

Lower and Higher Level Comprehension Skills of Undergraduate EFL Learners and Their Reading Comprehension

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Received 03/06/2020	Abstract The study examined the relationships between reading comprehension and measures of lower level comprehension skills (vocabulary, grammar, and word processing) and a higher level comprehension skill (inference making), to determine if these measures of higher and lower level comprehension skills predicted different levels of variance in reading comprehension. The group of 126 undergraduate Thai students was categorized as low vocabulary (n=65) or high vocabulary (n=61) to determine if these relationships varied due to vocabulary level. Correlation demonstrated positive relationships between all measures (vocabulary, grammar, word processing, inference making and reading comprehension). The findings revealed that positive correlations were found among all measures; vocabulary and inference making showed the largest correlations. Regression analyses focusing on explaining variance in reading comprehension
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	indicated that lower level comprehension skills, such as grammar, explained the largest percentage of variability for the low vocabulary group, whereas the ability to make inferences (a higher level comprehension skill) was the largest predictor for the high English vocabulary group. The findings provide useful insights into the roles of lower and higher level comprehension skills in the prediction of reading comprehension and how to apply this knowledge in EFL reading instructions.
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1. INTRODUCTION

Reading comprehension is a complex construct, consisting of several processes (Duke, 2005). Silva and Cain (2015) summarised the reading process as readers decoding words and retrieving their meaning, applying their syntactic knowledge to combine these into larger units—such as clauses and sentences—and integrating information across different parts of the text. They often draw on background knowledge to infer information that the author has left implicitly.

Reading comprehension can also play an important role in determining a students' academic performance (Dawkins, 2017; Vacca, 2005), and can be a critical skill to develop while learning languages, particularly in second and foreign language learning contexts (Ibrahimet al., 2016). To successfully comprehend a reading text, several sufficient language components such as vocabulary, grammar knowledge, and background knowledge play vital roles in enhancing reading comprehension, particularly in a foreign language (Laufer & Sim, 1985). These multiple language comprehension skills can be divided into two types—lower and higher level comprehension skills. Lower level comprehension skills serve as the foundational knowledge for text comprehension. Such skills would include the ability to recognize words as whole units, the ability to determine the meaning of a word by accessing a sight vocabulary, and the ability to recognize basic features, such as grammar, that connects a word with those around it. These lower level comprehension skills are essential for the comprehension and production of more complex discourse. In contrast, higher level comprehension skills are involved in the process of constructing a mental model of a text's meaning. These higher level skills would include the

ability to make inferences from the text, to monitor comprehension to avoid incorrect interpretations, and to acquire structure knowledge (Hogan et al., 2011).

In Thailand, English is considered a foreign language (EFL), and is taught as a compulsory foreign language course. Concerning the four language skills, effective English reading plays a crucial role for Thai students in their academic studies as well as in their working environment after their graduation (Akkakoson, 2011; Yimwilai, 2019). However, some Thai undergraduate students often have difficulty comprehending what they read and tend to lack confidence in their own reading ability (Akkakoson & Setobol, 2009; Chavangklang & Suppasetserree, 2018; Rungwaraphong, 2020). Similarly, at a Thai public university where the study was conducted, based on the author's own experience as an English lecturer, English reading proficiency for the majority of students remains limited although they have been studying English for over ten years.

An extensive number of recent studies in Thai EFL contexts have focused on teaching reading methodologies and reading strategies to increase English reading proficiency (e.g., Rawengwan & Yawiloeng, 2020; Yotapan, 2020). For example, Wannathong (2016) investigated cognitive reading strategies with a group of EFL undergraduate learners, and Rawengwan and Yawiloeng (2020) explored the reciprocal teaching method in Thai undergraduate students. As to the relationship between comprehension skills and reading comprehension, there have been relatively some studies on single skills such as vocabulary (Astan, 2014; Chou, 2011; Ibrahim et al., 2016; Sidek & Rahim, 2015; Thavornpon, 2012) or grammatical knowledge (Akbari, 2014; Alsied et al., 2018). To better understand reading comprehension and other related skills would be beneficial for EFL teachers and learners. Although some studies have demonstrated the importance of lower and higher level comprehension skills in developing proficiency in reading, fewer studies of English as a second or foreign language have contrasted these differing skills in investigations of what may influence good or poor reading comprehension. However, examinations of specific contrasts between the level of lower and higher level skills have not been performed, for example, whether levels of the lower skill had an impact on the higher skill. Therefore, the current study included measures of whole word recognition, vocabulary, and grammar, as well as inference making, in

