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An In-depth Investigation into the Relationship between Vocabulary Knowledge and Academic Listening Comprehension

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Abstract

The present study was conducted in the context of learning English as a Foreign Language (EFL) with the purpose of assessing the roles of breadth and depth of vocabulary knowledge in academic listening comprehension. The Vocabulary Size Test (VST, Nation & Beglar, 2007) and the Word Associates Test (WAT, Read, 2004) were administered to measure breadth and depth of vocabulary knowledge, respectively. EFL listening comprehension was measured with an academic version of the International English Language Testing System (IELTS). The findings indicated that (a) both dimensions of vocabulary knowledge were positively and significantly correlated with academic listening comprehension, but depth of vocabulary knowledge indicated a higher correlation; (b) multiple regression analysis revealed that depth of vocabulary knowledge was a stronger predictor of listening comprehension success; and (c) a lexical coverage of 98% only yielded a listening comprehension percentage of 66.4%, which is less than the level of adequate listening comprehension, defined as scoring higher than 70% (Stæhr, 2009). Although the present study confirmed the important role of vocabulary knowledge in successful EFL listening comprehension, other linguistic or non-linguistic factors might also affect the participants' listening comprehension success.

Keywords: breadth of vocabulary knowledge, depth of vocabulary knowledge, correlation, listening comprehension

Introduction

Teachers and researchers have long recognized the importance of vocabulary knowledge, or lexical repertoire, in learners' proficiency in using English; however, research on vocabulary knowledge has almost exclusively focused on reading. Listening comprehension is the conscious processing of the auditory stimuli that have been perceived by hearing (Richard & Lynn, 2010). In other words, listening is the ability to accurately receive and interpret messages in the communication process. Listening is the

key to all effective communication; without the skill to listen effectively, messages are easily misunderstood. Thus, listening is widely acknowledged as an indispensable means for language learning resources (Goh, 2000; Mendelsohn, 2008). As a complex process of decoding information, listening comprehension requires more intense lexical competence, such as faster and more efficient word recognition than comprehending written input (Matthews & Cheng, 2015).

The present study was motivated by a lack of empirical studies on exploring the role of vocabulary knowledge in listening comprehension. Armed with the knowledge above, the researcher deems it necessary to assess the roles of breadth and depth of vocabulary knowledge in listening comprehension, and thus promote the core points and explore some implications for teaching listening skills to English as a Foreign Language (EFL) students. To this end, an empirical study investigating the extent to which lexical repertoire contributes to the success of listening comprehension is necessary. The present study investigated the roles of breadth and depth of vocabulary knowledge in EFL students' academic International English Language Testing System (IELTS) listening comprehension.

Literature Review

Breadth versus Depth Dimension of Vocabulary Knowledge

Researchers have long recognized the diverse aspects of vocabulary knowledge. In this connection, possessing vocabulary transcends knowing the individual meaning in a specific context (Nation, 2013; Schmitt, 2010). In an attempt to research lexical pedagogy, two dimensions of vocabulary knowledge, breadth and depth, have been proposed (Qian, 1999; Wesche & Paribakht, 1996).

Breadth of vocabulary knowledge is regarded as the size of a learner's vocabulary, or the quantity or number of words that the learner knows at a particular level of language proficiency (Nation, 2001). It has long been emphasized that vocabulary size plays an important role in EFL learners' academic competency in English (Nation, 2001; Stæhr, 2008). In an early study, Meara (1996) argued that vocabulary size is the basic dimension of lexical repertoire and emphasized that learners with a larger vocabulary size tend to perform more proficiently in using English than learners with a smaller vocabulary size. In view of the critical role that vocabulary size plays in language proficiency, considerable progress has been made in validating tests in measuring the size of a learner's vocabulary (e.g., Laufer & Nation, 1999; Nation, 1983; Nation & Beglar, 2007; Schmitt, Schmitt, & Clapham, 2001). These studies provided basic measures of the learner's overall vocabulary size. However, clear indications of how well the learner knew a word was not provided.

