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The Role of English Proficiency in the Interactions of Phonological Awareness and Reading/Listening Comprehension*

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ABSTRACT

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The goal of this study was to investigate the role of English proficiency in the interactions of Chinese college EFL students' phonological awareness (PA) skills and their English reading and listening comprehension abilities. Seventy-four college students were divided into two proficiency groups based on their English test scores for the Chinese college entrance examination. Since it is known that PA often works via word decoding and that vocabulary size is also an important factor in language comprehension, a total of five types of tasks were administered: PA, word decoding, vocabulary, reading comprehension, and listening comprehension. The results first showed that, as was expected, the high proficiency group (HP) performed significantly better than the low proficiency group (LP) in all five tasks. Then Pearson correlation analyses showed that PA had a significant correlation with reading and listening comprehension abilities in LP, but not in HP. The subsequent regression analyses conducted for LP revealed that, PA made an indirect contribution to reading comprehension through word decoding and uniquely contributed to listening comprehension. PA, which was measured in three divided sub-variables (phoneme, onset-rime, and syllable), was significantly related to word decoding in both groups, but word decoding was more closely connected to phonemic awareness in HP while it was to onset-rime awareness in LP. These results suggest that learners with different English proficiency levels are in the different developmental stages of PA skills, and that these skills are especially essential for the low proficiency learners in improving their reading and listening abilities. The results of this study, therefore, offer some pedagogical implications in the English classrooms with less-skilled adult learners.

KEYWORDS

phonological awareness, English proficiency, word decoding, vocabulary, reading and listening comprehension, Chinese college EFL learners

1. Introduction

Phonological awareness (PA) is the ability to manipulate and analyze the sound structure of a language. In alphabetic languages, such as English, PA helps readers convert visually presented words into the phonological forms. A number of studies have reported that PA significantly contributes to word decoding or recognition, eventually enhancing reading comprehension in young English L1 learners (Castles and Coltheart 2004, Shapiro and Solity 2008). It has been suggested, however, that as a learner's reading comprehension ability increases, the correlation between the accuracy of word decoding and reading comprehension decreases (Nassaji 2014). The contribution of children's PA to reading comprehension diminishes at higher grade levels, as word decoding skills become relatively automatic.

On the other hand, research conducted on L2 learners has reported mixed results. For example, Gottardo and Lafrance (2005) and Lee (2011) found that young Chinese EFL learners, like young L1 learners, showed a close relationship between PA and reading comprehension. However, in the research for Japanese college students as subjects, Yoshikawa and Yamashita (2014) found that PA made an indirect contribution to reading comprehension via word decoding, but Inutsuka (2009) noted that PA had no significant relation with reading comprehension. Macaruso and Shankweiler (2010) claimed that PA was one of the best predictors that distinguish less skilled readers from average readers.

As PA is the ability to clearly perceive and produce the sound units of a language, it is also expected that PA may play a role in spoken language processing. Recently, there were some attempts to examine the role of PA in listening comprehension in English as L2. For example, in a study for Cantonese advanced ESL learners, Cheung (2007) found that PA had a relationship with phoneme discrimination but not with listening comprehension. In contrast, Li et al (2012) found that PA played an important role in English listening comprehension among Chinese EFL children in an English-immersion program.

No previous studies have covered a comprehensive study probing into the role of English proficiency in the interactions between PA and language comprehension, including both reading and listening, in the adult L2 learners. Therefore, the present study was designed to investigate the relationships between PA and both reading and listening comprehension abilities in Chinese college EFL learners with different English proficiency levels. With the learners' English proficiency as a key factor, this study will also analyze the roles of vocabulary knowledge and word decoding abilities as well as the role of PA in order to better understand the role of PA among other competing variables in the learners' language comprehension abilities.

In this study, three sub-units of PA were examined, i.e., phonemic awareness, onset-rime awareness, and syllabic awareness, to more accurately assess the participants' PA. PA will be used as a cover term including all three sub-units. In addition, since it is well known that PA is closely connected to word decoding, the mechanism interrelating PA and word decoding will be carefully investigated. Specifically, this study focuses on the following research questions:

1. What are the relationships between PA, vocabulary, word decoding, and reading/listening comprehension in Chinese college EFL learners? Are there significant differences according to the learners' English proficiency?
2. What is the role of word decoding? Does it play a role as a mediator between PA and reading comprehension?
3. Do the sub-units of PA (syllable, onset-rime, and phoneme) behave differently in their interactions with reading comprehension? Are there significant differences according to the learners' English proficiency?

2. Theoretical Background and Literature Review

Yopp and Yopp (2009) note that PA is a kind of metalinguistic ability that requires the explicit knowledge of different sizes of phonological segments of spoken words as well as the conscious ability to notice, think about, and manipulate these phonological units. The learners' awareness of their language's phonological structure can be classified into at least three levels: the level of the syllable, the level of the onset and the rime, and the level of the phoneme. Previous research has demonstrated that, in alphabetic languages such as English, the development of PA progresses from an awareness of larger phonological units (e.g., syllables) to smaller ones (e.g., phonemes) (Treiman and Zukowski 1996). Phonemic awareness is the most advanced and last acquired level of PA and emerges following the exposure to formal reading instruction, because it requires a higher level of metalinguistic ability and does not always come easily for beginning readers (Goswami and East 2000). It has also been noted that English L2 learners seem to develop PA in the same sequence as English L1 learners (Gillon 2017).

Numerous studies have identified a positive relationship between PA and word decoding skills among English L1/ L2 learners at the beginning level (Holopainen et al. 2000). Word decoding, also called word recognition, refers to the ability to transform printed words into phonetic codes and to read them accurately. PA helps readers grasp how phonemes and graphemes relate to orthography because they can identify the internal sound structure of words. The readers then are able to use letter-sound correspondence rules as a self-teaching device for acquiring an efficient word decoding skills. In this sense, it can be assumed that PA can contribute to word decoding. There are also studies claiming that decoding is necessary even in the word recognition process of skilled readers (Seidenberg 2005). According to Coltheart (2006), when readers encounter unfamiliar words, it is assumed that they work on phonological decoding, segmenting strings of letters into graphemes, converting the graphemes to sounds, and establishing a phonological representation of the word.

