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*Iranian Journal
of
Language Teaching Research*
ORIGINAL ARTICLE



Urmia University

Background Knowledge as a Moderator of the Relationship between Vocabulary Knowledge and Foreign Language Listening Comprehension

Gholam Hassan Khajavy^{a,*}, Elham Aghae^b

^a *University of Bojnord, Iran*

ABSTRACT

Research has indicated the importance of vocabulary knowledge and background knowledge in second/foreign language (L2) listening comprehension. However, previous studies treated these two factors separately, and no study has examined the simultaneous contribution of these two factors to L2 listening comprehension. Therefore, the aim of this study is to examine whether background knowledge moderates the relationship between vocabulary knowledge and L2 listening comprehension. To this end, one-hundred and fifty-one L2 learners participated in this study and completed instruments measuring constructs of vocabulary knowledge (breadth and depth of vocabulary knowledge), background knowledge, and listening comprehension. Results of the study indicated that, first, measures of both breadth and depth of vocabulary knowledge contributed to the listening comprehension while vocabulary breadth was a stronger predictor. Second, findings of the moderation analysis revealed that background knowledge moderated the relationship between vocabulary knowledge and listening comprehension. These findings suggest that background knowledge can help language learners to have a better performance in listening comprehension tests only if they have high levels of vocabulary knowledge.

Keywords: listening comprehension; vocabulary breadth; vocabulary depth; background knowledge; language learning

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ARTICLE HISTORY

Received: 11 Sept. 2020

Revised version received: 10 June 2021

Accepted: 10 Nov. 2021

Available online: 1 Jan. 2023

* Corresponding author: Department of Foreign Languages, University of Bojnord, Bojnord, Iran

Email address: hkhajavy@ub.ac.ir

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10.30466/ijltr.2023.121275

Listening comprehension plays an important role in language acquisition (Graham, 2017; Vandergrift, 2007). An important line of research in L2 listening comprehension has been devoted to identifying factors that significantly contribute to teaching and assessing this skill (Cross, 2015; Rost, 2011; Vandergrift & Baker, 2015, 2018; Vandergrift & Goh, 2012). Relying on Imhof and Janusik's (2006) systems model of listening, Vandergrift and Goh (2012) identified different personal (individual) factors which influence L2 listening comprehension. These include cognitive and affective factors. Cognitive factors include linguistic knowledge (vocabulary, syntactic, and discourse), pragmatic knowledge, background knowledge, metacognitive knowledge, working memory, L1 listening ability, and sound discrimination ability (Vandergrift & Goh, 2012). Affective factors are related to factors such as anxiety, motivation, and self-efficacy.

Among the cognitive factors, vocabulary knowledge has been identified as an influential factor in L2 listening comprehension (Noreille et al., 2018; Stähr, 2009; Vandergrift & Baker, 2015, 2018; Vandergrift & Cross, 2018). Vandergrift and Baker (2015, 2018) found vocabulary knowledge as the best predictor of L2 listening comprehension. Another influential factor in L2 listening comprehension has been found to be background knowledge (Vandergrift & Cross, 2018) which has been supported both in the schema-theoretic perspective of listening comprehension (Long, 1989) and several empirical studies (e.g., Sadighi & Zare, 2006; Schmidt- Rinehart, 1994). Rost's (2011) model of L2 listening assessment also emphasizes both lexical and general knowledge (background knowledge is one of its subcategories) in L2 listening comprehension and assessment.

However, previous studies have not examined the possible interaction between vocabulary knowledge and background knowledge so that background knowledge functions as a moderator. Such an interaction would imply that it might be possible that among L2 learners who have a similar level of vocabulary knowledge, those with greater background knowledge might have a better performance on L2 listening comprehension tests. Moreover, another theory which has been used to explain the role of background knowledge in reading and listening is *linguistic threshold hypothesis* (see Kreckler, 2006). This theory originally states that L2 readers/listeners can take advantage of their L1 reading/listening skills in case they have a certain level of L2 proficiency (Clarke, 1980). Similarly, it has been suggested that background knowledge might be helpful for L2 reading/listening comprehension only if learners achieve a certain level of vocabulary knowledge. Therefore, it can be explained that there might be a threshold for background knowledge to be helpful in L2 listening comprehension based on the vocabulary knowledge. This means background knowledge might not help learners with very low levels of vocabulary knowledge. However, to the best of our knowledge, no study has examined to what extent background knowledge and vocabulary knowledge might be related to L2 listening comprehension. To answer this question, we examined whether background knowledge moderates the relationship between vocabulary knowledge and L2 listening comprehension performance. It should be noted that in this study, we focused on a specific type of listening, namely one-way (monologue) academic listening (Lynch, 2011). It refers to listening to a lecture in an academic setting or mini-lectures for research purposes (Lynch, 2011). The reason we selected academic listening was that background knowledge might be more crucial in this type of listening in which individuals have to incorporate it into text processing for information contextualization (Lynch, 2006, 2011).

Vocabulary Knowledge in Listening Comprehension

Research in the field of L2 listening comprehension has been using different research methods to examine the role of relevant variables in L2 listening (e.g., Aryadoust, 2021; Goh & Aryadoust, 2016; Vandergrift & Baker, 2015; Vandergrift & Cross, 2018) and how to improve this skill through intervention (e.g., Bozorgian et al., 2022a, 2022b; Cross, 2011; Graham & Macaro, 2008). More specifically, previous research has indicated that vocabulary plays an important role in listening comprehension (Janebi Enayat & Amirian, 2020; Milton, 2010, 2013; Vandergrift & Baker, 2015; Vandergrift & Cross, 2018). Vocabulary knowledge can be thought of as consisting of two

components, breadth and depth (Crosson et al., 2019; Li & Kirby, 2015; Qian, 1999, 2002; Read, 1993; Schmitt, 2014). Breadth of vocabulary knowledge refers to the number of words (vocabulary size) that learners possess (Schmitt, 2014). According to Nation (1990), vocabulary size can be measured in two ways. The first method refers to selecting a sample of words from dictionary that we assume the learners know, and then some of these words are tested. The second method is based on the corpus-driven lists of word families categorized by how often those words are used (frequency). These groups of words are combined together in the first most frequent 1,000 words, the second most frequent 1,000 words, and so forth. This might be used as a reference to the learner's knowledge of the number of words they know according to frequency lists.