In contrast, depth of vocabulary knowledge is considered to be the understanding level of various aspects of a given word. Put simply, depth of vocabulary knowledge measures either how well a learner knows an individual word or how well words are organized in a learner's mental lexicon (Nation, 2001). The conceptual framework of depth of vocabulary knowledge could be traced back to Richards (1976), as he proposed that knowing a word means knowing its frequency, register, syntactic behavior, derivations, association, semantic value, and polysemy (i.e., one single word having two or more

different senses). Nation (1990) added receptive and productive knowledge, and defined form, position, function, and meaning as the four components of lexical knowledge. Qian (1998) refined the theoretical frameworks of Richards (1976) and Nation (1990) by including pronunciation, spelling, morphological properties, and syntactic properties to the depth of vocabulary knowledge. In addition, Qian (1999) added collocational properties. The studies mentioned above showed the complexity and multidimensionality of depth of vocabulary knowledge. For example, some learners might be good at the grammatical functions of particular words while others seem to have a stronger knowledge of English word parts (Lessard-Clouston, 2013). Thus, researchers have approached the construct of depth of vocabulary knowledge in a number of ways (Read, 2000).

In some studies, depth of vocabulary knowledge has been related to stages or degrees on a continuum rather than extremes or ends of the continuum. For instance, Henriksen (1999) proposed three continua; namely, partial to precise knowledge; depth of knowledge; and receptive and productive knowledge. The first word knowledge dimension delineates the different levels of word knowledge. On this continuum, breadth of vocabulary knowledge might be located toward the partial knowledge end, while depth of vocabulary knowledge would be found at the precise knowledge stage. Researchers who adopted this approach attempted to capture stages of semantic meaning through using a vocabulary knowledge scale (Wesche & Paribakht, 1996).

Another approach was to incorporate not only semantic knowledge, but also a wide range of other aspects of knowing a word, such as paradigmatic (antonymy, synonymy, hyponymy) and syntactic characteristics (collocational). This framework has been used to specify multiple components of word knowledge (Nation, 2001, 2013). A third approach was to measure a learner's ability to link a word to other related words. In this case, the learners' associative behaviors are related to depth of vocabulary knowledge. Thus, researchers have approached the construct of depth of vocabulary knowledge from the perspective of word associations (Meara, 1996; Read, 1998, 2004).

At present, breadth and depth, both dimensions of vocabulary knowledge, continue to be critical parts of vocabulary research. However, little investigation has been conducted as to which dimension plays the dominant role in academic listening comprehension.

The Role of Vocabulary Knowledge in Listening Comprehension

Although previous studies have documented a strong and significant relationship between vocabulary knowledge and reading comprehension (Ehsanzadeh, 2012; Qian, 2002; Stæhr, 2008), these findings cannot be generalized to listening comprehension. This is because "listening is not merely an auditory version of reading" (Lynch & Mendelsohn, 2002, p. 194). This is a strong motivation to explore the strength of the relationship between vocabulary knowledge and listening comprehension.

In a previous study (Bonk, 2000), the relationship between vocabulary knowledge and listening comprehension was assessed from the perspective of a lexical coverage threshold. Participants included 59 Japanese EFL students who listened to four text passages, designed with increasing lexical difficulties. The findings did not show a definite minimum lexical threshold for adequate listening comprehension. However, results did

suggest that most of the learners who had a lexical coverage of 80% of running words were not likely to achieve high comprehension scores. Additionally, 60% of the learners who recognized more than 90% of the running words achieved adequate listening comprehension. According to other studies (Nation, 2013; Schmitt, 2008), it is suggested that learners should recognize at least 95% of the total running words to have adequate listening comprehension scores. However, in Bonk's (2000) study, some learners who recognized fewer than 80 % of the running words were also able to obtain good listening comprehension scores. In addition to this, some learners who did not obtain good scores in listening comprehension were of a 90% lexical coverage threshold. One finding of these studies is that the relationship between vocabulary knowledge and listening comprehension is unequivocal, complex, and multidimensional. Thus, Bonk suggested that further investigation be conducted into this issue.

Stæhr (2009) invited 115 Danish EFL learners to take a series of paper-and-pencil tests, including tests on breadth of vocabulary knowledge, a depth of vocabulary knowledge, and listening comprehension. The two dimensions of vocabulary knowledge were found to be positively correlated with listening comprehension. In this case, half of the variance in the listening comprehension scores was predicted. Furthermore, the study findings revealed that a lexical coverage of 98% was essential for having adequate comprehension of spoken texts. Although results yielded by this study did suggest that breadth of vocabulary knowledge is the basic component in successful listening comprehension, the dominant role of depth of vocabulary knowledge was not uncovered.