order to investigate their potential influence on English foreign language learners' reading comprehension. An understanding of the skills that support reading comprehension may be of benefit with regard to the best instructional methods in a language classroom to prevent literacy failure (Silva & Cain, 2015) and this may also support procedures to support English learners in an adult student context.

2. OBJECTIVE OF THE STUDY

The research objectives were to assess the relationships between reading comprehension and measures of lower level comprehension skills (vocabulary, grammar, and word processing) and a higher level comprehension skill (inference making), and to determine if these measures of higher and lower level comprehension skills predicted different levels of variance in reading comprehension.

3. REVIEW OF LITERATURE

3.1. Lower level comprehension skills

To be able to comprehend a text requires accurate word decoding and recognition. As a result, decoding ability and word recognition skills show a high predictive ability to comprehension (Perfetti & Hart, 2001). However, several studies suggest that the impact of word decoding becomes small in predicting reading comprehension (Ouellette & Beers, 2010), and its influence eventually disappears when readers enter the secondary educational level (van Gelderen et al., 2007). Therefore, word decoding or word reading have received the most attention in teaching young readers. Similarly, in Thai EFL context, research areas on instruction aiming to develop word decoding or spelling have been conducted in several studies in children; such as, Punyapet and Laohawiriyanon (2012) which investigated the effects of systematic remedial phonics instruction on the development of pronunciation, spelling and reading comprehension skills of eight grade 7 Thai students. Butkhen and Leenam (2015) examined whether using pictures can improve English vocabulary achievement of grade 3 students. One of few studies conducted with Thai college students is the study of Bancha

(2013) which investigated types of spelling inaccuracy and assessed the causes of misspelling among 31 first year Thai university students. The result demonstrated ten types of spelling mistakes which result from the lack of awareness of phonology and insufficient knowledge of inflectional morphology. However, investigation on the relationship between word decoding, other language skills and reading comprehension have not been found. In sum, the ability to recognise individual words has not been much investigated in the adult context, particularly in the EFL context; thus the current study included this aspect.

Another significant component to text comprehension is vocabulary knowledge (Daugaard et al., 2017). There is a strong relationship between vocabulary and reading comprehension as scores on tests of reading comprehension and vocabulary in parallel demonstrated (Anderson & Freebody, 1981; Stanley et al., 2018). Similarly, in the EFL contexts, a positive relationship between vocabulary and reading comprehension is demonstrated in a number of studies (e.g., Chou, 2011; Hatami & Tavakoli, 2012; Nirattisai, 2014). A study by Ibrahim et al. (2016) investigated the relationship between vocabulary size and reading comprehension among pre-university students in Malaysia and found a positive relationship between vocabulary and reading comprehension. In addition, Thavornpon (2012) explored the relationships between vocabulary learning strategies, vocabulary knowledge and reading comprehension with 160 first year health sciences students. The results showed a positive effect of vocabulary strategies and vocabulary knowledge of EFL Thai learners on their reading ability. In terms of these relationships, vocabulary knowledge has been investigated with other comprehension skills, such as lexical inferencing. For example, a study by Hatami and Tavakoli (2012) investigated the influence of vocabulary on lexical inferencing in a group of English second language learners. Both vocabulary breadth (the number of words known) and depth (the richness of word knowledge) explained variance in lexical inferencing success. Furthermore, there were other studies, for example, Ibrahim et al. (2016) investigated the relationships between vocabulary knowledge, reading comprehension, and writing ability among 175 EFL college students in Malaysia. The results showed that vocabulary knowledge demonstrated a positive contribution to reading and writing proficiency in this study. Chou (2011)

examined the influence of vocabulary knowledge and background knowledge on EFL reading comprehension with 159 Taiwanese college students. The results showed that the participants who received a list of vocabulary performed better on the reading comprehension test than those provided with the background knowledge of reading texts.