In English L1/L2 context, there is a consensus that decoding skills make a larger contribution to reading comprehension for younger or less skilled readers, compared to older or skilled readers (Bell and Perfetti 1994). Such findings do not necessarily imply that word recognition is not used in skilled reading. Rather, they may suggest that advanced readers have reached a level of reading proficiency where they are able to identify words efficiently while devoting little attention to decoding processes (Nassaji 2014). On the other hand, not many studies have investigated the role of word recognition in skilled adult L2 readers, but some relevant studies have shown that efficiency of word recognition is also critical for skilled L2 readers' successful reading comprehension (Akamatsu 2003).

However, not as many studies have been done on what specific roles are played by the sub-units of PA. For English L1 learners, research results have consistently indicated that phonemic awareness is a more powerful predictor of early reading skills than onset-rime awareness (Humle et al. 2002). For English L2 learners, however, the role of PA units in word decoding tends to be influenced by learner's L1 language experiences and reading abilities. For example, in a study for Chinese kindergarten children, McBride-Chang et al. (2004) found that English word recognition was predicted by syllable and onset-rime awareness. Ramirez et al. (2011) reported that for Chinese L1 students in Grades 4 and 7, phonemic awareness was significantly predictive of word reading.

Vocabulary knowledge is also often considered a significant factor in the L2 reading comprehension and listening comprehension (Stahr 2008). There is also converging evidence that PA is associated with vocabulary knowledge (McBride-Chang et al. 2006). According to the Lexical Restructuring Hypothesis by Fowler (1991), beginning learners store newly acquired words as holistic phonological units. With time, learners gradually expand their vocabulary size, and their increasing vocabulary stimulates phonological segmentation and facilitates the restructuring of their learned words.

There have been quite a number of studies exploring the relationship between PA and reading comprehension among young native English speakers. The results have indicated that PA, especially phonemic awareness, is a significant predictor in early reading comprehension (Hulme et al. 2005). Also, it has been reported that PA

indirectly contributes to reading comprehension. For example, Carlson et al. (2013) examined the relationship among phonemic awareness, decoding, vocabulary, and reading comprehension among 3 to10-year-old children with reading disabilities. The findings demonstrated that the effect of phonemic awareness on passage comprehension was through decoding and vocabulary. In addition, most studies have shown that PA loses its predictive power when learners are older and become better readers (Torgesen and Mathes 1998).

Most of the previous studies on Chinese young adolescents with English as L2 have shown that English PA is related to their performance in reading comprehension (Gottardo and Lafrance 2005, Lee 2011, McBride-Chang and Kail 2002 among others). Specifically, Lee (2011) examined the relative contributions of PA and word-specific orthographic knowledge to the English reading proficiency in 122 Chinese students in Grade 7 in Hong Kong. He found that PA is still a determining factor in successful reading comprehension, even though word-specific orthographic knowledge is a much more important variable influencing the success in reading comprehension.

In contrast, there are not many studies that have investigated the role of PA in reading comprehension among Chinese adult learners, and the results are inconsistent. For instance, Sieh (2016) explored the relationships among vocabulary size, PA, and reading comprehension in Taiwanese college EFL learners with low proficiency and reported that PA skills and vocabulary knowledge were associated with reading comprehension.

On the other hand, Koda (1998) investigated the relationship among phonemic awareness, decoding, and reading comprehension in the Taiwanese ESL learners at the beginning level and found no associations between phonemic awareness and reading comprehension. Koda argued that reading Chinese characters draws upon visual-orthographic analyses, so it prompts the Taiwanese readers to apply a similar approach when reading English. However, other researchers have claimed that word-recognition processes are similar regardless of different writing systems. For example, it was suggested by Seidenberg (1992) that one's spelling knowledge determines word-recognition processes and, regardless of differences in writing systems, all skilled readers process written words via both visual and phonological mediation, and the familiarity of printed words determines which route is utilized.

In contrast, the issue on the relationship between PA and listening comprehension, especially in L2, is not as simple. Rost (2011) claims that the listening process also involves a decoding process, which builds small units of speech signals into larger ones to make sense. Thus, the efficiency and automaticity of decoding processing is the primary and prerequisite phase for comprehension (Field, 2009). For L1 listeners, decoding processing is automatic without much conscious attention, but for L2 listeners, this phase becomes increasingly automatic with practice by strengthening the linking between sound and word (Vandergrift and Goh, 2012).

Research on L2 listening indicates that L2 listeners, especially those who are less-experienced, tend to pay more conscious attention to the details of listening materials (Vandergrift 2007). Field (2009) notes that low proficiency L2 listeners pay more conscious attention to the word level before progressing up to higher levels. According to Rost (2006), the listener's ability to detect phonetic features helps the listener to segment speech input into words. As PA is the ability to break down a spoken language into its component sounds and manipulate these sound units, it is reasonable to assume that PA can contribute to oral word recognition and therefore to listening comprehension.

Recently, researchers have begun to investigate the relationship between PA and a spoken language processing (Cheung 2007, Cheung et al. 2001). For example, Cheung et al. (2001) claimed that spoken language experience had an effect on the PA development after they compared the PA of children from different linguistic backgrounds on a certain PA task. Cheung (2007) further suggested that, among adult native English speakers and advanced Chinese ESL learners, PA made a contribution to the spoken language perception. In addition, Li et al. (2012) claimed that English PA could predict the development of listening comprehension in Chinese young students in the English immersion program. However, there is not enough research probing into the relationship between PA and listening comprehension for adult EFL learners, such as college students.