More recently, Teng (2014a) attempted to explore the predictive role of depth of vocabulary knowledge in listening comprehension. The study findings indicated that depth of vocabulary knowledge was strongly correlated with the listening comprehension. In addition, a multiple regression analysis revealed that depth of vocabulary knowledge had a higher predictive power of successful listening comprehension relative to breadth of vocabulary knowledge. While yielding beneficial insights, the main shortcoming of this study stems from the omission of analysis on the interconnectedness and interdependence of the two dimensions of vocabulary knowledge.

The Present Study

The findings yielded by extant studies in this field suggest presence of a strong and positive correlation between vocabulary knowledge and listening comprehension. Lexical repertoire seems to be an invaluable source of knowledge that learners rely on, and it is posited as one of the best predictors of adequate listening comprehension, as well as ability to retrieve information from spoken texts. Thus, both breadth and depth remain important areas of research. However, there is paucity of studies attempting to elucidate the dimension of vocabulary knowledge that plays a crucial role in academic listening comprehension. To this end, the aim of the present study was to uncover the contribution of breadth and depth of vocabulary knowledge to academic listening comprehension. Thus, it was guided by the following research questions:

RQ1. To what extent do breadth and depth of vocabulary knowledge correlate to academic listening comprehension?

RQ2. To what extent do breadth and depth of vocabulary knowledge contribute to the prediction of listening comprehension? Which dimension is a stronger predictor of academic listening comprehension?

RQ3. What vocabulary size is needed for adequate IELTS academic listening comprehension?

Method

Participants

The study participants included 88 Chinese EFL learners (20 males and 68 females), all of whom were second-year students of English at Nanning University, China. The participants' ages ranged from 19 to 21. All the participants were native speakers of Chinese, and none had lived in a country where English is the official language. In addition to receiving eight years of formal English instruction, the participants had similar educational backgrounds. At the time this study was conducted, they were attending a class to prepare for College English Test (Band 6). As a prerequisite for attending this class, they had already passed College English Test (Band 4).

College English Test (CET), administered by the National College English Testing Committee in China, is a nationwide test, providing a reliable, accurate, comprehensive measure of the university students' English proficiency. The CET consists of three tests: CET Band 4, CET Band 6, and the CET spoken English test. A basic word level of about 3,000–4,000 word families is needed to pass Band 4, whereas passing Band 6 requires knowledge of about 5,000–6,000 word families (Zheng & Cheng, 2008). According to their performance on CET Band 4, the participants were considered to have mastered a word level of about 3,000–4,000 word families.

Instruments

Three paper-and-pencil tests were administered as a part of the present study. Thus, all participants took part in a vocabulary size test, a depth of vocabulary knowledge test, and a listening comprehension test. Instructions and some example questions for each test were provided to guide the participants.

Vocabulary Size Test (VST)

Nation and Beglar's (2007) Vocabulary Size Test (VST) was applied to measure the participants' breadth of vocabulary knowledge. This test provides a reliable measure of a learner's receptive vocabulary size from the 1st 1,000 to the 14th 1,000 word family in English language. This comprises of 140 multiple-choice items, whereby 10 items pertain to each 1,000–word family level. One of the items from the 1st 1000–word family is given below:

PERIOD: It was a difficult period.
A. question
B. time
C. thing to do
D. book

The test taker is required to select one option and is awarded one point for each correct answer, resulting in the maximum score of 140 points. Vocabulary size is obtained by multiplying the total score by 100. The test has been validated in previous studies, as elucidated by Beglar (2010). In addition, VST has been accepted by a number of researchers as an accurate measure of vocabulary size (Nguyen & Nation, 2011; Teng, 2015, 2016).

The Depth of Vocabulary Knowledge Test

The Word Associates Test (WAT) was employed to measure depth of vocabulary knowledge. This test was developed by Read (2004) and measures depth of vocabulary knowledge based on three relationships among words: paradigmatic (meaning), syntagmatic (collocation), and lexical progression (lexical building). The goal is to ascertain whether the learners can correctly identify the collocational, synonymous, part-whole, and whole-part relationships among words. Each item includes a stimulus word (an adjective), followed by eight word options, four of which associate with the stimulus word.

Savage

wild	original	cruel	desolate	dictatorship	mess	sight	canyons

The words on the left box are all adjectives and the words on the right box are all nouns. The relationship of the given word with the choices (wild, cruel) on the left is either synonymous or part-whole, whole-part. The relationship of the given word with the choices (dictatorship, sight) on the right is collocational.