Recent studies have focused on the learning strategies and teaching methods to promote vocabulary acquisition in the EFL context. Numerous research works (Boonnoon, 2019; Nirattisai, 2014; Pookcharoen, 2016; Puangsang & Intharaksa, 2017; Saengpakdeejit, 2014; Siriwan, 2007) investigated vocabulary strategies used by Thai undergraduate students. Rungwaraphong (2020) studied using glossing to assist Thai EFL students to acquire new English vocabulary.

Grammar is the method by which a set of rules is applied to combine word meaning with sentence structure to create a comprehensible meaning for a reading text (Poulsen & Gravgaard, 2016; Silva & Cain, 2015). The significance of grammar to text comprehension is clearly evident when lexical information is presented well but the necessary grammatical cues are not. As a result, successful reading comprehension does not occur (Grabe, 2005). Grammatical knowledge provides a predictive role for reading comprehension longitudinally (Muter et al., 2004). Lexical and grammatical cues play a crucial role in the Thai EFL context, because they are fundamental to constructing both local and global coherence of a reading text (Malelohit, 2016; Zwaan & Rapp, 2006). Unfortunately, the study of Saengboon (2017) demonstrated that the Thai university students performed poorly on a grammar knowledge test. It suggests that many Thai EFL undergraduate students do not acquire ample grammar knowledge.

An extensive number of previous studies on grammar in the EFL context, including in Thailand, have investigated two areas: grammar teaching methods (Kumduang, 2019; Lin et al., 2020; Liu, Sands-Meyer, & Audran, 2019; Malelohit, 2016; Sukchuen, 2001) and grammar learning strategies (Alsied et al., 2018; Saengboon, 2017; Supakorn, Feng, & Limmun, 2018). For example, Malelohit (2016) used the cooperative learning using Student-Teams-Achievement Division (STAD) technique to improve English grammar outcome for Thai undergraduate students. Alsied et al. (2018) investigated the use of different types of strategies to learn grammar by 121 Libyan EFL undergraduate students. The results found that the most frequently used strategies were memory strategies.

Furthermore, some studies examined the relationship and predictive power of grammar to reading comprehension (Akbari, 2014; Alsied et al., 2018; Gürata, 2008; Kumduang, 2019). In the study of Shiotsu and Weir (2007), grammar demonstrated a more positive role in predicting reading comprehension than did vocabulary in an EFL context. Aryadoust and Baghaei (2016) examined the relationships between reading comprehension and vocabulary and grammar knowledge of 825 EFL learners by employing an Artificial Neural Network (ANN), a computational model used to generate these relationships. The finding indicated that vocabulary knowledge was related to reading comprehension more strongly than grammatical knowledge. Furthermore, some recent studies investigated the reversed relationship how reading assist with vocabulary development, such as J. Lee et al. (2015) which assessed the effect of two types of reading instruction, extensive reading and translation with 124 EFL learners in South Korea. The results indicated that after extensive reading and translation instruction, students showed better grammar knowledge based on pretest and post tests.

3.2 Higher level comprehension skills

With the respect to the higher level comprehension skills, inference making processes occur when the reader combines the ideas communicated in the text with his or her background knowledge to generate information that is not explicitly stated in the text (Graves et al., 2007; van den Broek et al., 1995). Good inference making has been demonstrated as a key to text comprehension (Cain, 2010; Cain et al., 2001; Dole et al, 1991; Eason et al., 2012). Studies on the development of inference making have demonstrated that young children generate similar inferences to those made by adults; however, they tend to do so more slowly than adults (Casteel & Simpson, 1991). Furthermore, training in inference making can improve the reading comprehension ability of children (e.g., Elbro & Buch-Iversen, 2013; McGee & Johnson, 2003).

