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Vocabulary Breadth, Depth, and Syntactic Knowledge: Which One Is a Stronger Predictor of Foreign Language Reading Performance?

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Abstract

This study was designed to assess the relative contributions of vocabulary and syntactic knowledge as predictors of reading comprehension performance. It also sought to investigate the interrelationship between syntactic and word knowledge and reading comprehension performance. Participants included 159 male freshman and sophomore Iranian high school students. Data were collected through the reading section of a retired version of Preliminary English Test (2004), Vocabulary Levels Test, Word Associates Test, and Syntactic Knowledge Test. The results revealed that both grammar and vocabulary scores correlated positively with reading comprehension scores. Also, vocabulary correlated significantly with reading comprehension but not as strongly as syntactic knowledge did. Our analysis revealed that syntax explains a larger portion of the reading variance. To examine whether depth / breadth of vocabulary knowledge or syntax may have more predictive power in reading comprehension performance, multiple-regression analysis was conducted. Beta values indicated that grammar made statistically significant contribution to reading comprehension, although other variables

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explained the variance on the reading test. The results offer new insights into the significant mediating influence that learner's knowledge of grammar may have in reading comprehension at low intermediate level.

Keywords: Vocabulary depth; Vocabulary breadth; Syntactic knowledge; Reading comprehension performance; English as a Foreign Language

Introduction

The role of syntactic knowledge in adult L2 reading has recently received a lot of consideration. Urquhart and Weir (1998) state that: "Grammar is a component of reading that has been almost ignored in the research. It seems to us that this is an interesting and potentially valuable research area which L2 teachers and applied linguists are in a good position to investigate" (p. 269). Correlation studies also suggest that syntactic awareness is related to reading ability. Bowey (1986a, 1986b) concluded that children's ability to correct grammatically incorrect sentences in oral language correlated with measures of reading comprehension. In his work on the English Language Testing Service (ELTS) Revision Project, Alderson (1993) found high correlations between a grammar test and tests of academic reading. When the IELTS test was developed, he also found that the proposed IELTS grammar sub-tests correlated highly with the reading sub-test. Similarly, qualitative research by Bernhardt (1999; 2000) indicates that syntax influences L2 reading ability significantly. Alderson (2000, p.37), refers to "the importance of knowledge of particular syntactic structures, or the ability to process them, to some aspects of second language reading" and argues that "the ability to parse sentences into their correct syntactic structure appears to be an important element in understanding text".

Similarly, reading comprehension researches have investigated the role of vocabulary arguing that there is a "strong, well-documented association between vocabulary knowledge and the ability to read well" (Read, 2000, p. 74). Alderson (2000, p. 99) confirms that "vocabulary plays a very important role in reading tests," and that reading research has "consistently found a word knowledge factor on which vocabulary knowledge loads highly."

To define the learner's knowledge of a word, second language (L2) vocabulary researchers unanimously agree that vocabulary knowledge should be regarded as a multidimensional construct. Read (1998), Wesche and Paribakht (1996), and Qian

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(1999) contend that vocabulary knowledge should at least comprise two dimensions : breadth and depth of vocabulary knowledge. Whereas vocabulary breadth is defined in terms of the number of words a learner knows with some superficial knowledge of some of the meanings, depth of vocabulary knowledge indicates how well a learner has mastered the meaning of a word. According to Qian (1999), depth of vocabulary knowledge may include mastery of pronunciation, spelling, meaning, register, frequency, morphological, syntactic, and collocational properties. Qian's (1998; 1999; 2002) findings revealed that there existed high intercorrelations between vocabulary size, depth of vocabulary knowledge, and reading comprehension. Qian and Schedl (2004) also confirmed the significant effect of depth of vocabulary knowledge on test-takers' performance in the assessment of reading comprehension. Finally, lexical knowledge has been found to correlate with success in reading, writing, general language proficiency, and academic achievement (Laufer, Elder, Hill, & Congdon, 2004).