Different measures have been developed to measure vocabulary breadth. The vocabulary levels test (VLT) is the most common vocabulary breadth test (Schmitt, 2010) which was originally developed by Nation (1983) and was updated by other researchers (see Webb et al., 2017). Other measures have also been developed such as X_Lex (Meara & Milton, 2003) and AuralLex which is the phonological equivalent of X_Lex (Milton & Hopkins, 2005) and The Productive Vocabulary Levels Test (PVLTL, Laufer & Nation, 1999, see Schmitt, 2010). Milton and Hopkins (2006) found a strong correlation between orthographic and phonological measures of vocabulary breadth ($r = .68$) supporting the notion that both versions can be used in listening research studies. Concerning the relationship between breadth of vocabulary knowledge and L2 listening comprehension, Stæhr (2008, 2009) tested the contribution of breadth to listening comprehension and found correlation coefficients of .69 and .70 between vocabulary size and listening comprehension. Milton et al. (2010) examined the role of orthographic vocabulary knowledge assessed by X_Lex and phonological vocabulary knowledge assessed by AuralLex in International English Language Testing System (IELTS) subskills including listening. Findings showed that both orthographic ($r = .48$) and phonological vocabulary ($r = .67$) tests were positively related to L2 listening comprehension. In a similar study, Masrai (2019) investigated how orthographic vocabulary knowledge, phonological vocabulary knowledge, and working memory capacity were related to IELTS listening scores. Consistent with Milton et al. (2010), results indicated that both orthographic ($r = .59$) and phonological vocabulary ($r = .67$) tests were positively related to L2 listening comprehension. McLean et al. (2015) developed a Listening Vocabulary Levels Test (LVLT) and found a positive correlation between this test and parts 1 and 2 of the Test of English for International Communication (TOEIC) listening test ($r = .54$). Vandergrift and Baker (2015, 2018) also reported significant correlations between vocabulary breadth and listening comprehension (both studies reported $r = .51$). Moreover, Li (2019) found a positive relationship between LVLT and General English Proficiency Test (GEPT) listening scores among Taiwanese university students ($r = .73$). These studies indicated that vocabulary size has a large effect on listening comprehension.

Depth of vocabulary knowledge refers to the quality of vocabulary knowledge or how well the learners know the words (Read, 2000; Schmitt, 2014). It should be noted that although some researchers have reported high correlations between depth and breadth of vocabulary knowledge, they both have been found to account for unique explanatory variance in different language outcomes (Li & Kirby, 2015; Qian, 2002; Stæhr, 2009; Zhang & Yang, 2016; see Schmitt, 2014 for more details). Due to the complex and multidimensional nature of depth, different approaches have been utilized to define it (Stæhr, 2009). Read (2004) mentioned three different aspects of the meaning of depth. The first one relates to how exactly one knows the word; is it a vague concept of meaning or a clear one? Second, comprehensive vocabulary knowledge focuses not only on semantic features but also on other features of vocabulary such as its orthographic, collocational, and pragmatic properties. The third aspect, network knowledge, refers to the ability to associate and link the word to other words in the schemata. To measure depth, Read (1993, 1998) developed word associate test (WAT) based on the network knowledge. In this test, test takers have to select words which are synonyms or collocations of the target word (Read, 1993, 1998). Schmitt et al. (2011) conducted a validation study and found that the test is a reliable and valid measure of vocabulary depth. Other developments have also been made in assessing vocabulary depth. For example, Crossley et al. (2010) considered knowledge of word polysemy as an indicator of vocabulary depth.

In L2 listening research, researchers have mostly used WAT or its revised formats to assess depth of vocabulary knowledge (e.g., Li & Zhang, 2019; Stæhr, 2009; Teng, 2016). Concerning the relationship between depth of vocabulary knowledge and L2 listening comprehension, Mecartty (2000) examined the role of vocabulary knowledge and grammatical knowledge and found that only vocabulary knowledge contributed to listening comprehension ($r = .38$). Tests of vocabulary knowledge in Mecartty's (2000) study were word association and word antonym tasks which can be considered as examples of a depth of vocabulary knowledge test.

A very limited number of studies have examined the simultaneous role of depth of vocabulary knowledge and breadth of vocabulary knowledge in listening comprehension (Li & Zhang, 2019; Stæhr, 2009; Teng, 2016). This is important as when both breadth and depth are examined simultaneously as predictors of listening comprehension, their relative importance in listening can be compared with each other. Stæhr (2009) investigated the effects of breadth and depth simultaneously on listening comprehension among a group of 115 advanced Danish EFL learners. To measure breadth and depth, the VLT and the WAT were utilized, respectively. Moreover, listening comprehension was measured using Cambridge Certificate of Proficiency in English (CPE). Correlational analyses revealed that both breadth of vocabulary knowledge ($r = .70$) and depth of vocabulary knowledge ($r = .65$) were significantly related to listening comprehension. Results of multiple regression analysis indicated that breadth and depth jointly accounted for 51% of the variance in listening comprehension. Moreover, the unique contribution of these two variables was investigated in which breadth accounted for 49% of the variance, and depth only added 2% of the variance to listening comprehension. This finding implies that vocabulary size is more influential in listening than vocabulary depth. Teng (2016) reported a correlation coefficient of .70 and .75 for the relations of IELTS listening with breadth and depth, respectively. Moreover, multiple regression analysis showed that depth was a stronger predictor of IELTS listening. Li and Zhang (2019) found that both depth ($\beta = .17$) and breadth ($\beta = .36$) were significant predictors of IELTS listening in a structural model. All these studies confirm that both depth and breadth of vocabulary knowledge are influential in L2 listening comprehension.

Background Knowledge in Listening Comprehension

One of the main reasons that L2 learners have difficulty in comprehension of spoken and written discourse is when they have no prior knowledge (i.e., background knowledge) of the topic (Carrell, 1983; Connor, 1984; Vandergrift & Cross, 2018). Considering this, prior research has indicated that background knowledge is a vital factor in L2 communication and assessment (Banerjee, 2019; Purpura, 2017; Rost, 2011).