The findings of the previous studies can be summarized as follows. First, phonological sensitivity can facilitate the L2 learners to decode words and retrieve their meanings in reading comprehension. Second, word decoding skills are a strong contributor to high-level reading comprehension, especially for younger and less-skilled readers who have not yet developed automaticity in word decoding skills. Third, based on the above two findings, it can be hypothesized that the role of PA in reading comprehension may differ according to the learners' English proficiency, because PA's contribution to reading comprehension can be mediated through word decoding skills (Yaghoub-Zadeh et al. 2012). Finally, it remains unclear how PA is related to listening comprehension. The current study was designed as below in order to test these previous findings and attempt to provide answers to the remaining questions.

3. Method

3.1 Participants

A total of 74 freshmen were recruited from a college in China who have taken the English test of the National College Entrance Examination (NCEE). This test is a standardized test consisting of listening comprehension, reading comprehension, application of linguistic knowledge and writing. The total score is 150 points, of which the full score of listening comprehension is 30, and that of reading comprehension is 40. Based on the participants' English scores in NCEE, they were divided into two groups. Those who scored above 120 out of 150 (80% accuracy) were assigned to the high proficiency group (HP), while those who scored less than 105 (70% accuracy) were assigned to the low proficiency group (LP). There were 37 students in HP and 37 students in LP. As Table 1 shows, the results of a *t*-test demonstrate that there was a statistically significant difference between the two groups' English test scores ($F = 14.818$, $p = .000$).

Table 1. Groups of Participants According to NCCE English Test Scores

Groups	*N*	*M*	*SD*	*Range*	*t*	*Sig.*
LP	37	98.54	4.82	75-105	13.01	.000
HP	37	123.54	10.64	120-137		

Note. HP = high proficiency, LP = low proficiency

3.2 Materials

A total of five types of tests were administered to the participants of this study: PA, word decoding, vocabulary size, listening comprehension and reading comprehension. At first, a PA test was carried out at a language lab. After the PA test, participants were given the word decoding test individually, and their performances were all recorded. A reading comprehension test, a vocabulary size test, and a listening comprehension test were conducted after a two-day interval. The contents and the characteristics of the tests are provided one by one.

First, three kinds of tasks, including oddity, segmentation, and deletion, were used to assess the three aspects of PA, syllabic awareness, onset-rime awareness, and phonemic awareness. The auditory stimuli that had been recorded by a native speaker of English were used in the test. Before each task, a brief practice session was given to ensure that participants understood what they were supposed to do for each task.

For the oddity task, 24 items were selected and revised based on Nation and Hulme (1997), and they were equally divided into three parts: initial syllable oddity task (e.g., *angry-anchor-energy*), initial phoneme oddity task (e.g., *vet-fay-film*), and rime oddity task (e.g., *die-high-light*). Participants were required to select the one odd word out of the given three stimuli.

The segmentation task was made based on Cameron's study (1996). In order to minimize the interference of orthographic knowledge, 21 words or pseudo-words consisting of one to four syllables were used. Seven monosyllabic words were used for onset-rime segmentation. In phoneme and syllable segmentation, participants were to say the word in isolation at syllable and phoneme level and count the number of the phonemes and syllables. In onset-rime segmentation, the participants were asked to listen to a question (e.g., What is the onset/rime in the word *page*?) and then write down the answers.

The deletion task was designed on the basis of the Test of Auditory Analytical Skills by Rosner (1975), which consisted of syllable deletion task (e.g., Delete *down* from *downtown),* onset deletion task (e.g., Delete *gr* from *grow*), and phoneme deletion task (e.g., Delete /f/ from *flip*).

Second, a common method that is used to estimate a learner's word decoding skills is a pseudo-word reading. In this task, participants are requested to read a series of isolated pseudo-words (e.g., *croad*, *fek* and *jom*). Although the pseudo-words do not actually exist in reality, their pronunciations could be predicted from how they are spelled, and therefore, reading accuracy reflects mastery of a grapheme-phoneme conversion in decoding. In this study, pseudo-words were selected from test materials of Gathercole (1995) and Snowling et al. (1986). The 24 pseudo-words were divided into four groups depending on the number of syllables (from one to four syllables). Each participant was given 30 seconds to prepare for the word reading test, and all their performances were recorded. The performance of pseudo-word reading was assessed by a native speaker of English who teaches English pronunciation in a Chinese college.

Third, vocabulary knowledge is often considered a significant factor in the second language reading comprehension and listening comprehension (Stahr 2008). In this study, Vocabulary Levels Test in Schmitt et al. (2011) was adopted using a word-meaning matching format. It aims at measuring a learner's breadth of vocabulary at five frequency levels (2K, 3K, 5K, academic, and 10K words). The participants were given nine groups of words, where each group included three target words and six candidate definitions, and they were asked to choose a correct definition for each target word. In accordance with the requirement of Chinese New College English Syllabus, the vocabulary levels for the selected word groups ranged as follows: four groups from 3K, three groups from 5K, and one group from 2K, and one group from academic. The participants were required to complete the test in 10 minutes.

In addition, a reading comprehension test included four reading passages with 24 multiple-choice questions. In order to avoid floor effect among low-proficiency participants, three passages were selected from the reading sections of the English test samples in NCEE. Another passage was selected from the reading comprehension subsection of a TOEFL exam. The number of the words in each passage ranged from 150 to 400. The students were given 45 minutes to finish this test.

Finally, a listening comprehension test was composed of eight short conversations with eight multiple-choice questions, two long dialogues with six multiple-choice questions, and one passage listening comprehension with ten blanks to be filled in by words. In order to avoid floor effect among low-proficiency participants, eight short conversations and one passage were selected from listening sections of the English test samples in NCEE. Two long dialogues were selected from the listening subsection of a TOEIC exam.

3.3 Data Analysis

To fully address the research questions, the results of all the above tests were analyzed by several statistical analyses. First, a descriptive statistical analysis was conducted to examine the participants' performance in each component skill measured. Then Pearson correlation analyses were conducted to figure out the relationships between the variables. After establishing the correlations between the variables, multiple regression analyses were conducted to explore the role of PA, word decoding, and vocabulary in the reading and listening comprehension. The results of the analyses will be presented in the next section.