While many research avenues have touched the interrelation between vocabulary and syntactic knowledge and reading ability, the literature on the relative contribution of grammar and vocabulary knowledge to reading comprehension performance is scanty and inconclusive (Shiotsu & Weir, 2007). In a study of reading performance of L2 learners of Dutch, Bossers (1992) concluded that vocabulary and grammar are both significant predictors, with vocabulary being a slightly stronger predictor. Yamashita (1999) stated that the contribution of vocabulary to reading comprehension is much larger than that of grammar. Van Gelderen, Schoonen, de Glopper, Hulstijn, Simis, and Snellings (2004) found that secondary-level EFL learners' reading correlated higher with grammar than with vocabulary. In three consecutive studies of the relative significance of syntactic knowledge and vocabulary breadth in the prediction of reading comprehension test performance, Shiotsu and Weir (2007) found that syntax was a better predictor of reading than vocabulary size and accounted for higher percentage of reading variance. The results of the study carried out by Guo (2008) indicate that both syntactic awareness and vocabulary knowledge account for differences in L2 reading comprehension. Further, both vocabulary knowledge and syntactic awareness, considered and measured as inseparable factors, were highly correlated with each other and with reading comprehension. The contradictory results of this study compared with the ones found by Shiotsu and Weir (2007) can be explained by the methods utilized for measuring syntactic awareness and vocabulary knowledge. Kaivanpanah and Zandi (2009) investigated the relationship between

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depth of vocabulary knowledge, syntactic knowledge, and reading comprehension among Iranian EFL learners. The analysis of the results showed that although depth of vocabulary knowledge significantly correlated with reading comprehension, grammatical knowledge was found to be a stronger predictor of reading comprehension.

In all these studies, the researchers have probed the relationship between vocabulary size, grammar knowledge and reading ability and there has been a little concern for the role of depth of vocabulary knowledge and interrelations among all the variables of vocabulary and grammar knowledge and reading ability. Therefore, the present study, which is a follow up to the experimental studies by Shiotsu and Weir (2007), attempted to illustrate the relationship between both breadth and depth of vocabulary and grammar knowledge and reading comprehension ability. Moreover, to address the relative contribution of vocabulary and syntactic knowledge to predicting reading comprehension performance, the researchers employed separate measures of syntactic knowledge, breadth and depth of vocabulary knowledge, and text reading comprehension to elicit data from EFL readers. Thus, the following research questions were formulated:

1. Is there any relationship between EFL learners' syntactic knowledge, breadth and depth of vocabulary knowledge, and their reading comprehension ability?
2. To what extent can the scores on syntactic knowledge and vocabulary knowledge tests predict EFL learners' performance on reading tasks?

Method

Participants

A sum of 200 low intermediate Iranian students participated in this study. The participants were first and second graders with an age range of 15-17, studying at a senior High school in Tehran, Iran. The students had already been placed in English classes on the basis of their scores on a placement test or successful completion of the prior course. All students had the same L1 background, Persian. Forty one subjects who did not complete the tests seriously or missed one of the vocabulary, grammar, or reading tests were excluded from the study; thus, reducing the number of the participants to 159 students.

Instrumentation

The instrumentation employed in this research included PET, VLT, WAT, and Syntactic Knowledge Test.

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Preliminary English Test (PET)

The reading section of a retired version of PET exam (2004), as an internationally valid proficiency test, was utilized in this study as a measure of reading comprehension. Based on the PET Handbook (2004), the test is developed to assess the use of language in real life. PET is based on the communicative approach to learning English while considering the need for accuracy. As for content, the test requires understanding public notices and signs; reading and understanding of short written texts incorporating factual information; understanding of grammar as utilized to express language notions such as time, space, possession, etc. Each of the 35 items of the reading section of PET carried one score. The reliability of the test as estimated against Kudar-Richardson Formula (KR-21) turned out to be 0.80.

Vocabulary Levels Test (VLT, Version 2)

VLT was originally developed by Nation in 1983 as a diagnostic vocabulary test. The VLT utilized in this study is the second version of the Levels Test revised, and validated by Schmitt et al. (2001), which is discrete-point test measuring vocabulary knowledge at five frequency levels: the 2000 word level, the 3000 word level, Academic Vocabulary, the 5000 word level, and the 10000 word level. The test consists of 10 clusters at each level and each cluster includes six words and three definitions, hence, a sum of 150 items. There are 15 nouns, 9 verbs, and 3 adjectives in each word level with a ratio of 3: 2: 1. According to the guidelines, the examinees were asked to match the definitions on the right column in each set with the words on the left. A sample item of VLT is provided below.

a. copy
b. event 1. _____ end or highest point
c. motor 2. _____ this moves a car
d. pity 3. _____ thing made to be like another
e. profit
f. tip

Some recent studies have shown that tests of breadth of vocabulary knowledge can predict success in reading, writing, general proficiency and academic achievement very well (Laufer et al., 2004; Laufer & Goldstein, 2004). Laufer et al. (2004) state that "vocabulary size on a single modality (such as `passive recognition') may suffice as a surrogate measure of overall proficiency or as a predictor of academic performance, since a score on one modality is likely to correlate highly with a score on any of the others" (p. 224) and the test promises to