In scoring, each correct choice is awarded one point. This test contains 40 multiple-choice test items. As each item contains four correct options, the maximum possible score is 160 points. The WAT has been successfully applied in a number of previous studies (Nassaji, 2004; Stæhr, 2009; Teng, 2014a).

Listening Comprehension Test

To assess the participants' academic listening comprehension, a standardized listening test from the IELTS was used. IELTS includes two versions: academic English and general English. Academic IELTS test materials were used to measure academic listening comprehension in the present study, and they were selected from Morgan and Fang (2008). This test includes different target-language situations that address a range of critical skills involved in academic listening comprehension. The test, which takes approximately 30 minutes to complete, contains four sections, each with 10 questions for a total of 40 questions. The first section is a conversation between two native speakers and the second section is a monologue. The third section is a conversation between up to four people and the fourth section is a monologue. Each section, which was recorded on a CD, was played once. A variety of question types was used. These included multiple-choice, map diagram labeling, note completion, table completion, summary completion, and flow-chart completion. In scoring, each correct answer is awarded one mark and the maximum raw score a test-taker can achieve is 40.

The rationale for selecting this test is as follows. First, this test belongs to the well-established Cambridge ESOL examination. As it contained a range of different text types and authentic English situations, different listening skills involved in academic listening comprehension were addressed. Second, the participants in the present study had passed College English Test (band 4) and needed a high-proficiency listening test.

Treatment Procedure

The present study was conducted to gather quantitative data from 88 EFL learners. The three paper-and-pencil test formats were administered to the participants in one section, which lasted about two hours. In this section, the order of administering the three tests was the Vocabulary Size Test, followed by the Depth of Vocabulary Knowledge Test, and finally, the Listening Comprehension Test. Before the testing session, all the participants were introduced to the three tests by receiving some instructions and sample exercises. The instructions were in Chinese, their native language, to make sure that none of the participants misunderstood the guidelines. This testing section was administered by the author, who was familiar with the treatment procedures.

Results

Research Question 1: To what extent do breadth and depth of lexical repertoire correlate to academic listening comprehension?

To answer this research question, the first step was to present descriptive and reliability statistics. As such, the means and standard deviations of the test results are presented in Table 1. In addition, Table 1 reports Cronbach's alpha reliability coefficients for the three tests: Vocabulary Size Test (VST), Depth of Vocabulary Knowledge Test (DVKT), and Listening Comprehension Test (LCT). Cronbach's alpha reliability coefficients are shown as a measure of the internal consistency of the three tests.

Table 1. ***Means, Standard Deviations, and Reliability Coefficients (N=88)***

Test	N	Min.	Max.	*M*	*S.D.*	Reliability
VST	88	39	56	45.12	10.19	0.95
DVKT	88	36	50	41.11	8.89	0.94
LCT	88	22	29	24.56	3.89	0.70

As shown in Table 1, the participants apparently achieved the highest mean scores in the VST. The large standard deviation reflects a reasonable spread in the scores. The degree of reliability is reasonably high (0.95). This suggests that a potential ceiling effect of depressing the correlations of vocabulary size with other measures is unlikely to occur.

The participants' mean scores in the DVKT are lower than in the VST. The large standard deviation also suggests that the potential ceiling effect should not be a cause for concern. The degree of reliability is also reasonably high (0.94). Thus, it is possible to correlate the depth of vocabulary knowledge with other measures.

It is worth noting that the LCT seems to present a level of difficulty for the participants. The degree of reliability is relatively low (0.70). In considering the fact that the LCT was selected from a standardized international test provided by Cambridge ESOL examination, this degree of reliability may seem counter-intuitive. One of the reasons for this cause might be that the participants did not produce a large variance in the LCT scores. This is shown in the low standard deviation (3.89). This might cause a deflation of the reliability estimate. However, it does not compromise the quality of the test (Lloyd-Jones & Binch, 2012).

The second step was to determine the relationship between the two dimensions of vocabulary knowledge and listening comprehension. In this case, the Pearson product-moment correlation was applied. Results are presented in Table 2.