4. Results

4.1 Participants' Performance Results on the Five Tasks

Table 2 displays the means and standard deviations of the two proficiency groups' performance on all tests conducted in this study, and a *t*-test was conducted to determine whether there were significant differences between the two groups. The results from the *t*-test indicated that the two groups performed significantly differently on all tests. In the PA test, HP scored 3.9 points higher than LP ($t = 3.37$, $p = .001$). This means that, compared with the students in HP, those in LP have weaker PA. However, the two groups' performances in the subtests under PA were not consistent. Among the three subtests, only phonemic awareness task ($t = 6.40$, $p = .000$) showed significant differences between the two groups. This indicates that, for the students in LP, phonemic awareness task was the most challenging, and it was reflected in the PA scores between the two groups. In English, bigger grain size units, such as syllables and onsets and rimes, are easier to acquire than phonemes, i.e., small grain size units, and this result is in accordance with the Psycholinguistic Grain Size Theory by Ziegler and Goswami (2005). The significant difference between the two groups were also found in reading comprehension test ($t = 5.75$, $p = .000$) and listening comprehension test ($t = 5.91$, $p = .000$), as shown in the table.

Table 2. Descriptive Statistics of All Test Scores

Tests	HP ($n = 37$)		LP ($n = 37$)		Full mark	*t*	*p*
	M	*SD*	*M*	*SD*			
Phonological Awareness	46.60	4.62	42.70	7.16	66	3.37	.001
Syllabic Awareness	15.13	2.34	14.7	3.35	22	.804	.425
Onset-rime Awareness	15.21	2.06	15.10	3.06	22	.791	.864
Phonemic awareness	17.21	2.26	14.00	3.23	22	6.40	.000
Pseudo-word reading	19.37	3.85	15.92	3.27	24	8.47	.000
Vocabulary Size	16.81	3.78	12.22	3.61	27	5.35	.000
Reading Comprehension	18.60	2.46	14.10	3.29	24	5.75	.000
Listening Comprehension	17.24	2.91	13.32	2.78	24	5.91	.000

The participants also took a word decoding test, measured by reading pseudo-words, and a vocabulary size test. In the pseudo-word reading task, the two groups showed significant differences. HP obtained significantly higher scores than LP ($t = 8.47$, $p = .000$), and this suggests that learners with higher English proficiency have better decoding abilities. In the vocabulary size test also, HP consistently performed better than LH ($t = 5.35$, $p = .000$).

4.2 Correlations among All Test Scores

With the above results, a series of correlation analyses were conducted to assess the possible correlations among all measures in the two proficiency groups. Table 3 is diagonally divided from top left to bottom right into two parts. The part above the diagonal line lists the correlation coefficients for LP, and the part below lists those for HP.

Table 3. Correlation Results for All Variables in the Two Proficiency Groups

	1	2	3	4	5	6	7	8
1. Syllabic Awareness	-	.716**	.133	.245	.452**	.136	.412*	.356**
2. Onset-rime Awareness	.122	-	.194	.837**	.467**	.037	.375*	.381*
3. Phonemic Awareness	.187	.139	-	.594**	.297*	.157	.125	.298*
4. PA	.665**	.651**	.657**	-	.512**	.149	.390*	.364**
5. Word Decoding	.294	.385*	.476**	.586**	-	.217	.249	.576**
6. Vocabulary	.106	.310	.177	.302	.544	-	.447**	.491**
7. Listening Comp	.149	-.151	.097	.045	.310	.494*	-	.350*
8. Reading Comp	.206	.131	.254	.298	.325*	.317**	.214	-

Note. Below the diagonal are Pearson's correlation coefficients (r) for HP, and above the diagonal are correlation coefficients for LP.
**$p < .01$, *$p < .05$

First of all, the Pearson correlation analyses revealed that the correlations between PA and reading comprehension were different in the two proficiency groups. That is, PA was significantly correlated with reading comprehension ($r = .364$, $p < .01$) in LP, but not in HP.

Second, PA was correlated significantly and positively with pseudo-word reading in both LP ($r = .512$, $p < .01$) and HP ($r = .586$, $p < .01$). Specifically, all three PA variables were significantly correlated with pseudo-word reading in LP, with the closest correlation in onset-rime awareness ($r = .467$) in LP. In contrast, phonemic awareness and onset-rime awareness were correlated with pseudo-word reading in HP, and the closest correlation was found with phonemic awareness ($r = .476$).

In addition, pseudo-word reading was correlated significantly and positively with reading comprehension in both proficiency groups ($r = .576$, $p < .01$ in LP, $r = .325$, $p < .05$ in HP), with a stronger correlation for LP. As expected, vocabulary size was also significantly associated with reading comprehension in both proficiency groups ($r = .491$, $p < .01$ in LP, $r = .317$, $p < .01$ in HP).

Finally, PA was not correlated with listening comprehension in HP, whereas it showed a significant correlation with listening comprehension in LP ($r = .390$, $p < .05$). Vocabulary size was correlated with listening comprehension in both proficiency groups ($r = .447$, $p < .01$ in LP, $r = .494$, $p < .05$ in HP).

4.3 Multiple Regression Analyses for PA and Reading/Listening Comprehension

First, a series of hierarchical multiple regression analyses were used to explore the role of PA in reading comprehension. Since PA did not show correlations with reading comprehension in HP, the regression analyses were only conducted for LP. In this group, PA, word decoding, and vocabulary are all significantly correlated with reading comprehension. In order to better understand the collective and unique contributions of the variables, hierarchical multiple regression analyses were conducted. Because the focus of this research was to establish the role of PA in reading comprehension, the dependent variable was reading comprehension, and the three independent variables were entered in order of (1) English vocabulary, (2) word decoding, and (3) PA in the first round of analysis.