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be efficient for placement and admission purposes in language teaching programs (ibid). Vocabulary Levels Test has been considered by some L2 lexical researchers as an appropriate measure of vocabulary size (e.g. Nassaji, 2004; Nation, 2001; Qian, 1999, 2002). The VLT employed in the present research enjoys high reliability indices. The reliability indices for all levels of VLT using Kudar-Richardson Formula (KR-21) ranged from 0.81 to 0.85 and for the whole test was 0.93. Since the total number of items in the test is 150, with 30 items at each frequency level, the maximum score for each level is 30 and for the whole test 150.

Word Associates Test (WAT)

WAT was originally developed by Read (1993) as a reliable test to measure some paradigmatic and syntagmatic aspects of vocabulary knowledge (Qian, 2000). It includes 40 items each comprising one stimulus word, that is an adjective with two boxes, each containing four words. The test taker is supposed to associate the adjective above the boxes with the eight words below. Four out of eight words given can be synonymous to the stimulus word or they can collocate with it. There are always four correct answers in each item. Each correct answer weighs one point. Therefore, the maximum possible score is 160 for the 40 items. The following item illustrates the typical format of the items:

Beautiful

Enjoyable□ expensive □ free□ loud□	education □ face□ music □ weather□

According to Read (2000, p. 90), "research on depth – or quality – of vocabulary knowledge is quite limited", and his "Word Associates Test is perhaps the best written test of depth of vocabulary knowledge that is available" (ibid). Read (ibid) claims that the results of the Word Associates Test correlate well with the results of the Vocabulary Levels Test. WAT measures some components of vocabulary knowledge which are important to many researchers as being indicative of deep word knowledge (Nation, 2001; Read, 2000; Wesche & Paribakht, 1996). While acknowledging the significant role of depth of vocabulary knowledge in reading comprehension, Qian (2002) maintains that in exploring the role of vocabulary knowledge in reading comprehension both breadth and depth of vocabulary knowledge deserve equal attention (p. 518).

Syntactic Knowledge Test

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The grammar test used in this study was adapted from Shiotsu and Weir (2007). It is a reduced and validated version of the original Test of English for Educational Purposes (TEEP) grammar test developed by Weir (1983). The new modified version used in the present research consists of 32 multiple choice items which requires the testees to fill in the missing blanks with appropriate structures. The decontextualised nature of the items ensured the construct validity of the measure, that is, all items were expected to test syntactic knowledge rather than lexical semantics, or sentence semantics. Shiotsu and Weir (2007) state that "a test of syntactic knowledge should attempt to reduce the need for semantic processing as far as possible and keep contextualization to a minimum" (p. 106). One point was assigned to each item so the total score was 32. The reliability of the test, as estimated against the alpha measure turned out to be 0.75.

Procedure

The four tests were administered to the subjects in two successive sessions in the students' regular English classes. The first session was allocated to administering the syntactic knowledge test and the reading section of PET. The participants were given 20 minutes to answer the syntactic knowledge test and 35 minutes to do the PET. A week later, Vocabulary Levels Test and Word Associates Test were administered to them. The time allotted to these tests was 50 minutes for VLT and 30 minutes for WAT.

Results

The first research question probed the relationship between subjects' syntactic knowledge, breadth and depth of vocabulary knowledge, and their reading comprehension ability. Therefore, the scores on these four tests were analyzed through the Pearson Product-Moment correlation test. The descriptive statistics for the participants' performance on vocabulary levels separately and their vocabulary level as a whole along with WAT, syntactic knowledge, and reading tests are displayed in Table 1. The correlations among variables are shown in Table 2. As Table 2 indicates, all the correlations among the four variables turned out to be significant at $p<.01$. High positive correlation was found between syntactic knowledge and reading comprehension (0.58), which is higher than the correlations between vocabulary breadth and reading (0.46), and vocabulary depth and reading (0.44). The highest correlation was found between vocabulary breadth and vocabulary depth (0.73).