Background knowledge can also be related to schema-theoretic perspective of L2 comprehension. This theory refers to the role of world knowledge in better comprehension of L2 reading and listening materials (Long, 1989) and has been highlighted as an important aspect of language comprehension (Nassaji, 2002, 2007; Nguyen & Newton, 2018). The emphasis in schema theory is on the notion that the activation of prior knowledge plays a facilitative role in understanding the written or spoken discourse. Moreover, Long (1989) discussed the specific role of schema theory in L2 listening comprehension. Based on the schema-theoretic perspective of L2 listening comprehension, background knowledge has a very crucial role in L2 listening comprehension.

Previous empirical studies have addressed the influential role of background knowledge on different L2 skills including speaking (Khabbzbashi, 2017), reading (Shin et al. 2019; Taghizadeh Vahed & Alavi, 2020), writing (Gustilo & Magno, 2015), and listening (Chang & Read, 2006; Sadighi & Zare, 2006; Schmidt- Rinehart, 1994). With regard to L2 listening comprehension, Chang and Read (2006) examined the usefulness of four different listening support activities including previewing the test questions, repetition of the input, providing background knowledge about the topic, and

vocabulary instruction. Results of their study showed that providing background knowledge about the topic was the most useful technique to enhance students' L2 listening comprehension.

In addition to these studies, several studies have corroborated the supportive role of background knowledge assessed in terms of topic familiarity in listening comprehension. Chiang and Dunkel (1992) found that Chinese EFL learners had a better performance in a listening comprehension test with a familiar topic than in a listening comprehension test with an unfamiliar one. Schmidt-Rinchart (1994) found that American learners of Spanish received higher scores in listening comprehension with familiar topics than with unfamiliar ones. Similar results were found by Sadighi and Zare (2006) who reported that Iranian EFL students who were familiar with the topic outperformed students who had no familiarity with the topic in listening comprehension tests. Therefore, many studies which examined the role of background knowledge in listening comprehension have confirmed its influential role in listening comprehension.

The Present Study

In this study, we first examined the predictive role of depth and breadth of vocabulary knowledge in L2 listening comprehension. Moreover, the above literature review shows that several studies have examined the unique role of vocabulary knowledge and background knowledge in L2 listening comprehension. However, no studies have examined the interaction of these two factors in L2 listening comprehension in which background knowledge is considered as a moderator variable. As explained earlier, this interaction could deepen our understanding of the role of background knowledge in L2 listening comprehension for students with low and high levels of vocabulary knowledge. Therefore, we investigated whether background knowledge moderates the relationship between vocabulary knowledge and listening performance. More specifically, we ask this research question to see whether students with similar vocabulary knowledge but different background knowledge levels perform differently in the listening comprehension test. Therefore, the following research question were asked:

RQ1: Are breadth and depth of vocabulary knowledge significant predictors of L2 learners' listening comprehension?

RQ2: Does L2 learners' background knowledge moderate the relationship between vocabulary knowledge and listening comprehension? This means students with similar vocabulary knowledge but different background knowledge perform differently in the listening comprehension test.

Method

Participants

The participants of the present study were 151 EFL learners (109 females & 42 males), recruited from two universities in the North-East of Iran. All participants were undergraduate Teaching English as a Foreign Language students who were studying English as an academic major. They all passed the university entrance exam to enter the university. Participants' age ranged from 19 to 42 ($M = 21.54$, $SD = 2.74$). Participants self-assessed their language proficiency, and most of them (71.9%) identified themselves as having intermediate and upper-intermediate English language proficiency (other proficiency levels: beginner and elementary = 11.5%, pre-intermediate = 14.4%, advanced = 2.2%). Participants were informed that answering the questionnaire and tests was voluntary.

Instruments

Listening Comprehension Test

To assess listening comprehension, the International English Language Testing System (IELTS) was used. IELTS listening test includes four sections, and they are designed in such a way that the first section is the easiest and the fourth section is the most difficult one. The present research utilized the fourth section of the IELTS listening test to examine how vocabulary knowledge and background knowledge contribute to listening comprehension. This section is a monologue about an academic subject (one-way academic listening). The reason we selected the fourth section of the IELTS listening test was that it includes a variety of academic topics and individuals might have different levels of background knowledge about these topics. Other sections are about social needs (sections 1 and 2) or education and training (section 3). Therefore, section 4 can be used for examining background knowledge better than other sections of the IELTS listening test. We selected two listening comprehension tests with two different topics. One was about mass stranding of whales and dolphins (Cambridge English IELTS 9, 2013) and the other one was about ethnography research in business (Cambridge English IELTS 11, 2016). We selected these two listening tests as the topics were not related to the participants' academic major and we expected to see a range of different levels of background knowledge for them. Each listening comprehension test had 10 questions which resulted in a total of 20 questions. The format of the questions was note completion in which participants had to fill in the blanks based on the information provided in the listening. Participants listened to each passage once.

Vocabulary Breadth Test

We used the VLT developed by Nation (1990) which measures vocabulary size at different levels of the 2,000-, 3,000-, 5,000-, 10,000-word levels, and university word lists. Consistent with Stæhr (2009), in this study, we removed the participants' score in university word level for the final analyses as it is based on a different corpus which has frequencies between 2,000 and 10,000 levels which have been already covered in VLT. Moreover, the words used in this level are within the range of 2,000- to 10,000- words levels which are already covered in other bands. It took about 30 minutes for the participants to answer the questions. Each level includes 6 items; and each item has six words on the left and three definitions on the right. Participants had to choose three definitions for the right words from the left side. Each correct answer was scored one point. The maximum score for each level is 18. For all levels (except the university word list), the highest possible score is 72. A sample test item is represented in Figure 1:

- | | |
|-------------|-------------------------------------|
| 1. Original | |
| 2. Private | <input type="checkbox"/> complete |
| 3. Royal | <input type="checkbox"/> first |
| 4. Slow | <input type="checkbox"/> not public |
| 5. Sorry | |
| 6. Total | |

Figure 1. A Sample Item of the VLT

Vocabulary Depth Test

We used Read's (1993, 1998) WAT to assess vocabulary depth. This test entailed 40 items, in each of them there are two boxes of words. For each word, participants had to find the synonyms from the left box and collocations from the right box. An example is provided in Figure 2:

1. Beautiful

| | | | | | | | |
|------------------------------------|------------------------------------|-------------------------------|-------------------------------|------------------------------------|-------------------------------|--------------------------------|----------------------------------|
| <input type="checkbox"/> enjoyable | <input type="checkbox"/> expensive | <input type="checkbox"/> free | <input type="checkbox"/> loud | <input type="checkbox"/> education | <input type="checkbox"/> face | <input type="checkbox"/> music | <input type="checkbox"/> weather |
|------------------------------------|------------------------------------|-------------------------------|-------------------------------|------------------------------------|-------------------------------|--------------------------------|----------------------------------|

Figure 2. A sample Item of the WAT

In this test, it is not predetermined how many of the correct choices are in the left or the right side. However, participants were informed that each item had four correct choices. Each choice which was selected correctly was counted one point. Hence, the maximum score of the WAT is 160. The test took about 35 minutes to complete.