Table 4. Hierarchical Multiple Regression Analyses for English Vocabulary, Word Decoding, and PA in Reading Comprehension (First round)

Model	*B*	Std. Error	Beta	Adjusted R^2	R^2 Change
1. English vocabulary	.272	.063	.591***	.350***	.350***
2. English vocabulary	.185	.068	.401**	.419***	.102**
Word decoding	.373	.149	.371*	.419***	.102**
3. English vocabulary	.179	.066	.390*	.451***	.046
Word decoding	.331	.147	.329*	.451***	.046
PA	.201	.116	.220	.451***	.046

*p < .05, **p < .01, ***p < .001 (Dependent Variable: reading comprehension)

As displayed in Table 4, vocabulary accounted for 35% of the variance in reading comprehension when it was entered at Step 1 (R^2 = .35, F(1, 35) = 18.811, p < .001). When word decoding was introduced at Step 2, it accounted for an additional 10.2% of the variance when the contribution of vocabulary was controlled. However, PA did not add any further significant variance to reading comprehension when it was entered after word decoding.

It has been proposed in the previous research that word decoding is a mediating variable between PA and reading comprehension (Yaghoub-Zadeh et al. 2012). To clearly figure out the relationships between PA and word decoding, an additional hierarchical regression analysis was carried out, with the order of the PA and word decoding entered into the model in the reverse order. With reading comprehension as a dependent variable, the independent variables were entered in this order: (1) English vocabulary, (2) PA, and (3) word decoding in the second round of the analysis.

Table 5. Hierarchical Multiple Regression Analyses for English Vocabulary, PA, and Word Decoding in Reading Comprehension (Second round)

Model	*B*	Std. Error	Beta	Adjusted R^2	R^2 Change
1. English vocabulary	.272	.063	.591***	.350***	.350***
2. English vocabulary	. 254	.061	.551**	.385***	.070**
PA	.244	.121	.267*	.385***	.070**
3. English vocabulary	.179	.066	.390**	.451***	.078**
PA	.201	.116	.220	.451***	.078**
Word decoding	.331	.147	.329*	.451***	.078**

*p < .05, **p < .01, ***p < .001 (Dependent Variable: reading comprehension)

The results of the second hierarchical regression analysis show that PA can significantly explain additional 7% of the variance in reading comprehension (R^2 = .385, F(2, 34) = 12.287, p < .001), after English vocabulary variable was controlled. Adding word decoding at the third step accounted for an additional 7.8% of the variance (R^2 = .451, F(3,33) = 10.877, p < .001), but the beta value of PA has lost its statistical significance (p = .053). In addition, the Model 3 in Table 5 shows that both vocabulary knowledge and word decoding significantly contributed to reading comprehension, jointly accounting for 45.1% of its variance.

To get to a clearer understanding of this issue, an additional simple regression analysis was conducted that measures the contribution of PA to word decoding. The results shown in Table 6 indicate that PA significantly contributed to word decoding, accounting for 24.1% variance (R^2 = .241, F(1,35) =12.439, p = .001). Based on the results presented in Table 5 and Table 6, it can be concluded that PA had an indirect contribution to reading comprehension via word decoding in the low proficiency group.

Table 6. Simple Regression Analysis for PA and Word Decoding

Model	*B*	Std. Error	*Beta*	Adjusted R^2	*Sig.*
PA	.234	.066	.512	.241	.001

Dependent Variable: word decoding

Finally, in order to assess the effect of PA on listening comprehension, hierarchical multiple regression analyses were also conducted for low proficiency group only, because PA was not associated with listening comprehension in the high proficiency group. Since Pearson correlation analyses indicated that LP's listening comprehension was correlated with PA and English vocabulary, but not with word decoding, vocabulary was only used as a control variable. The results are summarized in the table below.

Table 7. Hierarchical Multiple Regression Analyses for English Vocabulary and PA in Listening Comprehension

Model	*B*	Std. Error	*Beta*	Adjusted R^2	R^2 Change
1. English vocabulary	.345	.117	.447**	.177**	.177**
2. English vocabulary	.307	.111	.398**	.266**	.107**
PA	.129	.056	.330*	.266**	.107**

*p < .05, **p < .01, ***p < .001 (Dependent Variable: listening comprehension)

English vocabulary alone accounted for 17.7% of the variance in the listening comprehension when entered at the first step (R^2 = .177, F(1, 35) = 8.763, p = .005). When PA was added, an additional 10.7% of the listening comprehension variance was explained (R^2 = .266, F(2,34) = 7.527, p = .002), and the combination of vocabulary and PA accounted for 26.6% of the listening comprehension measures. Since the significant effect of PA remained even after the variable of English vocabulary was controlled, it was confirmed that PA skills contributed to listening comprehension in LP. In addition, the beta scores that indicate the contributions of the individual variables show that both PA (*Beta* = .330) and vocabulary knowledge (*Beta* = .398) have comparable strengths in explaining the variability for listening comprehension. In the next section, the results of this study will be discussed in detail in order to provide answers to the research questions made at the beginning.

5. Discussion and Conclusion

Let us first investigate the role of PA on word decoding and reading comprehension. The results of the correlation analyses revealed that PA, word decoding, and reading comprehension were all interconnected in LP, but the hierarchical multiple regression analyses indicated that the significant contribution of PA to reading comprehension disappeared after word decoding was entered as an additional variable. However, a simple regression analysis showed that PA was a significant contributor to word decoding. This result indicates that PA indirectly contributes to reading comprehension through word decoding. This indirect association of PA with reading comprehension is in line with previous studies that proposed the mediating role of word reading in the relationship between PA and reading comprehension (Yaghoub-Zadeh et al. 2012). For low proficiency learners, it can be assumed that their underdeveloped PA has led to the poor word decoding performance, which in turn results in poor reading comprehension. This result also supports the claim that reading difficulties of less-skilled learners are often manifested in inadequate word reading, which may be attributed to poor phonological decoding (Borodkin and Faust 2014).