Table 2. ***Pearson Correlations among Scores on the Breadth and Depth of Vocabulary Knowledge and Listening Comprehension***

Test	VST	DVKT	LST
VST	–	0.92**	0.70**
DVKT	0.92**	–	0.75**
LST	0.70**	0.75**	–

***P*<0.01(two-tailed)

As Table 2 illustrates, inter-correlations among the scores of the three tests were all statistically significant (*P*<0.01). The correlation between breadth and depth of vocabulary knowledge was the highest (*r*=0.92). Breadth of vocabulary knowledge produced a correlation of 0.70. This suggests a strong correlation between breadth of a learner's vocabulary knowledge and the quality of this learner's listening comprehension. Depth of vocabulary knowledge displayed a slightly higher correlation of 0.75. This also indicates a strong correlation between depth of a learner's vocabulary knowledge and the quality of this learner's listening comprehension. The Fisher r-to-z transformation was run to calculate the value of *z*. This showed the difference between the correlations of breadth and depth of vocabulary knowledge to the quality of listening comprehension was not statistically significant. This is evidence that breadth and depth of vocabulary knowledge are equally and positively correlated to listening comprehension.

Therefore, based on the analyses noted above, the answer to the first question seemed to be clear. There was a strong and positive correlation between a learner's breadth and depth of vocabulary knowledge and the quality of listening comprehension.

Research Question 2: To what extent do breadth and depth of vocabulary knowledge contribute to the prediction of listening comprehension? Which one is a stronger predictor in academic listening comprehension?

To this end, the multiple regression analysis was run to determine the unique contribution of each of the two predictors. In this case, scores of breadth and depth of vocabulary knowledge were taken as predictors (independent variables) and scores of listening comprehension as the criterion (dependent variable). Results are presented in Table 3.

Table 3. ***Multiple Regression Analyses (N=88)***

Step	*Predictor(s)*	R^2	*Adjusted* R^2	R^2 *Change*
(A)				
1	Depth	0.68**	0.68**	
2	Depth, Breadth	0.78**	0.75**	0.09
(B)				
1	Breadth	0.48**	0.50**	
2	Breadth, Depth	0.78**	0.75**	0.28

***P*<0.01

In Table 3, the column labeled R^2 shows the proportion of total variance in the criterion variable (the listening comprehension) was accounted for by the predictors (breadth and depth of vocabulary knowledge). The adjusted R^2 is an estimation of the proportion value. R^2*Change* is the difference between an R^2 value for the preceding variable and an R^2 value for the variable being entered, showing the effects of one variable to another variable.

Table 3 includes two sections: A and B. In the first section (A), depth of vocabulary knowledge was first entered into the equation, followed by breadth of vocabulary knowledge. As indicated, the R^2 value and the adjusted R^2 value at the first step were both 0.68. This is evidence that depth of vocabulary knowledge accounted for 68% of the variance in the listening comprehension. This seemed to suggest that depth of vocabulary knowledge explained a significant amount of success in listening comprehension. Breadth of vocabulary knowledge was then added to the equation. As such, the R^2 value changed to 0.78, while the adjusted R^2 value changed to 0.75. Based on the R^2 value, it is suggested that breadth and depth of vocabulary knowledge combined together accounted for 78% of the total variance in listening comprehension. The unexpected results lay in the R^2 *change*, which was only 0.09. This means breadth of vocabulary knowledge added at the second stage contributed only an additional 9% of the variance in listening comprehension. Evidently, breadth of vocabulary knowledge did not predict significantly over and above depth of vocabulary knowledge in listening comprehension success.

In the second section (B), breadth of vocabulary knowledge was first entered into the equation, followed by depth of vocabulary knowledge. At the first step, the R2 value and the adjusted R^2 value were 0.48 and 0.50 respectively. The R^2 value showed that breadth of vocabulary knowledge alone explained 48% of the variance in listening comprehension success. At the second step, when depth of vocabulary knowledge was added, the R2 value and the adjusted R^2 value changed to 0.78 and 0.75 respectively. In this case, the R2 value indicated that the breadth and depth of vocabulary knowledge jointly explained 78% of the total variance in listening comprehension. The unexpected results also lay in the R^2 *change*, which was 0.28. This is evidence that depth of vocabulary knowledge explained an additional 28% of the variance in the listening comprehension success.

Research Question 3: How much vocabulary is needed for adequate IELTS listening comprehension?

Previous studies have shown that 98% text coverage is needed for adequate comprehension of spoken texts (Nation, 2006; Stæhr, 2009). However, there was no indication of a definite vocabulary size, where comprehension increased dramatically at a particular percentage of vocabulary knowledge (Schmitt, Jiang, & Grabe, 2011). The third research question attempted to explore the relationship among breadth of vocabulary knowledge, lexical coverage of listening materials, and the degree of listening comprehension success.

