty answering the unknown vocabularies on the collocation test with high lexical collocational density. In other words, lexical collocational density helps the participants to answer the unknown vocabularies better.

#### 4.2 Results of inferential statistics

In order to answer the research questions, ten t-tests of Independent-Sample and Paired ones as well as one repeated measures test were run on the data. The first statistical procedure presented here is that of a paired-sample test which looks at the significant growth in the performance of participants in the experimental group on the high lexical collocational test from pre- to post test. The results of this test are shown in Table 6.

Table 6. Paired-sample test for the experimental group (high lexical collocational density)

Test	Sig (two-tailed)	t	Df	Mean	Mean of Scores	SD
Pair 1 Pre-EG-hi – Post-EG-hi	.001	-3.731	39	-.550	Pre-EG-hi =9.650	1.210
					post-EG-hi =10.200	1.136

Table 6 has yielded results which could be used to answer the first research question of this study. In other words, its outcomes are important to make inferences about the effectiveness of the treatment on the performance of the participants in the experimental group on high lexical collocational test from the pre- to post test. There was a statistically significant increase in the scores of the participants in the experimental group on the high lexical collocational test from the pre- test ( $m= 9.65$ ,  $SD= 1.21$ ) to the post test ( $m= 10.20$ ,  $SD= 1.13$ ) ( $t(39) = -3.73$ ,  $df= 39$ ,  $p< .05$ ). Thus, one can infer that there is a significant growth in the scores of the experimental group on the lexical collocational test with high lexical collocational density. In other

words, one can say that texts with high lexical collocational density affect the comprehension of the texts positively. A few studies have been done on the effect of cohesion on reading comprehension. Halliday and Hasan (1976) stated that cohesion relates different elements of a text together which enables the reader or the listener to use those elements to comprehend a text better. Similarly, (McClure & Steffensen, 1985; and Ehrlich, Remond, and Tardieu, 1999) found a positive relation between cohesion and comprehension of the texts. However, no experimental studies, to the knowledge of the researcher, have been done on the effect of lexical collocational density on EFL learners' comprehension of English texts. Therefore, the results of the present study cannot be compared with any studies done up to the present time. The next analysis undergoes the same procedure as for the low lexical collocation test. The result of this is presented in Table 7.

Table 7. Paired-sample test for the experimental group (low lexical collocational density)

Test	Sig (two-tailed)	t	Df	Mean	Mean	SD
Pair 1 Pre-EG-low- Post-EG-lo	.010	-2.710	39	-.675	Pre-EG-low =6.550	2.024
					Post-EG-low =7.225	

As one can see in Tables 6 and 7, the mean scores of the participants on the test with high lexical collocational density is higher (9.65(pre-test) and 10.20(post-test)) than in the text with low lexical collocational density (6.55(pre-test) and 7.22(post-test), shown in Table 7. There was a statistically significant increase in the scores of the participants in the experimental group on low lexical collocational test from the pre-test ( $m=6.55$ ,  $SD=2.02$ ) to the post test ( $m=7.22$ ,  $SD=2.27$ ),  $t(39) = -2.71$ ,  $p < .05$ (two-tailed), table 4.5. Thus, it indicates the significance of the growth in the scores of the experimental group on the lexical collocational test with low lexical collocational density. As a result, the effectiveness of the treatment was supported. The result of this experiment is in line with that of (Nesselhauf, 2003; Tseng, 2002; and Mahmoud, 2005) who proposed knowing collocations improve both accuracy and fluency. An immediate pedagogical implication would be to include teaching lexical collocations in the teaching syllabi. The next analysis investigates the significant growth in the performance of the participants in the control group on high lexical collocational test from the pre- to the post-test.



Table 8. Paired-sample test for the control group (high lexical collocational density)

Test	Sig (two-tailed)	t	Df	Mean	Mean	SD
Pair 1	.800	.255	39	.0500	Precontrolfirst=9.025	1.440
Pre_CG_first					Postcontfirst=8.975	.9469
Post_CG_first						

In the above table, a decrease in the scores of the participants in the control group on high lexical collocational test from the pre- test ( $m= 9.02$ ,  $SD= 1.44$ ) to the post test ( $m= 8.97$ ,  $SD=.94$ ),  $t(39) = -.25$ ,  $p> .05$ (two-tailed) was observed which is not statistically significant. This can be evidence for the effectiveness of the treatment which was absent in the control group. The following table observes the growth in the performance of the participants in the control group on low lexical collocational test from the pre- to the post- test.