Additionally, word decoding is significantly associated with reading comprehension in both LP and HP, but the correlation is stronger for LP ($r = .576$, $p < .01$) than for HP ($r = .325$, $p < .05$). This result supports the assumption by Binder and Lee (2012) that decoding ability is connected with adults' passage comprehension. Also, it is well known that the ability to read unknown words or pseudo-words is a predictive indicator to reading comprehension (Joshi and Aaron 2000, Yoshikawa and Yamashita 2014). As for the stronger correlation between decoding and reading comprehension in LP, it is assumed that because the reading passages were more difficult for low proficiency learners, and they have not yet developed sufficient automaticity in word decoding, they may have needed to sound out the words using grapheme-phoneme rules either consciously or unconsciously (Rau et al. 2014). This also explains the result of the hierarchical regression analyses for LP, which indicated that PA had an indirect effect on reading comprehension via word decoding, i.e., word decoding was a mediator connecting PA and reading comprehension in LP.

On the other hand, the results of this study revealed no correlation between PA and reading comprehension for HP, and this may be accounted for by two reasons. The first reason is that because the participants in HP of this study were more skilled readers than those in LP, it was possible that they were all efficiently processing the phonological components when reading. This view is supported by Nassaji (2014), who noted that skilled readers of English are so sensitive to the sound structure of English that phonological decoding skills themselves do not cause individual differences in them. The second reason may be that in their reading comprehension process the skilled readers depend more on the visual-orthographic strategy to recognize words directly without phonological mediation as claimed by Stanovich (2000).

Regarding the correlations between PA and word decoding, the results of this study showed that PA was correlated significantly and positively with word decoding in both HP and LP. This means that most participants activated PA when reading pseudo-words. This result is in accordance with the Dual Route Models of Coltheart (2006), according to which PA is used to read unfamiliar words or non-words. This finding is also in line with a large body of previous studies highlighting the importance of PA in decoding pseudo-words or unfamiliar words (Gilbert et al. 2011).

In this study, three sub-units of PA were investigated, i.e., phonemic awareness, onset-rime awareness, and syllabic awareness, to measure the participants' PA more accurately and meaningfully. Because low proficiency as well as high proficiency learners were included in the participants, it was assumed that their performance in the sub-units of PA might vary according to their English proficiency levels.

It was established above that PA was a significant contributor to word decoding in both proficiency groups. However, when the correlations between PA and word decoding in the two groups were more closely examined, quite opposite situations were revealed in the two proficiency groups. That is, in the high proficiency group, word decoding had a stronger connection with phonemic awareness ($r = .476$, $p < .01$) than with onset-rime awareness ($r = .385$, $p < .01$), while in LP it was more strongly related with onset-rime awareness ($r = .467$, $p < .01$) than with phonemic awareness ($r = .297$, $p < .05$).

The strong correlation between word decoding and phonemic awareness for HP matches the finding of the research by Warmington and Culme (2012) on English L1 speakers, which suggests that phonemic awareness is the strongest correlate of non-word reading. The result of the present study for HP is natural because, compared to less-skilled L2 readers, advanced L2 readers would use the skills more similar to L1 readers. In contrast, the result for LP indicates that less-skilled readers tend to rely more on onset-rime awareness than on phonemic awareness when reading non-words. This suggests that the low-level learners have not fully developed the necessary analyzing skills at the phonemic level, which is also not surprising because, as was mentioned above, recognizing phonemes is the most complicated task among the three PA skills.

A possible reason for the strongest correlation between onset-rime awareness and word decoding in LP may be found in the orthographic features of the participants' L1. All participants' native language is Mandarin Chinese, which has an ideographic system of orthography. Each Chinese character represents one syllable, and the Chinese

syllables are constructed from a restricted set of onsets and rimes. In Chinese reading classes, the syllables are taught as combinations of onset and rime units (Cheung et al. 2001). Therefore, onset-rime awareness is important in reading Chinese, and low-level learners of English tend to rely more on onset-rime awareness, which is one of their L1 reading strategies, and less on phonemic awareness, an L2 (English) reading strategy.

This result seems to be in line with Koda's (1998) research, which reported that reading Chinese characters requires visual-orthographic analyses, and it encourages the Taiwanese readers to apply a similar approach when reading English. Koda's hypothesis was that, in L2 readers of English, amount of L1 alphabetic experience is directly associated with the development of L2 phonemic awareness and decoding skills. Therefore, she argued that the Taiwanese readers, whose L1 is a non-alphabetic Chinese language, did not have enough experience with alphabetic experience, and this has caused insufficient development of phonemic awareness in them.

However, in the current study, the participants in LP as well as HP showed correlations between phonemic awareness and word decoding, although the correlation was weaker than that between onset-rime awareness and word-decoding for LP. This means that high proficiency Chinese learners of English used phonemic awareness more than syllabic awareness when reading pseudo-words. At the same time, however, some of the low proficiency Chinese learners in this study had also acquired a certain level of phonemic awareness, which they used in pseudo-word decoding.

Part of the reason why we have these contrasting results from the learners of English who speak the same L1 may be found in Pinyin, the official alphabetic script system for Mandarin Chinese developed to facilitate reading Chinese characters. Chinese college students are all very familiar with this alphabetic system, so the participants of the present study, even the low level learners of English, may have acquired some phonemic awareness, which they could use in decoding pseudo-words. In Taiwan, on the other hand, the romanization system of Pinyin has not been used as officially and generally as in the Mainland China. Therefore, it is assumed that lack of alphabetic experience of the Taiwanese readers in Koda's study has led to insufficient phonemic awareness in English, which in turn resulted in no correlation between phonemic awareness and word decoding.

Regarding the relationship between PA and listening comprehension, the two proficiency groups demonstrated significant differences. In HP, PA had no correlation with listening comprehension, but, in LP, PA made a significant contribution to listening comprehension. The result that PA did not correlate with listening comprehension in high proficiency learners supports the claim of Cheung (2007) that PA is critical for speech perception but less important in subsequent meaning construction among advanced Chinese ESL learners. Listeners of high proficiency tend to have a better development of PA, and therefore other factors, such as vocabulary, context, and pragmatic knowledge, would be more important for them to improve their listening skills (Snow et al. 1998).