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Table 1
Descriptive statistics and reliability indices for the measures

Tests	Minimum	Maximum	Mean	Std. Deviation	Variance	Reliability
READING	14	35	26.9119	5.25716	27.638	0.80
SYNTAX	7	30	19.8616	5.21982	27.247	0.75
WAT	32	131	92.0724	20.63948	425.988	0.91
V2000	11	30	24.4717	4.63314	21.466	0.81
V3000	5	29	19.3396	5.96172	35.542	0.83
AVLT	1	30	19.2075	6.25014	39.064	0.85
V5000	.00	29	12.5220	6.35335	40.365	0.84
V10000	.00	17	3.8742	3.30658	10.933	0.72
TOTAL VOC (all 5 levels of VLT)	26	133	79.4151	22.69453	515.042	0.93

Table 2
Pearson correlations for the measures

	READING	SYNTAX	TOTAL VOC. (all 5 levels)	WAT
READING	1	.588(*)	.463(*)	.440(*)
SYNTAX		1	.677(*)	.560(*)
TOTAL VOC.			1	.732(*)

* Correlation is significant at the 0.01 level (2-tailed).

According to Hatch and Lazarton (1991), when probing correlations among a group of variables, researchers should take heed of equality of the variables' reliabilities. In the case of having differences in the reliability indices for measures, the correlations obtained may be distorted. Given the reliability indices for the four measures in a correlation (i.e., 3 predictors and 1 criterion variable), the researchers estimated the actual correlation of the scores in all measures through correction for attenuation. Table 3 illustrates the relationships between the variables after correcting the correlation. As Table 3 depicts, there was a fairly close relationship between the learners' vocabulary knowledge, syntactic knowledge, and their

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reading comprehension ability, but syntactic knowledge turned out to highly correlate with reading comprehension. Besides, as a basic principle, multiple regression presupposes normal distribution of data on all measures and the linear relationship between all variables (ibid). Figures 1 and 2 demonstrate the normal distribution and linearity of the variables.

Table 3
Correction for attenuation

	SYNTAX	WAT	TOTAL VOC. (all 5 levels)
READING	.75*	.51*	.53*
SYNTAX		.68*	.80*
WAT			.80*

* Correlation is significant at the 0.01 level (2-tailed).

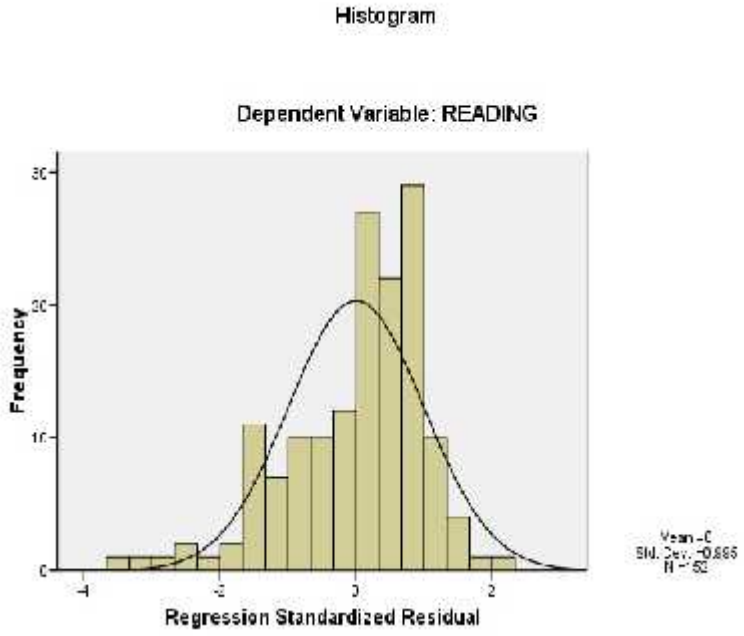

Figure 1: Normal distribution for the measures

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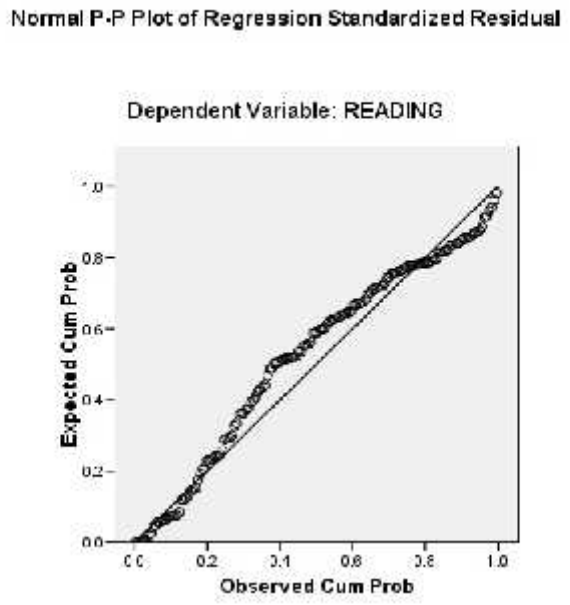