Background Knowledge Questionnaire

To assess background knowledge, a questionnaire was developed similar to the one used by Khabbzbashi (2017) for speaking. After listening to each passage, listeners completed the questionnaire to show to what extent they were familiar with the topic they listened to. The questionnaire consisted of four questions and participants answered the questions on a ten-point scale. A higher score showed more familiarity with topic and consequently more background knowledge. The items can be seen in Table 1.

Table 1

Background Questionnaire Items

-
1. This topic is familiar to me.
 2. The questions about this topic were easy to respond to.
 3. I know a lot about this topic.
 4. I performed very well on this task.
-

Procedure

Data collection was conducted at two universities. Data were gathered during regular class hours in two sessions. Learners listened to the first speech once and answered the questions. Then, the background knowledge questionnaire was completed and this process was repeated for the second test as well. When participants answered the listening comprehension tests, they were not allowed to go back to the background questionnaire to revise their responses.

Data Analysis

This study uses a correlational design to examine the relations between depth and breadth of vocabulary knowledge, background knowledge, and L2 listening comprehension. To answer the first research question, regarding the predictability of L2 listening comprehension (dependent variable) based on breadth and depth of vocabulary knowledge (independent variables), structural equation modeling was performed. In this model, depth, breadth and listening comprehension were latent variables. To specify indicators for depth, we followed the same procedure used in van

Gelderen et al. (2004) and Shiotsu and Weir (2007) by splitting the test into two halves. The first half was composed by adding the odd numbers and the second half by adding the even numbers. For breadth, we used the scores of each level (i.e., 2,000, 3,000, 5,000, and 10,000) as indicators of this latent variable. Finally, we used each of the two listening comprehension tests as indicators of listening comprehension ability. To check the model fit, we used goodness-of-fit indices including comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). To have a fit model, CFI and TLI should be above .90, and RMSEA and SRMR should be less than .08 (Hu & Bentler, 1999).

Moreover, to answer the second research question which explores whether background knowledge moderates the role of vocabulary knowledge on listening comprehension, we performed moderation analysis using path analysis. In doing moderation analysis, the main effects (i.e., breadth, depth, and background knowledge \rightarrow L2 listening comprehension) and interaction effect (breadth and depth \times background knowledge \rightarrow L2 listening comprehension) were reported. Having a significant interaction effect supports the moderation. We performed all the moderation analyses on standardized data. We also conducted simple slope analysis to deepen our understanding of the interaction effect. For this purpose, we examined how vocabulary knowledge was related to listening comprehension when background knowledge is below the average (one standard deviation below the mean), when background knowledge is average (the mean), and when background knowledge is above the average (one standard deviation above the mean). For each of these situations, we obtained a slope (beta). The slopes are interpreted as the larger the value for the slope, the higher the relation between vocabulary knowledge and listening comprehension. In other words, by doing simple slope analysis, we can understand that under which condition (i.e., low background knowledge, average background knowledge, or high background knowledge), vocabulary and listening had the strongest relation.

Results

Preliminary Analyses

Before running the main analyses, we checked missing data, outliers, and normality. For missing data, we used expectation-maximization (EM) algorithm for data imputation. In this method, missing data are replaced by substituted values (Kline, 2016). For outliers, both univariate and multivariate outliers were examined. For detecting univariate outliers, we analyzed z-scores and in case of values exceeding ± 3 , they were removed from further analyses. Multivariate outliers were examined using Mahalanobis D^2 score. When a case had a D^2 value with $p < .001$, it was considered a multivariate outlier and was subsequently removed from the data. We found five cases of outliers and removed them from the data. Finally, to check normality, skewness and kurtosis values were examined. Values exceeding ± 2.0 show non-normal distribution. All variables had skewness and kurtosis values within the acceptable range (see Table 2).

Descriptive statistics and reliability coefficients are reported in Table 2. Reliability statistics were calculated for all the tests and background knowledge questionnaires using Cronbach's α (see Table 2) and all the tests had acceptable to high values of reliability.

Table 2

Descriptive Statistics for all Variables

| | MPS | Range | M | SD | No of Outliers | Skewness | Kurtosis | Cronbach's α |
|---------|-----|--------|-------|-------|----------------|----------|----------|---------------------|
| BK1 | 40 | 4-40 | 13.86 | 7.61 | 3 | 1.20 | 1.87 | .89 |
| BK2 | 40 | 4-37 | 15.28 | 8.88 | 2 | 1.28 | 1.57 | .91 |
| Breadth | 72 | 7-67 | 38.01 | 11.61 | 0 | -.01 | -.27 | .93 |
| Depth | 160 | 42-140 | 99.84 | 18.89 | 0 | -.14 | -.48 | .93 |
| LC1 | 10 | 0-9 | 3.70 | 1.93 | 2 | .64 | -.06 | .75 |
| LC2 | 10 | 0-8 | 3.38 | 2.08 | 0 | 1.01 | .69 | .71 |

Note. MPS = maximum possible score, M = mean, SD = standard deviation, BK1 = background knowledge1, BK2 = background knowledge2, LC1 = listening comprehension1, LC2 = listening comprehension2

Correlations among breadth and depth of vocabulary knowledge, listening comprehension, and background knowledge can be seen in Table 3. As can be seen, breadth and depth of vocabulary knowledge were significantly related to each other ($r = .69, p < .001$). The relationship between breadth of vocabulary knowledge with the first listening comprehension test ($r = .49, p < .001$) and the second listening comprehension test was significant ($r = .59, p < .001$). Depth of vocabulary knowledge was also significantly related to the first listening comprehension test ($r = .49, p < .001$) and the second listening comprehension test ($r = .55, p < .001$). Moreover, significant relationships were found between the first background knowledge and the first listening comprehension test ($r = .35, p < .001$) and the second background knowledge and the second listening comprehension test ($r = .40, p < .001$).