On the other hand, the regression analyses of this study revealed that PA remained a significant predictor of listening comprehension in LP even after the variable of vocabulary was controlled. An examination of the standardized beta coefficients further affirmed that both PA and vocabulary knowledge made comparable contributions to listening comprehension. This result suggests that PA is an important component of listening comprehension as a means of making sense of spoken language in low proficiency listeners. The influence of PA on listening processing is critical for less-skilled listeners who tend to encounter decoding problems at the preliminary stage of listening comprehension. Previous research has indicated that low proficiency L2 listeners tend to pay more attention to the word level (Chen 2013, Li et al. 2012). Similarly, Goh (2000) noted that the difficulties encountered by low proficiency listeners were associated with perceptual processing and parsing. Chen (2013) also reported that at the lower level of listening processing, most Chinese EFL learners encounter difficulties in phonological information processing, such as segmenting word boundaries and decoding sounds into phonological representations. Based on these findings, it can be generalized that for low proficiency listeners, the development of PA plays a pivotal role in the input-decoding stage of listening.

To summarize, the results of this study revealed that the role of PA skills in L2 reading and listening comprehension differed significantly depending on the learners' L2 proficiency levels. First, PA skills significantly contributed to reading and listening comprehension for low proficiency learners. Specifically, PA had an indirect

but significant effect on reading comprehension via word decoding in LP, which implies that strengthening less skilled learners' sensitivity to the sound structure of spoken English would help them read and recognize words quickly and efficiently. As the learners' decoding strategies become automated, more cognitive resources can be utilized to process and understand printed materials, thereby improving their reading comprehension. Second, PA was a significant predictor of the development of listening comprehension in LP, which means that poor PA skills would cause poor listening comprehension. For low proficiency learners, therefore, increasing their PA skills would help them improve listening comprehension. In addition, regarding the effect of L1 orthographical features on PA and word decoding in L2, the results of this study seem to suggest that the Chinese learners' experience in Pinyin has facilitated their phonemic awareness in English and thus led to its significant correlations with word decoding in both proficiency groups. However, further research contrasting the variable of Pinyin availability in the subjects is needed to draw a clearer conclusion on the issue.

This study has provided empirical evidence on the role of PA in reading and listening comprehension in Chinese EFL learners in college, and therefore the findings provide implications for English classrooms in college. To enhance conventional literacy teaching focusing on contextual and pragmatic cues, educators could use PA instruction, such as rhyming and segmenting and blending sound units, especially for low proficiency students, in order to supplement their reading and listening activities. PA instruction may not result in an immediate effect, but it is expected that it should be a beneficial means in facilitating students' language learning in the long term.

References

Akamatsu, N. 2003. The effects of first language orthographic features on second language reading in text. *Language Learning* 53, 207-231.

Bell, L. and C. A. Perfetti. 1994. Reading skill: Some adult comparisons. *Journal of Educational Psychology* 86, 244-255.

Binder, K. S. and C. S. Lee. 2012. Reader profiles for adults with low literacy skills: A quest to find resilient readers. *Journal of Research and Practice for Adult Literacy, Secondary, and Basic Education* 1(2), 78-90.

Borodkin, K. and M. Faust. 2014. Naming abilities in low-proficiency second language learners. *Journal of Learning Disabilities* 47, 237-253.

Cameron, J. 1996. *Phonological Awareness and Adult Beginning Readers*. Carleton University.

Carlson, E., F. Jenkins, T. Li and M. Brownell. 2013. The interactions of vocabulary, phonemic awareness, decoding, and reading comprehension. *The Journal of Educational Research* 106(2), 120-131.

Castles, A. and M. Coltheart. 2004. Is there a causal link from phonological awareness to success in learning to read? *Cognition* 91(1), 77-111.

Chen, A. H. 2013. EFL listeners' strategy development and listening problems: A process-based study. *The Journal of Asia TEFL* 10(3), 81-101.

Cheung, H. 2007. The role of phonological awareness in mediating between reading and listening to speech. *Language, Cognition and Neuroscience* 22(1), 130-154.

Cheung, H., H. C. Chen, C. Y. Lai, O. C. Wong and M. Hills. 2001. The development of phonological awareness: Effects of spoken language experience and orthography. *Cognition* 81(3), 227-241.

Coltheart, M. 2006. Dual route and connectionist models of reading: An overview. *London Review of Education* 4(1), 5-17.

Field, J. 2009. *Listening in the Language Classroom.* Cambridge University Press.

Fowler, A. E. 1991. How early phonological development might set the stage for phoneme awareness. *Phonological Processes in Literacy: A Tribute to Isabelle Y. Liberman* 106, 97-117.

Gathercole, S. E. 1995. Is nonword repetition a test of phonological memory or long-term knowledge? It all depends on the nonwords. *Memory and Cognition* 23, 83-94.

Gilbert, J. K., D. L. Compton and D. M. Kearns. 2011. Word and person effects on decoding accuracy: A new look at an old question. *Journal of Educational Psychology* 103(2), 489.

Gillon, G. T. 2017. *Phonological Awareness: From Research to Practice*. Guilford Publications.

Goh, C. C. 2000. A cognitive perspective on language learners' listening comprehension problems. *System* 28(1), 55-75.

Goswami, U. and M. East. 2000. Rhyme and analogy in beginning reading: Conceptual and methodological issues. *Applied Psycholinguistics* 21(1), 63-93.

Gottardo, A. and A. Lafrance. 2005. A longitudinal study of phonological processing skills and reading in bilingual children. *Applied Psycholinguistics* 26(4), 559-578.

Holopainen, L., T. Ahonen, A. Tolvanen and H. Lyytinen. 2000. Two alternative ways to model the relation between reading accuracy and phonological awareness at preschool age. *Scientific Studies of Reading* 4(2), 77-100.

Hulme, C., P. Hatcher, K. Nation, A. Brown, J. Adams and G. Stuart. 2002. Phoneme awareness is a better predictor of early reading skill than onset-rime awareness. *Journal of Experimental Child Psychology* 82(1), 2-28.