First, participants' scores in breadth of vocabulary knowledge were presented in Table 1 as mentioned above. A participant's total score needed to be multiplied by 100 to get his/her total vocabulary size. Second, a program called *Vocabprofile* on the Compleat lexical website (Cobb, 2000) was run to analyze the lexical frequency of the listening materials. This program currently contains seven versions: Classic, BNC-20, BNC-COCA 25, BNC-COCA CORE-4, NGSL/NAWL, BNL, and FRENCH 25. The present study used the NGSL/NAWL version because the word list is from the New General Service List (NGSL), which is an updated word list (Browne, 2013). This version contains 25 frequency lists; each list is comprised of 1,000-word families. Since proper nouns had not been included in the word lists, they were excluded from the listening materials. Proper nouns included the names of people and cities. Some words like *Ah* and *Umm* were also not in the word lists. The off-list words accounted for around 3% of the tokens (running words) in the listening materials. It was assumed that participants understood the off-list words. Based on the analysis, the listening materials contained 1,873 tokens, 513 different word types, and 367 different word families.

To answer Research Question 3, results on the relationship among breadth of vocabulary knowledge, lexical coverage of listening materials, and degree of listening comprehension success were presented in Table 4.

Table 4. ***Relationship among Breadth of Vocabulary Knowledge, Lexical Coverage of Listening Materials, and Degree of Listening Comprehension Success (n=88)*****.**

Word level	N	VST score	Cumulative lexical coverage of the listening materials	Listening test scores
K-1 words	–	–	91.3%	–
K-2 words	–	–	95.6%	–
K-3 words	20	39.15	96.9%	22.14 (55.3%)
K-4 words	45	42.16	98.1%	26.56 (66.4%)
K-5 words	23	55.56	98.7%	28.97 (72.4%)
K-6 words	–	–	98.8%	–
K-7 words	–	–	99.1%	–

Word level	N	VST score	Cumulative lexical coverage of the listening materials	Listening test scores
K-8 words	–	–	–	–
K-9 words			99.5%	–
K-10 words	–	–	–	–
K-11 words			99.7%	–
K-12 words	–	–	–	–
K-13 words	–	–	–	–
K-14 words	–	–	–	–
K-15 words	–	–	–	–
K-16 words			100%	
K-17 words	–	–	–	–
K-18 words	–	–	–	–
K-19 words	–	–	–	–
K-20 words	–	–	–	–
K-21 words	–	–	–	–
K-22 words	–	–	–	–
K-23 words	–	–	–	–
K-24 words	–	–	–	–
K-25 words	–	–	–	–

As displayed in Table 4, the participants were divided into three vocabulary size groups (3,000, 4,000, and 5, 000). As shown in the first and second columns, 20 students had mastered the 3,000-word level, 45 students had mastered the 4,000-word level, and 23 students had mastered the 5,000-word level. As shown in the third column, the learners who knew the 3,000 word families would have approximately 96.9% text coverage of the listening input. Knowing the 4,000-word families will increase the text coverage to 98.1%. If the learners knew the 16,000-word families, they would be likely to know 100% of the running words in the listening input. As indicated in the fourth column, the learners who knew the 3,000-word families and reached a lexical coverage of 96.9% in the listening input obtained a mean score of 55.3% in the listening comprehension test. As noted above, 98% text coverage is needed for adequate listening comprehension. However, it can be observed that learners who had mastered the 4,000-word families and reached a lexical coverage of 98.1% obtained a mean score of only 66.4%. This suggested that some linguistic or non-linguistic factors may have affected their listening comprehension, and

this accounted for the 33.6% loss. It was also noted that participants who had mastered the 5,000-word families and reached a lexical coverage of 98.7% obtained a mean comprehension score of as high as 72.4%. The results are graphically presented in Figure 1.