A number of longitudinal studies have consistently revealed the significant influence of inferential skills on reading comprehension with young children whose first language is English (Kendeou et al. , 2008; Kendeou et al., 2007; Oakhill & Cain, 2007). However, in general EFL

contexts, only lexical inference, the ability to identify the meaning of unfamiliar words, has been focused on (e.g., Aryadoust & Baghaei, 2016; Prior et al., 2014; Riazzi & Babaei, 2008). For example, Wu and Shen (2009) investigated the relationship between EFL learners' reading proficiency and lexical inference performance of 145 Taiwanese college students. Three instruments consisting of, a reading proficiency test, a lexical inference task, and a vocabulary strategy, were used to assess their abilities. The findings indicated that correlations between EFL learners' reading proficiency and their lexical inference performance and their reading strategies were significant. There have been few studies investigating other types of inference in EFL contexts, in Thailand or elsewhere. H. Lee (2013) examined how ESL primary school students make inferences during reading. Six primary students participated in a think-aloud session where they read texts. The results showed that they had low performance in bridging and global inferencing. Bridging inferencing is an ability to construct connections to form a coherent meaning; and global inferencing is an ability to apply extra but significant information to the text to fulfil mental representation of it.

4. METHODOLOGY

4.1 Participants

A random sampling procedure was used to select 126 participants from a population of 924 students in the faculty of Sciences and Art at one Thai university. Based on data from a questionnaire completed by the students, their average age was 20.99 (SD=.70), there were 27 males and 99 females, all Thai native speakers who have studied English as a foreign language as part of the Thai education system. The participants were comprised of second to fourth year students from a variety of programs (for example, business administration and English for business communication).

4.2 Design and measures

This present quantitative study aimed at understanding more about the relationships between comprehension skill measures and reading comprehension. Quantitative research works with statistics or numbers.

By using statistics, quantitative methods allow researchers to numerically describe phenomena, and assist researchers in determining relationships between two or more variables (Stockemer, 2018). In this study, all four measures on comprehension skills were independent variables, whereas reading comprehension was a dependent variable. The study assessed the collection of quantitative data collected from three measures of lower level comprehension skills, inference as a single higher comprehension skill, and reading comprehension. The participants were administered five assessments to determine their skill levels. The raw scores from these measures were used to perform statistical analysis to investigate the relationships between the variables in the study.

4.2.1 Word processing

This test was included as a measure of word-level literacy to assess both the accuracy and fluency in recognizing a whole word in a line of letters. A word-chain test was developed for present purposes. This was based on one used in the study of Elbro and Buch-Iversen (2013). Each item comprised four words with no spaces (e.g., "connectionssharetype"). All 140 words in the test were selected from a range of 1000th to 7000th headwords of Nation (2018). In this task, participants were asked to divide up the chains into words by inserting slashes (connection/share/type) between the whole words. Students were given 15 minutes to complete the 35 items or as many as they could. The scoring was by the number of correctly divided chains within the time limit. One item with low item-total correlation was removed to improve the test reliability: the remaining 34 items produced a reliability (Cronbach's alpha) score of 0.90. Therefore, this 34 item measure was used in the following analyses. An example of the word processing is presented below:

Example: 1. robustinmatecardinalsermon

Answer: robust/inmate/cardinal/sermon

4.2.2. Vocabulary

Thirty-five items from the vocabulary size test of Nation and Beglar (2007) were used to explore the number of English words that the participants had acquired. The standardized test covered 7,000 words from the vocabulary size data set (Nation & Beglar, 2007). Thirty-five test