Hulme, C., M. Snowling, M. Caravolas and J. Carroll. 2005. Phonological skills are (probably) one cause of success in learning to read: A comment on Castles and Coltheart. *Scientific studies of reading* 9(4), 351-365.

Inutsuka, K. 2009. *Component skills analyses for Japanese adult second language readers: The role of cognitive and linguistic skills and processing speed in predicting reader performance.* Doctoral dissertation, University of Toronto.

Joshi, R. M. and P. G. Aaron. 2000. The component model of reading: Simple view of reading made a little more complex. *Reading Psychology* 21(2), 85-97.

Koda, K. 1998. The role of phonemic awareness in second language reading. *Second Language Research* 14(2), 194-215.

Lee, K. M. 2011. *Relative Contributions of Phonological Awareness and Orthographic Knowledge to the Reading Proficiency of Chinese Students Learning English as a Foreign Language.* Doctoral dissertation, University of Houston, USA.

Li, M., L. Cheng and J. R. Kirby. 2012. Phonological awareness and listening comprehension among Chinese English-immersion students. *International Education* 41, 46-65.

Macaruso, P. and D. Shankweiler. 2010. Expanding the simple view of reading in accounting for reading skills in community college students. *Reading Psychology* 31(5), 454-471.

McBride-Chang, C., H. Cheung, B. Y. Chow, C. L. Chow and L. Choi. 2006. Metalinguistic skills and vocabulary knowledge in Chinese (L1) and English (L2). *Reading and Writing*, 19(7), 695-716.

McBride-Chang, C. and R. V. Kail. 2002. Cross–cultural similarities in the predictors of reading acquisition. *Child development* 73(5), 1392-1407.

McBride-Chang, C., E. Bialystok, K. K.Chong and Y. Li, . (2004). Levels of phonological awareness in three cultures. *Journal of Experimental Child Psychology* 89(2), 93-111.

Nassaji, H. 2014. The role and importance of lower-level processes in second language reading. *Language Teaching* 47(1), 1.

Nation, N. and C. Hulme. 1997. Phonemic segmentation, not onset-rime segmentation, predicts early reading and spelling skills. *Reading Research Quarterly* 32, 154-167.

Ramirez, G., X. Chen, E. Geva and Y. Luo. 2011. Morphological awareness and word reading in English language learners: Evidence from Spanish-and Chinese-speaking children. *Applied Psycholinguistics* 32(3), 601.

Rau, A. K., K. Moeller and K. Landerl. 2014. The transition from sublexical to lexical processing in a consistent orthography: An eye-tracking study. *Scientific Studies of Reading* 18(3), 224-233.

Rosner, J. 1975. *Helping Children Overcome Learning Difficulties*. New York: Walker and Company.

Rost, M. 2006. Areas of research that influence L2 listening instruction. In E. Uso-Juan and A. Martinez-Flor, eds., *Current Trend in the Development and Teaching of the Four Language Skills,* 47-74. Berlin: Mounton de Gruyter.

Rost, M. 2011. *Teaching and Researching Listening* (2nd ed.). Routledge.

Schmitt, N., X. Jiang and W. Grabe. 2011. The percentage of words known in a text and reading comprehension. *The Modern Language Journal* 95, 26–26.

Seidenberg, M. S. 1992. Beyond orthographic depth in reading: Equitable division of labor. *Advances in Psychology* 94, 85-118.

Seidenberg, M. S. 2005. Connectionist models of word reading. *Current Directions in Psychological Science* 14(5), 238-242.

Shapiro, L. R. and J. Solity. 2008. Delivering phonological and phonics training within whole class teaching. *The British Journal of Educational Psychology* 78(4), 597-620.

Sieh, Y. C. 2016. Vocabulary size, phonological awareness, and reading comprehension. *Studies in English Language Teaching* 4(3), 299-313.

Snow, C. E., M. S. Burns and P. Griffin. 1998. Preventing reading failure in young children. Preventing Reading Failure in Young Children with Phonological Processing Disabilities: Group and Individual Responses to Instruction. *Journal of Educational Psychology* 91(4), 579-593.

Snowling, M. J., J. Stackhouse and J. P. Rack. 1986. Phonological dyslexia and dysgraphia: A developmental analysis. *Cognitive Neuropsychology* 3, 309-339.

Stahr, L. S. 2008. Vocabulary size and the skills of listening, reading and writing. *Language Learning Journal* 36(2), 139-152.

Stanovich, K. E. 2000. *Progress in Understanding Reading: Scientific Foundations and New Frontiers*. New York: Guilford Press.

Torgesen, J. K. and P. G. Mathes. 1998. *What Every Teacher Should Know about Phonological Awareness*. Florida Department of Education, Division of Schools and Community Education, Bureau of Instructional Support and Community Services.

Treiman, R. and A. Zukowski. 1996. Children's sensitivity to syllable, onsets, rimes, and phonemes. *Journal of Experimental Child Psychology* 61, 193-215.

Vandergrift, L. 2007. Recent developments in second and foreign language listening comprehension research. *language Teaching* 40(3), 191-210.

Vandergrift, L. and C. C. M. Goh. 2012. *Teaching and Learning Second Language Listening*. Routledge.

Warmington, M. and H. Culme. 2012. Phonemic awareness, visual-verbal paired-associate learning, and rapid automatized naming as predictors of individual differences in reading ability. *Scientific Studies of Reading* 16(1), 45-62.

Yaghoub Zadeh, Z., F. Farnia and E. Geva. 2012. Toward modeling reading development in young English as second language learners. *Reading and Writing: An Interdisciplinary Journal* 25, 163-187.

Yopp, H. K. and R. H. Yopp. 2009. Phonological awareness is child's play! *YC Young Children* 64(1), 12-21.

Yoshikawa, L. and J. Yamashita. 2014. Phonemic awareness and reading comprehension among Japanese adult learners of English. *Open Journal of Modern Linguistics* 4(04), 471-480.

Ziegler, J. C. and U. Goswami. 2005. Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. *Psychological Bulletin* 131(1), 3-29.

Examples in: English
Applicable Languages: English
Applicable Level: Tertiary