Table 3

Correlations among Variables

| | BK1 | BK2 | Breadth | Depth | LC1 | LC2 |
|---------|--------|--------|---------|--------|--------|------|
| BK1 | 1.00 | | | | | |
| BK2 | .59*** | 1.00 | | | | |
| Breadth | .14 | .16 | 1.00 | | | |
| Depth | .23* | .16 | .69*** | 1.00 | | |
| LC1 | .35*** | .17 | .49*** | .49*** | 1.00 | |
| LC2 | .16 | .40*** | .59*** | .55*** | .47*** | 1.00 |

Note. BK1 = background knowledge1, BK2 = background knowledge2, LC1 = listening comprehension1, LC2 = listening comprehension2

* $p < .05$, *** $p < .001$.

Depth and Breadth as Predictors of L2 Listening Comprehension

In order to examine the role of depth and breadth of vocabulary knowledge as predictors of listening comprehension (RQ1), structural equation modeling (SEM) was conducted with Mplus 7.4. Goodness-of-fit indices for the proposed model were acceptable. CFI and TLI were .96 and .93, respectively, and RMSEA and SRMR were .07 and .04, respectively which confirm the model fit. Results of the SEM can be seen in Figure 3. As Figure 3 indicates, both breadth ($\beta = .61, p < .001$) and depth ($\beta = .27, p = .03$) were significant predictors of listening comprehension accounting for 62% of the variance in listening comprehension.

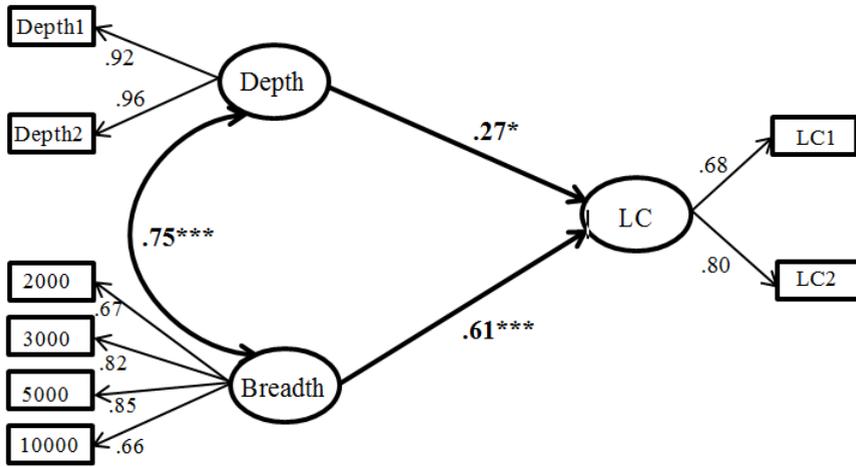


Figure 3. Depth and Breadth of Vocabulary Knowledge as Predictors of Listening Comprehension

Moderating Role of Background Knowledge

In order to examine whether background knowledge moderates the relationship between depth of vocabulary knowledge and listening comprehension, and the relationship between breadth of vocabulary knowledge and listening comprehension (RQ2), path analysis was used. As background knowledge for each listening test was specific to it, we performed four separate path analyses for the two listening comprehension tests.

In the first two models (see Figures 4 and 5), breadth of vocabulary knowledge, background knowledge, and the interaction between breadth of vocabulary knowledge and background knowledge were entered as predictors of the two listening comprehension tests. Results showed the significant role of breadth of vocabulary knowledge (Model 1: $\beta = .39, p < .001$; Model 2: $\beta = .50, p < .001$), background knowledge (Model 1: $\beta = .26, p = .002$; Model 2: $\beta = .30, p < .001$), and the interaction between breadth of vocabulary knowledge and background knowledge (Model1: $\beta = .21, p = .007$; Model 2: $\beta = .19, p = .009$). The significant interaction proves the moderating role of background knowledge on the relationship between breadth of vocabulary knowledge and listening comprehension tests. Simple slope analysis (Aiken & West, 1991) indicated the slopes for the three groups of low-background knowledge (Model 1: $\beta = .22, p = .09$; Model 2: $\beta = .41, p = .004$), average-background knowledge (Model1: $\beta = .39, p < .001$; Model2: $\beta = .51, p < .001$), and high-background knowledge (Model1: $\beta = .57, p < .001$; Model2: $\beta = .60, p < .001$).

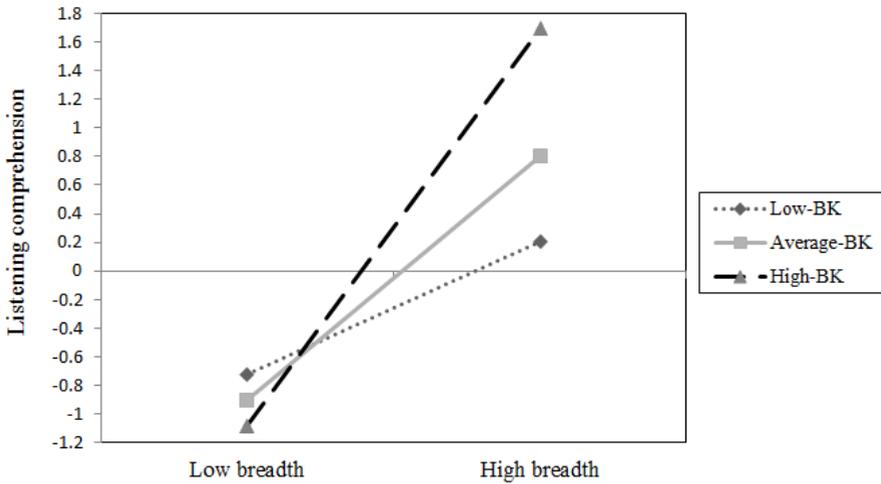


Figure 4. Moderation of BK on the Association between Breadth of Vocabulary Knowledge and Listening Comprehension 1 (Model 1)