Table 9. Paired-sample test for the control group (low lexical collocational density)

Test	Sig (two-tailed)	T	Df	Mean	Mean	SD
Pair 1	.520	-.650	39	-.1500	precontsecond =7.000	1.281
Pre_CG_Second					postcontsecond=7.150	1.075
Post_CG_Second						

There was an increase in the scores of our participants in the control group on low lexical collocational test from the pre- test ( $m= 7.00$ ,  $SD= 1.28$ ) to the post test ( $m= 7.15$ ,  $SD=1.07$ ),  $t(39) = -.65$ ,  $p> .05$ (two-tailed) which is not statistically significant, however. The result of the last two tests show that there was not a significant growth in the performance of the control group on the lexical collocational test with both high and low lexical collocational densities. This experiment indicates raising learners' consciousness and teaching lexical collocations can help them understand the English texts better. The results are in line with (Halliday, 1975; Halliday and Hasan, 1976; Van Dijk, 1977; Van Dijk & Kintsch, 1983; Tseng, 2002; and Mahmoud, 2005) who proposed that collocations can hang the elements of the text together and create cohesion which helps learners to comprehend the text easier. Table 10 compares the performance of the participants in answering the four vocabulary items on the collocation test with high and low lexical collocational density.

Table 10. Independent-sample test for the four vocabulary items of the collocation test with high and low lexical collocational density

Test	sig	t	Df	Sig (two-tailed)	Mean of Scores
Density	.172	4.559	158	.000	High= 2.212
EVA*		4.559	155.184	.000	Low= 1.587
EVNA^					

\*EVA= Equal Variances Assumed, ^EVNA= Equal Variances Not Assumed

The answer to the second research question of this study can be sought in the above table. This question investigates the effect of different levels of lexical collocations on participants' answering the vocabulary items. Table 4.8 shows us that the P-value or level of significance is .17 (Sig= .17). As (.172 > 0.05), (0.05 is the significance level of the test), the first assumption of equal variances is accepted, and the results of the t-test are given based on the fact that the variances are equal. The results of the t-test show that the t-value is 4.559 which is more than the level of significance which is .000 (4.559 > .000). This means that the difference is significant. In other words, the test being highly dense or lowly dense collocationally will have an impact on the participants' correct responses. In other words, the participants could answer the vocabulary items better in the collocation test with high lexical collocational density. As Halliday and Hasan (1976) contend, in collocations, cohesion is achieved through the close co-occurrence of words in a text that relates one part of a text to another which leads to its better understanding. In the collocation test with high lexical collocational density, there are more cohesive ties which can be the reason that participants answered the vocabulary items better than in the test with low lexical density. The next statistical procedure is a paired sample test, observing any significant growth in the performance of participants in the experimental group on vocabulary items in high lexical collocational test from the pre- to post-test.

Table 11. Paired-sample test for the growth in the experimental group on vocabulary items (high lexical collocational density)

Test	Sig(two-tailed)	t	Df	Mean	Mean	SD
Pair 1					highpreexp = 2.275	.933
Pre_EG_Hi	.000	-7.851	39	-		
Post_EG_Hi				1.050	Highpostexp = 3.325	.572

There was a statistically significant increase in the scores of the participants in the experimental group in the vocabulary items in the high

lexical collocational test from the pre-test ( $m=2.27$ ,  $SD=.93$ ) to the post test ( $m= 3.32$ ,  $SD= .57$ ),  $t(39) = -7.85$ ,  $p<.05$ (two-tailed). Table 11 indicates that the significance level for the experimental group on high lexical collocational density from the pre-test to the post-test is .000 which is statistically significant. The results indicate the significance of the treatment in the experimental group which is in line with Rahimi (2005) proposing the effectiveness of the systematic teaching of lexical collocations on vocabulary learning. In the following table, another paired sample test was run to investigate any significant growth in the performance of the participants in the control group on vocabulary items in high lexical collocational test from the pre- to post- test.

Table 12. Paired-sample test for vocabulary items of the control group (high lexical collocational density)

Test	Sig (two-tailed)	t	Df	Mean	Mean	SD
Pair 1					highprecont =2.150	.921
Pre_CG_Hi	.000	-5.731	39	-.800	highpostcont	.597
Post_CG_Hi					=2.950	