Figure 2: Regression model for the measures

The second research examined the extent to which the scores on syntactic knowledge and breadth and depth of vocabulary knowledge tests may predict the performance on reading comprehension tasks. The R-Squared values of the correlation coefficients between each predictor variable and dependent variable are as follows: VLT alone explains about 21% of the variance in the criterion variable (i.e. reading comprehension), WAT alone explains about 19% of the variance in reading, and syntax alone accounts for about 34% of the variance in reading as the dependent variable. The predictive values of these three independent variables (i.e. syntactic knowledge, and breadth and depth of vocabulary knowledge) in explaining the variance in reading were investigated further through conducting a series of hierarchical multiple- regression analyses.

First, the VLT and WAT were entered into the model. The R2 change was .23 (F change= 4.40, p< .01), showing that WAT provides an additional 2% of the

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criterion variance over and above VLT. However, the changes in the magnitudes of the shared variances (R2) weren't statistically significant. This very increase in variance occurred when the entrance order of these two predictors into the model changed. Next, when the predictor variable of syntax was entered into the model, the R2 change turned out to be .36 (F change = 16.95, $p < .01$), indicating that syntax offers an additional 15% of the criterion variance over and above VLT and WAT and the change in the magnitude of the shared variance (R2) was statistically significant. As Table 4 illustrates, the R square value indicates that 36% of the variance in the reading score is accounted for by the syntax score. The F and the associated *p*-value reflect the strength of the relationship between the predictor variable of syntax and the criterion variable of reading. B-values for the regression equation are presented in Table 5. As Table 5 depicts, only the B-value for standardized scores of the variable syntax was significant (.50, $p< .01$), i.e. syntactic knowledge tuned out to predict the reading measure significantly. The results of the multiple-regression analyses also confirmed that in building regression models with any pair of the three predictors, WAT, VLT, and syntax, no matter what the orders of entry, the magnitude of R2 changes for grammar turned out to be statistically significant. That was the case even when the 5000 and 10000-word frequency levels which were beyond the students' current vocabulary knowledge were deleted from the whole process of analysis (R Square= .36; syntax B-value= .48)

Table 4

R-Square values for correlation coefficients between predictor variables and the dependent variable

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std, Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.603[a]	.364	.351	4.23621	.364	28.185	3	148	.000

a. Predictors: (Constant), WAT, SYNTAX, TOTAL VLT (all voc levels)
b. Dependent Variable: READING

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Table 5

Results of regression analysis for reading, vocabulary and grammar scores

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	13.201	1.647		7.884	.000
SYNTAX	.492	.091	.488	5.435	.000
TOTAL VOC	.005	.025	.022	.197	.844
WAT	.038	.025	.151	1.557	.122

a. Dependent Variable: READING

Discussion

The findings verified that knowledge of grammar enhances performance on reading comprehension of EFL readers. The findings offer some new insights into the significant mediating impact of syntactic knowledge on reading and that such knowledge can help L2 learners in reading comprehension. The findings are consistent with those of Alderson (1993, 2000), van Gelderen et al. (2004), Paribakht, (2004), Shiotsu and Weir (2007), and Kaivanpanah and Zandi (2009). More specifically, the results of this study show that syntactic knowledge accounted for over 36% of the variance in reading comprehension. This implies that in order to predict testees' performance on reading comprehension, using syntax knowledge can prove more efficient than vocabulary knowledge alone.

The findings also support Cain (2007) who argues that syntactic knowledge may promote the development of word reading in context. The current research supports linking between syntactic knowledge and reading performance. The results of the study by Cupples and Holmes (1992) indicated that good readers outperformed average readers in terms of accuracy on the syntactic task but not on the semantic task. Some correlation studies also suggest that syntactic knowledge is related to reading ability (e.g. Bowey, 1986a, 1986b). He found the ability of children to correct grammatically incorrect oral sentences correlating with measures of reading comprehension. Stanovich and Stanovich (1999) approve the significant role of lexical knowledge but they argue that it is "not sufficient for

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good reading comprehension" (p.28). They hold that although good reading comprehension confirms high lexical knowledge, "it is possible for a person to have adequate word recognition skills yet still display poor reading comprehension" because of other supporting factors such as syntactic knowledge (ibid). Rivas (1999) also contends that syntactic knowledge plays a decisive role in comprehending a text.