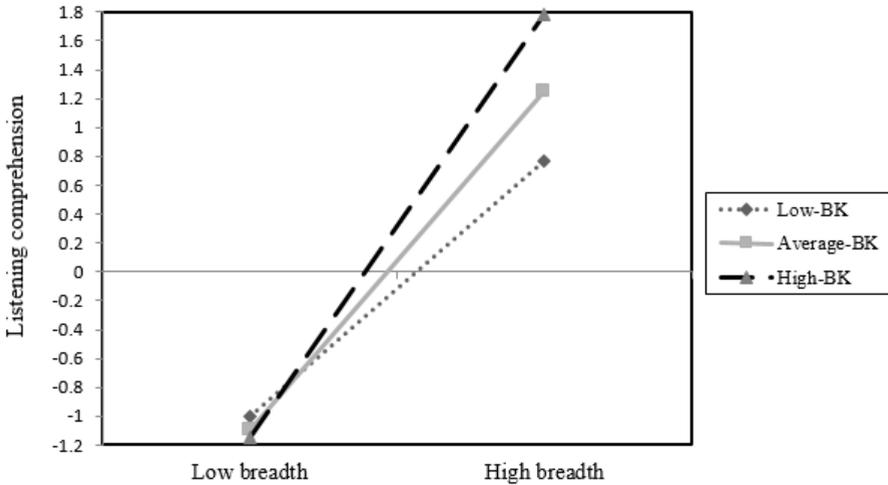


Figure 5. Moderation of BK on the Association between Breadth of Vocabulary Knowledge and Listening Comprehension 2 (Model 2)

Considering the depth of vocabulary knowledge, similar findings were obtained. In the tested models (see Figures 6 and 7), depth of vocabulary knowledge, background knowledge, and the interaction between depth of vocabulary knowledge and background knowledge were entered as predictors of the two listening comprehension tests. Results showed the significant roles of depth of vocabulary knowledge (Model 3: $\beta = .41, p < .001$; Model 4: $\beta = .47, p < .001$), background knowledge only for Model4 (Model 3: $\beta = .13, p = .13$; Model 4: $\beta = .29, p < .001$) and the interaction

between depth of vocabulary knowledge and background knowledge (Model 3: $\beta = .25, p < .001$; Model 4: $\beta = .14, p = .04$). The significant interaction suggests the moderating role of background knowledge on the relationship between depth of vocabulary knowledge and listening comprehension tests. Simple slope analysis (Aiken & West, 1991) indicated the slopes for the three groups of low-background knowledge (Model 3: $\beta = .16, p = .12$; Model 4: $\beta = .33, p = .002$), average-background knowledge (Model 3: $\beta = .41, p < .001$; Model 4: $\beta = .47, p < .001$), and high-background knowledge (Model 3: $\beta = .66, p < .001$; Model 4: $\beta = .61, p < .001$).

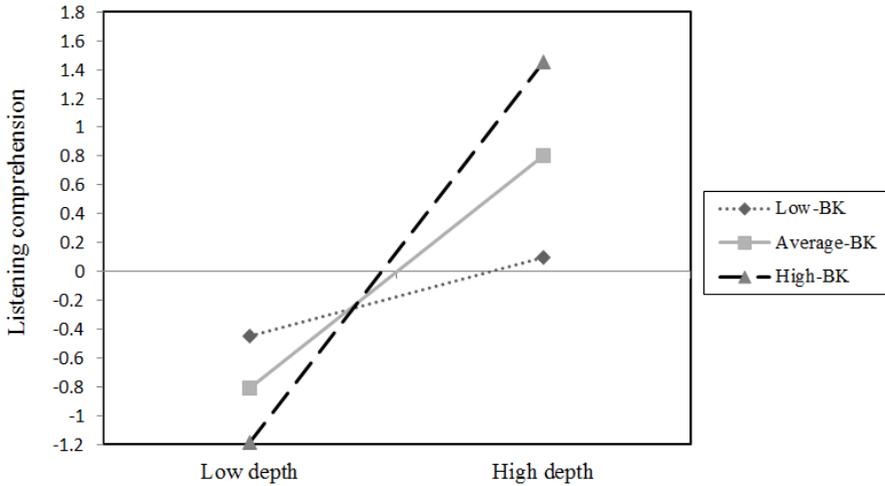


Figure 6. Moderation of BK on the Association between Depth of Vocabulary Knowledge and Listening Comprehension 1 (Model 3)

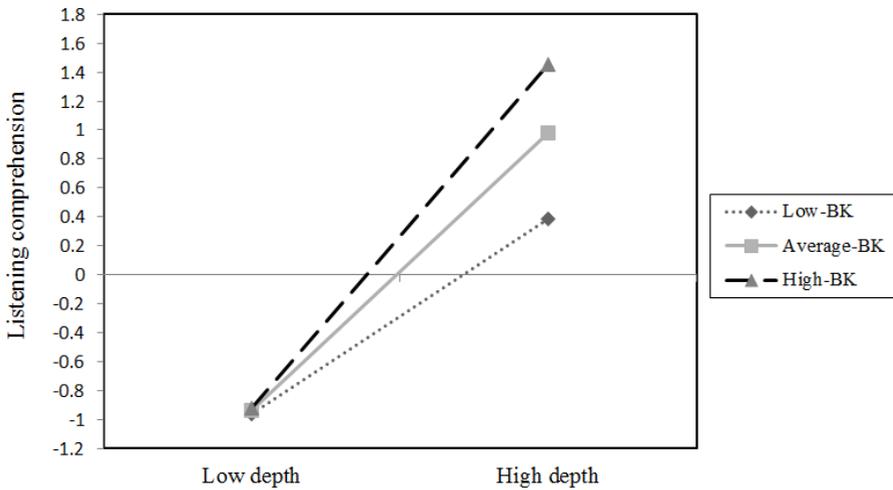


Figure 7. Moderation of BK on the Association between Depth of Vocabulary Knowledge and Listening Comprehension 2 (Model 4)

Results of the moderation analysis for both breadth and depth indicated that the high-background knowledge group had the steepest slope for all four models. Background knowledge functioned as an enhancer for the positive relationship between vocabulary knowledge (i.e., both breadth and depth) and listening comprehension. This means for students high in background knowledge, breadth and depth of vocabulary knowledge were associated with higher levels of performance on listening comprehension. The best performance on both listening comprehension tests was obtained by participants who had the highest level of vocabulary knowledge (i.e., both breadth and depth) and background knowledge. Moreover, by looking at Figures 4, 5, 6 and 7, it becomes clear that among the participants with low levels of breadth and depth of vocabulary knowledge but with different levels of background knowledge (i.e., low, average, and high), there is not much difference with regard to their performance on the listening comprehension tests. However, among participants with higher levels of breadth and depth of vocabulary knowledge, the three background knowledge groups were different in their performance on both listening comprehension tests.