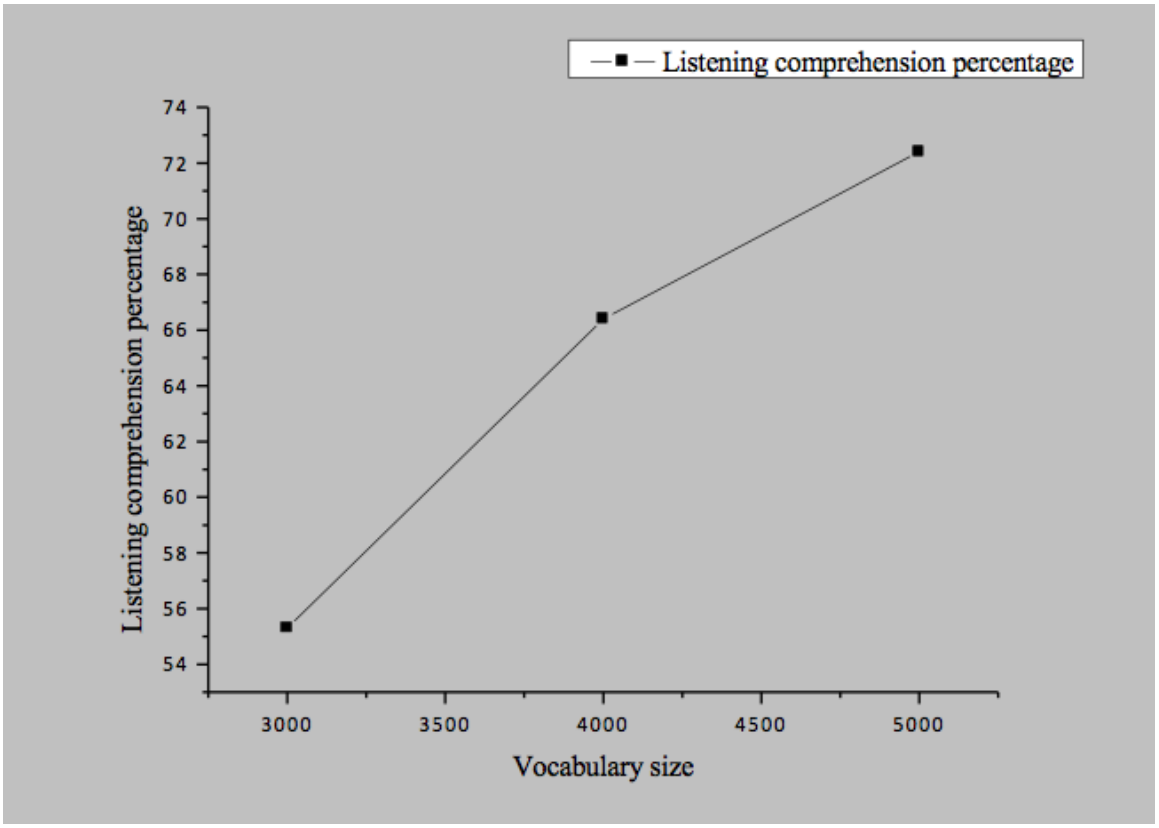

***Figure 1*. Relationship among breadth of vocabulary knowledge, lexical coverage of listening materials, and degree of listening comprehension success**

In sum, the results showed that students with a larger vocabulary size and more lexical coverage would achieve better comprehension scores in listening. However, the change in listening comprehension scores did not show a vocabulary threshold. It indicated that having a receptive vocabulary size of 4,000, which resulted in an adequate lexical coverage of 98% suggested by lexical researchers (Nation, 2006; Stæhr, 2009), led to a mean comprehension score of 66.4%. Other factors might have affected their listening comprehension.

Discussion and Conclusion

Three findings were obtained in the present study. First, as the results of Pearson correlation showed, breadth and depth of vocabulary knowledge were positively and significantly correlated with academic listening comprehension. The two dimensions of vocabulary knowledge jointly accounted for 78% of the total variance in listening comprehension success. This is evidence that both breadth and depth of vocabulary

knowledge are important factors for successful academic listening comprehension. This finding also supported the assumption that a combination of breadth and depth of vocabulary knowledge correlates better with successful listening comprehension. Additionally, the results of Pearson correlation analysis revealed a positive and strong correlation between breadth and depth of vocabulary knowledge. This is not surprising, as a previous study (Qian, 2002) had shown that receptive knowledge of individual word meaning may have affected the knowledge of collocation, which is one aspect to be measured in the test of depth of vocabulary knowledge. In addition, the DVKT attempted to measure some deeper aspects of knowledge, such as antonyms, or synonyms, which the VST may also attempt to measure. In addition, the learners in the present study were upper-intermediate EFL students. Thus, the two dimensions of vocabulary knowledge were inter-correlated.