There was a statistically significant increase in the scores of the participants in the control group in the vocabulary items in the high lexical collocational test from the pre-test ( $m=2.15$ ,  $SD=.92$ ) to the post test ( $m= 2.95$ ,  $SD=.59$ ),  $t(39) = -5.73$ ,  $p<.05$ (two-tailed). Table 12 indicates that the significance level for the experimental and the control group on high lexical collocational density from the pre-test to the post-test, is .00 which is smaller than .05. In other words, the above table illustrates the significance of the growth in the scores of the experimental and control group on the lexical collocational test with high lexical collocational density, respectively. Therefore, it does not support the effectiveness of the treatment because we had growth in both experimental and control groups. However, as one can see in the table, the mean scores of the participants in the experimental group increased more on the test with high lexical collocational from the pre-test to the post-test (from 2.27 to 3.32) than in the control group (from 2.15 to 2.95). The results of this experiment is in contrast with Rahimi (2005) who reported the positive effect of systematic teaching of lexical collocations on vocabulary learning by Iranian EFL learners. One reason for the ineffectiveness of the treatment can be because of the short duration of the treatment. It was not practical to have a long term treatment and to take the time of the participants' class. Another reason can be the fact that a large number of vocabulary items were not presented which can be a limitation of this study; it was not practical to add more vocabulary items due to lack of time for the administration of the test.

Obviously, further research is needed on collocations with different levels of lexical collocational density with more vocabulary items specifically to (dis) confirm the results of this study. The next analysis undergoes the same procedure for the low lexical collocation test. The result of this is presented in Table 13.

Table 13. Paired-sample test for the vocabulary items of the control group (low lexical collocational density)

Test	Sig (two-tailed)	t	Df	Mean	Mean	SD
Pair 1 Pre_CG_Lo Post_CG_Lo	.017	-2.490	39	-.375	lowprecont =1.550	.814
lowpostcont =1.925					.655	

There was a statistically significant increase in the scores of the participants in the control group in the vocabulary items on lexical collocation test with low lexical collocational density from the pre-test ( $m=1.55$ ,  $SD=.81$ ) to the post test ( $m=1.92$ ,  $SD=.65$ ),  $t(39) = -2.49$ ,  $p < .05$ (two-tailed). Similarly, the above table does not support the effectiveness of the treatment for there was an increase in the scores of the participants in both the control and the experimental group which is in contrast with Rahimi (2005). The next table investigates any significant growth in the performance of participants in the experimental group in the vocabulary items in low lexical collocational test from the pre- to the post- test.

Table 14. Paired-sample test for the vocabulary items of the experimental group (low lexical collocational density, pre & post)

Test	Sig(two-tailed)	t	Df	Mean	Mean	SD
Pair 1 Pre_EG_Lo Post_EG_Lo	.000	-5.958	39	-.90000	lowpreexp =1.6500	.80224
lowpostexp =2.5500					.87560	

There existed a statistically significant increase in the scores of the participants in the experimental group in the vocabulary items in low lexical collocational test from the pre-test ( $M=1.65$ ,  $SD=.80$ ) to the post test ( $M=2.55$ ,  $SD=.87$ ),  $t(39)=-5.95$ ,  $p < .05$ (two-tailed). Tables 14 and 14 show the results that illustrate the significance of the growth in the scores of the experimental and control group on the collocation test with low lexical collocational density as the P values for both of them were .017 and .000

which are smaller than .05. This could be another piece of evidence for the ineffectiveness of the treatment.

The results shown in Tables 11 to 14 can help to answer the third research question of this study. Thus, in responding to this research question of the experiment, one can say that there is no significant relationship between instruction of lexical collocation and answering the vocabulary items correctly. The next table compares the performance of the control and the experimental groups on lexical collocational test as the pre/post-tests.

Table 15. Results of t-test 10: Descriptive statistics and Independent Samples Test for the pre/post tests

Test		sig	t	Df	Sig (two-tailed)	Mean of Scores
Pretest	EVA*	.001	.211	78	.833	Control= 16.225
EVNA^			.211	63.999	.833	Experi.= 16.125
Posttest	EVA	.009	2.999	78	.04	Control=16.100
EVNA			2.999	64.302	.04	Experi.=17.575

\*EVA= Equal Variances Assumed, ^EVNA= Equal Variances Not Assumed

Table 15 shows us that the P-value or level of significance in the collocation test as a post-test is 0.001 (Sig= 0.001). As Sig is smaller than 0.05 (0.05 is the significance of the test), (0.001 < 0.05), the second assumption is accepted, and the results of the t-test are given based on the fact that the variances are not equal. The results of the t-test show that the t-value is 0.211 which is more than the level of significance, 0.004 (0.211 > 0.004). Therefore, there is a significant difference between the experiment and the control group on the lexical collocational test as a post-test. The above table also shows us that the experimental group has outperformed the control group on the lexical collocational test as a post-test with a mean difference of 1.47 which is significant at 0.05. Furthermore, the P-value or level of significance in the collocation test as a pre-test is 0.001 (Sig= 0.001). As (0.001 < 0.05), the second assumption is accepted and the results of the t-test are given based on the fact that the variances are not equal. The results of the t-test in Table 15 show that the t-value is 0.299 which is smaller than the level of significance, 0.83 (0.21 < 0.83). No significant difference between the experiment and the control groups on the lexical collocation test as a pre-test was witnessed. Therefore, in response to the fourth research question of this study, one could find a positive effect of instruction of lexical collocations on the comprehension of the texts. The result of this experiment is similar to Rahimi (2005) who showed that teaching lexical collocations affects vocabulary learning positively. The results are also compatible with Mahmoud's (2005) who suggested the importance of direct teaching of collocations. The following table examines

the difference between different groups of students with different proficiency levels in terms of the effect of collocational density on their reading comprehension.