Discussion

Regarding the first research question, the findings of the study indicated that both breadth and depth of vocabulary knowledge were related to listening comprehension, accounting for 62% of the listening comprehension variance, while breadth was a stronger predictor of listening than depth. This finding implies that the number of words an individual knows plays a more influential role than the quality of learning words in L2 listening comprehension and testing. A possible explanation is that as listening is a receptive skill, listeners might mostly need a general knowledge of the meaning of the words (i.e., breadth) not a detailed knowledge of associations, collocations, and derivations about the words (i.e., depth) to understand the spoken discourse. However, it might not be the case with the productive skills of speaking or writing, as a more comprehensive knowledge of the words (i.e., depth) might be needed to have a satisfactory performance in these skills. The achieved results are similar to those of Stæhr (2009) on the contribution of vocabulary knowledge to listening comprehension. Stæhr (2009) reported 51% of the variance for the joint contribution of breadth and depth of vocabulary knowledge to listening comprehension which is comparable to 62% found in the present study. Furthermore, consistent with the findings of our study, the stronger role of breadth as a predictor of listening comprehension was reported in Stæhr (2009). Other studies have also found vocabulary knowledge (measured by just vocabulary size) as a significant predictor of listening comprehension (Li, 2019; Masrai, 2019; Milton et al., 2010; Vandergrift & Baker, 2015, 2018). The strong relation found between vocabulary knowledge and listening comprehension in the present study and previous studies suggests a threshold for listening comprehension based on the number of words an individual knows. To find this threshold, van Zeeland and Schmitt (2013) reported a 95% lexical coverage of the spoken text is required to understand a listening comprehension. However, it should be noted that van Zeeland and Schmitt (2013) reported this figure based on the analysis of the spoken informal narratives. Therefore, this figure might change based on the type of the spoken discourse. As vocabulary knowledge accounted for 62% of the variance in listening comprehension, it can be inferred that 38% of the remaining variance was related to other cognitive and affective factors (see Vandergrift & Baker, 2015, 2018; Vandergrift & Goh, 2012). Nevertheless, these findings indicated that similar to other language skills, vocabulary plays a major role in listening comprehension. The primary role of vocabulary in listening comprehension found in this study can also be understood based on Vandergrift and Baker's (2015) model of listening comprehension in which it is only vocabulary which is directly related to listening comprehension while other components including auditory discrimination, working memory, L1 vocabulary, and metacognition are indirectly related to listening comprehension.

Concerning the second research question, results of the path analysis indicated that higher levels of background knowledge and vocabulary knowledge (both breadth and depth) were associated with the best performance on L2 listening tests. However, students who had high background knowledge could not achieve high scores in listening comprehension if they had a very poor performance on the vocabulary knowledge tests. These findings suggest that when students with high levels of vocabulary knowledge (both breadth and depth) take a listening comprehension test, those with higher background knowledge might have a better performance on the test. However, this was not the case for students with low levels of vocabulary knowledge. Hence, the difference between low- and high-achievers in tests of L2 listening comprehension with similar levels of breadth and depth of vocabulary knowledge lies in their access to background knowledge about the topic. Interestingly, based on the findings of the present study, just having background knowledge is not enough for listening comprehension. This means that even when individuals are familiar with the topic but their vocabulary knowledge in L2 is not adequate, they would have difficulty in understanding the listening comprehension. Therefore, a combination of high background knowledge and vocabulary knowledge gives individuals the opportunity to have their best achievement in tests of listening comprehension. This is consistent with Banerjee's (2019) conceptualization of background knowledge which includes both content knowledge and lexical knowledge. These findings also support our earlier claim of applying linguistic threshold hypothesis to background knowledge in listening comprehension: background knowledge might be helpful for L2 listening comprehension only if learners achieve a certain level of vocabulary knowledge. This also supports Taghizadeh and Alavi's (2020) conclusion that discipline-related background might be helpful for English for academic purposes (EAP) test-takers, in case they are above the elementary level. Although we did not measure the exact lexical threshold above which background knowledge can be effective, we found that learners with lower vocabulary knowledge cannot benefit from background knowledge. One reason for this finding can be that learners with low vocabulary knowledge use much of their working memory in bottom-up listening processing which causes less attentional capacity to manage both bottom-up and top-down listening processing while learners with high vocabulary knowledge more efficiently manage their bottom-up listening strategies and have more attentional capacity to simultaneously and strategically use their top-down and bottom-up listening processing skills (Nguyen & Newton, 2018).

Results also indicated that background knowledge was a positive predictor of listening comprehension for three out of the four models we tested. This finding is in line with previous studies which highlighted the crucial role of background knowledge in listening comprehension (Chang & Read, 2006; Sadighi & Zare, 2006; Schmidt- Rinehart, 1994). The reason that background knowledge was not a significant predictor of listening comprehensions in one of the models (Model 3) can be explained by considering the possibility that background knowledge alone is not enough to have a successful performance on tests of listening comprehension. This was indicated in the significant interaction which was obtained in the same model, as the main effect of background knowledge on listening comprehension was not significant, while its interaction with depth became significant. This result along with other moderation findings suggest that the role that background knowledge plays in listening comprehension would be more effective when it is combined with high knowledge of vocabulary.