The second finding was that the correlation between depth of vocabulary knowledge and listening comprehension (r=0.75) is higher than that of breadth of vocabulary knowledge and listening comprehension (r=0.70). Additionally, the results of multiple regression analysis revealed that depth of vocabulary knowledge accounted for 68% of the variance in the listening comprehension success while breadth of vocabulary knowledge accounted for 48% of the variance. Furthermore, depth of vocabulary knowledge added to the breadth of vocabulary knowledge explained an additional 28% of the variance in the listening comprehension success. However, breadth of vocabulary knowledge added to depth of vocabulary knowledge contributed only an additional 9% of the variance in listening comprehension. This finding demonstrated that depth of vocabulary knowledge is a stronger predictor for successful listening comprehension, which may help establish the theoretical assumption that, to some extent, depth of vocabulary knowledge adds to the prediction of listening comprehension, over and above the prediction provided by breadth of vocabulary knowledge. This finding also reinforces previous theoretical assumption that breadth of vocabulary knowledge is the basic dimension of a learner's lexical repertoire, and that depth refines this learner's lexical repertoire and facilitates comprehension (Proctor, et al., 2012; Qian, 2002; Quinn et al., 2015).

The third finding was that having a large vocabulary size will provide the learner with a large lexical coverage of the input texts and that, a large lexical coverage of running words will be beneficial for successful listening comprehension. It seems plausible to assume that a learner needs a certain level of lexical repertoire to process the spoken texts effectively. It also seems reasonable to assume that a certain lexical coverage of input texts can facilitate learners in consulting to contextual information and inferring the meaning of unknown words.

The question is, however, what is the lexical coverage needed for adequate listening comprehension? In a previous study (Stæhr, 2009), a degree of comprehension higher than 70% had been defined as adequate listening comprehension. In his study, learners needed 98% lexical coverage to achieve this level of listening comprehension. However, in the present study, learners with a 98% lexical coverage could only achieve a mean score of 66.4%. This seems to suggest that, although a large lexical coverage can facilitate a learner's listening comprehension, this does not ensure an adequate level of comprehension. Other factors might have influenced this. For example, the VST measures

the written form of the words, whereas listening requires learners to recognize the spoken form of the words. In this case, a learner who can recognize the written form of a word will not necessarily recognize its spoken form. This is evidenced when teaching listening, in addition to orthographic word knowledge, teachers should also pay particular attention to phonological word knowledge. This was also suggested by a previous study (Milton, Wade, & Hopkins, 2010), where X_Lex and the A_Lex tests were used to measure orthographic as well as phonological word knowledge, respectively. Results showed that the orthographic word knowledge test correlated significantly with reading and listening. However, the phonological word knowledge test only correlated significantly with listening comprehension. This finding suggested that both orthographic and phonological word knowledge play an influential role in achieving an adequate level of listening comprehension.

As noted above, the participants in the present study with a 98% lexical coverage achieved a mean score of 66.4%. In this case, a vocabulary size of 4,000 was a prerequisite. This similarly led to a band score of 6 in IELTS listening. In the IELTS exam, a test-taker received scores on a band score from 1 (nonuser) to 9 (expert user). For passing this kind of advanced listening test with a high band score, such as 6.5, then a vocabulary size of 5,000 word families was needed. This was indicated by the fact that the 23 participants who mastered the 5,000 word level obtained a mean score of 72.4% in the listening test. Although Nation (2006) suggested a vocabulary size of 6,000-word families for comprehending spoken texts, it must be considered that his study used a larger and more diverse corpus, and the present study used the listening materials from an IELTS exam. The results of the two studies seemed to be similar. This drew attention to the need for expanding the students' vocabulary size to reach a reasonable lexical coverage in teaching listening (Teng, 2014b).

However, listening comprehension seems to be a complex learning construct. Although the findings seemed to suggest the important role of having a large vocabulary size, an exact vocabulary threshold was not concluded. In this case, the vocabulary size and lexical coverage needed for adequate comprehension are likely to vary according to the type of spoken texts. For example, for the conversational listening situations in the first section of IELTS test, learners might need a lower lexical coverage and they could employ some strategies (e.g., negotiating for word meaning, asking for clarification). For the one-way listening like an academic lecture in the fourth section of IELTS test, the learners might need a higher lexical coverage.

In sum, the kinds of analyses and interpretation provided in the present study are a modest representation of the role of vocabulary knowledge in academic listening comprehension. However, the results also indicated that, to uncover the role of vocabulary knowledge in listening comprehension success, much more research using more multiple measures of breadth and depth of vocabulary knowledge is warranted.

About the Author

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