Table 16. A two-way repeated measure for different proficiency levels of the students and different levels of collocational density on reading comprehension

Effect		Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.586	1.088E2 <sup>a</sup>	1.000	77.000	.000
	Wilks' Lambda	.414	1.088E2 <sup>a</sup>	1.000	77.000	.000
	Hotelling's Trace	1.413	1.088E2 <sup>a</sup>	1.000	77.000	.000
	Roy's Largest Root	1.413	1.088E2 <sup>a</sup>	1.000	77.000	.000
factor1 * level	Pillai's Trace	.021	.817 <sup>a</sup>	2.000	77.000	.446
	Wilks' Lambda	.979	.817 <sup>a</sup>	2.000	77.000	.446
	Hotelling's Trace	.021	.817 <sup>a</sup>	2.000	77.000	.446
	Roy's Largest Root	.021	.817 <sup>a</sup>	2.000	77.000	.446
a. Exact statistic						
b. Design: Intercept + level Within Subjects Design: factor1						

In response to the fifth research question of this study, Table 16 shows that the value for Wilk's Lambda (the most commonly reported statistics) is .414 for factor 1 (high and low lexical collocational density), with a probability value of .00. The p value is less than .05; therefore, it can be concluded that there is a statistically significant difference between high and low lexical density of the collocation test and its effect on the performance of the participants.

The value for Wilk's Lambda of the relationship of factor 1 (high and low lexical collocational density) and level (proficiency level of the participants) is .97, with a probability value of .44. The p value is more than .05; therefore, it can be claimed that different proficiency levels of the participants does not affect their performance on different levels of lexical collocational test significantly.

The result of this experiment is in contrast with Zhang's (1993) study of the correlation between the knowledge of English collocations and the quality of the participants' writings which claims that good writers within native and non-native groups performed significantly better than poor writers. The reason can be due to the insufficient number of the participants in this study.

### 5. Concluding Remarks

The results show that different proficiency levels of the participants did not affect their performance on lexical collocational tests with different lexical collocational density significantly. The result of this experiment is in contrast with Zhang's (1993) contentions that native and non-native good writers performed significantly better than poor writers on the writing test. This distinction between the results of the two studies can be because of the insufficient number of the participants taking part in our experiment.

As it was mentioned previously, the results of the collocation test show discouraging facts about EFL learners' knowledge of lexical collocations. Although the scores of the participants improved in the post-test due to the effectiveness of the treatment, their collocational knowledge was not high enough. This explains the fact that learners should spend more time and exert more effort to improve their knowledge of collocations. The results of the study confirm the fact that lexical collocations can be effective in learners' comprehension of the texts especially when there is a high level of lexical collocational density. Therefore, teachers should increase the students' awareness to use their knowledge of lexical collocation in reading. The results would also be helpful for materials developers in including more collocations in their textbooks. These issues are crucial, especially in Iran, where the concept of collocation is unknown for many students. Likewise, test developers can benefit from the results of such studies showing the difficulty EFL/ESL learners face while they are engaged in reading texts with English collocations. They can design their tests so that they incorporate collocational items and make the learners aware of the existence and importance of these elements in the language.

### 6. Limitations and Suggestions for Further Research

One has to take care of the limitations of the study before generalizing the findings of the study. The present study was carried out with 80 sophomore students studying at the Zand Institute in Shiraz. Therefore, the results cannot be generalized to other learner groups with different backgrounds or educational settings. This being the case, one can replicate the present study with larger and different samples in different settings. Second, although the experiment was done during a whole semester (three months), there is a need to investigate longer instructional period of the treatment on the comprehension of English texts. Thus, another experiment with two or three semesters' treatment would better verify the results of the present study. Third, in the present study the instruction of lexical collocation did not affect the participants' ability to answer the vocabulary items significantly. However, the number of vocabulary items in the test was not enough due to

practicality issues. Thus, one can increase the number of the vocabulary items to evaluate the results of the present experiment.

To recapitulate, the experiment presented here should be seen as a starting point whose results need to be replicated to further explore the effect of lexical collocational density on the Iranian EFL learners' reading comprehension and even their writing ability.

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