Pedagogical Implications

Given the findings of this study, several pedagogical implications can be provided for teaching and testing listening comprehension. We found that both breadth and depth of vocabulary knowledge are influential in listening comprehension, while breadth has a more influential role in listening comprehension than depth. This finding implies that to have a good performance in tests of listening comprehension, test takers should pay attention to improving the vocabulary knowledge. Teachers should not rely only on incidental vocabulary learning through reading texts or listening

activities and should complement it by providing deliberate vocabulary learning strategies. Teachers can use a wide range of different vocabulary learning strategies such as mnemonic strategies (Zhang & Lu, 2015), repeated storybook readings (Damhuis et al., 2015), and mastery use of dictionaries and guessing from the context (Gu & Johnson, 1996) to increase breadth of vocabulary knowledge. Another point which might be important for teachers is explicit teaching of high-frequency words as these words play a vital role in listening comprehension. According to Nation (2006), the most frequent 1,000 word families plus proper nouns cover almost 85% of spoken discourse. This means not knowing these 1,000 words would be a serious hindrance to listening comprehension. In addition, as this study focused on academic listening, academic word lists (Coxhead, 2016) should also be taught to students, as these words are more frequent in academic listening (Lynch, 2006, 2011). Therefore, teaching both general high-frequency and academic words is highly recommended to improve language learners' listening comprehension and performance. However, it should be mentioned that we just focused on listening, and this finding cannot be generalized to other language skills.

We also found that background knowledge moderates the relationship between vocabulary knowledge and listening comprehension. This has implications both for language teachers and test designers. For teachers, it suggests that they should pay more attention to the facilitating role of background knowledge in listening comprehension, as learners can comprehend the topic or text better when they are familiar with it. It has been already found that activating students' schemata and background knowledge helps them to better understand reading and listening comprehension (Chiang & Dunkel, 1992; Schmidt- Rinehart, 1994). Activating background knowledge can be done before listening to the text by different activities such as providing learners with the key words, topic preparation in small groups in which students share their ideas about the topic, and teaching students about the rhetorical structure of different spoken genres (Nguyen & Newton, 2018). Teachers should also take this into account that background knowledge is helpful for students when they have adequate vocabulary knowledge. Hence, students with low levels of vocabulary knowledge may not benefit from background knowledge as much as students with higher levels of vocabulary knowledge might do. This implies that, while teaching listening, teachers should first provide learners with a list of key words related to the listening text and then activate students' background knowledge so that both low-level and high/higher-level learners could benefit from activation of background knowledge. Therefore, as the main implication of this study, we believe that teachers should give priority to improving students' vocabulary knowledge and then provide them with the relevant background knowledge.

Concerning testing, this study showed that background knowledge about an academic listening topic can cause bias. This means that if we give a listening comprehension test to two groups of language learners and both groups have high levels of vocabulary knowledge but different levels of background knowledge about the topic, the group which has more background knowledge is more likely to outperform the other group. Though it is very difficult to find a text which no one has any background knowledge about, test designers should use topics for listening comprehensions which are not highly familiar to the majority of the test takers. For example, test designers should avoid topics which are popular among some groups of test takers such as a topic about a football team (which might be more biased towards those who are interested in football) or a famous tourist attraction in a specific country (which might be biased towards those who are already familiar with that tourist attraction). However, as we mentioned above, it is almost impossible to find a listening text that is unknown to all test takers, and the goal should be finding topics for which the minimum amount of common knowledge exists such as a topic about a rare animal in a remote place on Earth. As Purpura (2017) mentioned, background knowledge is fundamental in all types of L2 assessments. Another point which is related to the discussion of background knowledge is passage-independent and passage-dependent items. Considering listening comprehension, passage-dependent items can be answered only based on the information in the spoken discourse, while passage-independent items can be answered based on the test takers' prior knowledge without

listening to the spoken discourse (Keenan & Betjemann, 2006). Passage-independent items might cause serious problems for the validity of the test (Coleman et al., 2010). Test designers should be aware of this potential problem and write items in a way that test takers could not answer unless they have to listen to the spoken discourse not with reliance on their background knowledge.

Limitations of the Study and Suggestions for Further Research

Results of this study should be interpreted with caution due to some limitations. First, we used the fourth section of the IELTS listening which is related to an academic subject and uses formal monologue genre. Therefore, this cannot be considered as the only genre of listening and care should be given while generalizing the findings of this study. Further research can replicate this study with listening tests which measure informal spoken discourse. Moreover, the listening comprehension section of other international standardized language proficiency tests such as Test of English as a Foreign Language (TOEFL) and TOEIC can be examined in future studies. Second, we used a self-report questionnaire to assess students' background knowledge about the topic. Though using self-reports can be a good tool for evaluating background knowledge (see Khabbazbashi, 2017), designing tests which measure students' background knowledge about the topic can be a more reliable source of background knowledge. Third, this study used a one-shot design to examine the relationships among variables. We suggest using longitudinal design in the future studies to have a deeper understanding of the causal relationships existing among vocabulary knowledge, background knowledge, and listening comprehension. Fourth, in this study, we did not measure the exact threshold of vocabulary knowledge above which background knowledge might be helpful for L2 listening comprehension and further research is needed to deal with this point. Fifth, participants might respond correctly through guessing on vocabulary tests (Schmitt, 2014). This limitation can be overcome by using Yes/No formats (such as *X_Lex*, Meara & Milton, 2003) in which some pseudowords are used to control the effect of guessing (Mochida & Harrington, 2006). Finally, we assessed orthographic vocabulary knowledge for listening, while an aural vocabulary knowledge test would be more relevant for listening comprehension (McLean et al., 2015; Milton & Hopkins, 2006). However, the moderate and high correlations we found between orthographic vocabulary knowledge and listening comprehension support the usefulness of the orthographic vocabulary test when assessing its relationship with listening comprehension.

Conclusion

This study provided evidence for the role of vocabulary knowledge in L2 listening comprehension and the moderating role that background knowledge might have on the relationship between vocabulary knowledge and L2 listening comprehension. Results of this study demonstrated that while background knowledge can be helpful for language learners with high vocabulary knowledge and affects their performance in L2 listening tests, it might not help learners with low vocabulary knowledge.

Acknowledgement

Authors would like to thank Prof. Karim Sadeghi and two anonymous reviewers for providing us with helpful comments on earlier drafts of this paper.

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Gholam Hassan Khajavy (PhD) is Assistant Professor of Applied Linguistics at the University of Bojnord. His main research interests are the psychology of language learning and research methods in Applied Linguistics. He has published in different international journals such as *TESOL Quarterly*, *Studies in Second Language Acquisition*, and *Language Learning*.

Elham Aghaee is a PhD student of TEFL at Alzahra University. Her main research interests include psychology of language learning, language testing, and corpus analysis