The high correlations between syntactic knowledge and depth and breadth of vocabulary knowledge in this study can be justified on some grounds too. Most researchers agree that "lexical and syntactic knowledge bases are fundamentally interrelated in a kind of lexico-grammar" (Paribakht, 2004, p. 156). Schmitt (2000) also notes that any research on the nature of grammar and vocabulary acquisition would need to address the link between vocabulary and grammar "as partners in synergy, with no discrete boundary" (p. 14). The strong correlation between breadth and depth measures of vocabulary supports the generalization that these measures are not completely distinguishable from one another and "the more words a learner knows, the more likely it is that he or she will have a greater depth of knowledge for these words" (Qian, 2002, p. 517). The high correlation (0.80) between the scores on the two vocabulary measures is probably due to the fact that the constructs of the two measures partially overlap.

The results of multiple regression analyses verified that vocabulary measures, as two predictor variables, didn't show enough power in predicting performance on reading comprehension as the criterion variable. The results of the present study support the contention that performance on grammar measure can predict performance on multiple choice reading comprehension tests. This result may be accounted for by the fact that high school students in Iran are exposed to syntactic knowledge than lexical knowledge throughout their English courses.

Conclusion, Implications and Suggestions for Follow up Research

This study attempted to probe the relationship between the EFL students' syntactic knowledge, breadth and depth of vocabulary knowledge, and their reading comprehension ability. Further, we addressed the predictive power of syntactic knowledge and breadth and depth of vocabulary knowledge as three independent variables on the reading comprehension test performance of learners. The correlation indices between the Vocabulary Levels Test, WAT, syntactic knowledge test, and reading comprehension test attested to the positive relationship

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between these four variables. The results of regression analysis indicated that syntax was a better predictor of reading than vocabulary and the amount of reading variance it accounted for was more. The findings are in line with some other studies (e.g. Shiotsu & Weir, 2007; Kaivanpanah & Zandi , 2009) and provide support for the relatively higher significance of syntactic knowledge over vocabulary breadth and depth in predicting reading comprehension performance. While syntax surpassed vocabulary in regression coefficients in this study, the findings do not suggest that vocabulary is of less importance since high correlation were observed between vocabulary, grammar, and reading measures too. Word knowledge has been documented as an important factor in reading comprehension (Alderson, 2000; Nation, 2001; Laufer, 1996; Qian, 2002; Read, 2000; Zhang & Annual, 2008) and lexical knowledge has been shown to correlate with success in reading, writing, general language proficiency, and academic achievement (Laufer et al., 2004).

The findings promise a more detailed understanding of the relationship between breadth and depth of vocabulary knowledge, syntactic knowledge, and reading comprehension. In this study, vocabulary breadth did correlate significantly with reading (r = 0.53). Depth of vocabulary knowledge also correlated significantly with reading (r = .51), but not as strongly as syntactic knowledge did (r = .75). This implies that syntax plays a larger role than vocabulary knowledge in explaining reading comprehension variance for EFL learners. The inter-predictor correlations were also very high. The correlation between breadth and depth of vocabulary knowledge was 0.80* and the correlation between breadth of vocabulary knowledge and syntax and depth of vocabulary knowledge and syntax turned out to be 0.80 and 0.65 , respectively. Thus, we can argue that syntactic knowledge is equally, if not more, significantly related to reading and vocabulary knowledge. Moreover, as Schmitt (2000) notes, “much of what was previously considered grammar is actually constrained by lexical choices” (p. 14). It follows then that any research on the nature of grammar and vocabulary acquisition would need to address this link. Although previous studies also confirmed this connection between vocabulary and syntactic knowledge, our findings confirmed that syntactic knowledge is a superior predictor of performance on reading comprehension tasks. Therefore, EFL reading comprehension instructors are recommended to include grammar instruction in their pedagogy parallel with their attempts to increase the learners’ vocabulary size in order to enhance the learners’ reading comprehension ability.

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A word of caution seems necessary here. The construct of reading comprehension embraces a test method aspect (Rupp, Ferne, and Choi, 2006). The present research employed multiple-choice method of reading assessment and the results revealed that syntactic knowledge surpassed vocabulary breadth and depth in accounting for the variance in reading comprehension. Follow up research may provide evidence regarding other test methods of both the criterion reading and the predictor variables across mixed populations in terms of age, L1 background, and language proficiency. Also, future research may shed lights on the nature of any causal relations between syntactic knowledge and different aspects of reading comprehension ability.

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