comprehension questions targeted the factual information which clearly appeared in the text. Second, grammatically connecting inferences asked for a referent which was used in the reading text: for example, to be able to answer the question “Where did Tim put his overalls?”, the reader needs to infer that “them” refers to “overalls” in the sentence “Tim took off his dusty overalls and threw them into a plastic garbage bag”. Third, vocabulary relating inferences investigated the ability to identify that two words or phrases have the same meaning in a text: for example, the reader needs to recognize that “every morning” and “daily” have the same meaning in the text to answer one of the questions correctly. Fourth, text coherence inferences focused on connecting the information appearing in two phrases or sentences to resolve the meaning of a reading text. An example of this type of question from the study of Cain and Oakhill (1999) is: “Michael got some drink out of his duffel bag and they shared that. The orange juice was very refreshing”. The reader needs to make a connection between “some drink” and “orange juice” to achieve the correct answer of “his duffel bag” when asked the question “Where did Michael get the orange juice?”. Finally, prior knowledge inferences examined the reader’s ability to combine information in the text with background knowledge to determine ideas that are not explicitly stated in the text. An example for this sort of inference from Hogan et al. (2011, p. 6) is “No one came to the party. Nancy threw away the cake.”, with the question being “What was Nancy’s feeling after the party?”. The possible answer would likely be that she was upset, but this has to be inferred from knowledge about likely feelings in such incidents. For the 25 multiple choice questions in the administered test, the participants were to read the short reading texts silently to themselves and chose as many answers as they could. Four test items showed low item-total correlations were removed. This increased the reliability (Cronbach’s alpha) score to 0.85. An example of a reading text and related inference questions are provided below.

Passage 1 Paul usually has a very long day because he spends forty minutes driving to work every day. He usually works eight hours a day. Today he wanted to buy something nice for Alice. When he got home in the late evening, with a bunch of lovely flowers, he took his muddy boots off on the steps of the front porch. Alice would get angry if his dirty items made it as far as the welcome mat. He also took off his dusty overalls and threw them into a plastic garbage bag. Alice leaves a

new bag tied to the porch railing for him every morning. He went straight to take a shower as he had been instructed by Alice. Then, he joined her to eat dinner after he had made himself “presentable,” as Alice often said. Alice prepared Paul’s favorite drink. He sat comfortably and grabbed a can of beer.

Literal comprehension question

1. How long did Paul take to drive to work?
 - a. every day
 - b. every evening
 - c. forty minutes
 - d. eight hours

Grammatically connecting inference

2. Where did Paul put his overalls?
 - a. on the front porch
 - b. on the welcome mat
 - c. in a garbage bag
 - d. in the washing machine

Vocabulary relating inference

3. How often does Alice change the plastic garbage bag?
 - a. daily
 - b. every two days
 - c. every week
 - d. when the bag is full

Text coherence inference

4. What does Paul like?
 - a. flowers
 - b. beer
 - c. driving
 - d. having dinner

Prior knowledge inference

5. What type of job does Paul appear to have?
 - a. a librarian
 - b. a manager
 - c. a doctor
 - d. a labourer

4.2.5 Reading comprehension

The reading section of the IELTS general training was applied in order to examine the participants' reading comprehension ability. The general training section of IELTS measures the English proficiency of those who aim to work or study at below degree level in an English-speaking country: it is a standardized test for these purposes. The general training reading passages contain authentic materials, such as newspaper texts (British Council, 2019). The test was composed of 20 items, drawn from three reading passages. For the current sample, two items showed poor item-total correlations and were removed to produce a Cronbach’s alpha reliability score of 0.83 for the 18 item measure.

4.3 Data collection procedures and analysis

Data collection was conducted by the researcher at a university in Thailand during the 1st semester of the Academic Year 2019. One hundred twenty six participants completed the five assessments. Group test administration of the measures was conducted in three sessions on different days to avoid tiring the students. Each administration section was carried out approximately 25-30 minutes. Three test administration sections were assigned as follow: reading comprehension, inference and word processing, and grammar knowledge.

To investigate the relationship between the lower level comprehension skills, a higher level comprehension skill, and reading comprehension, the study assessed the participants' performance in lower and higher level comprehension skills and reading comprehension. For overall analysis, the participants were focused as the entire participants. In addition, performance on a vocabulary measure was also used to determine two groups of students: those with low vocabulary levels and those with high vocabulary levels: a simple mid-point split was used to determine these two groups, so that there were roughly equal numbers of students in both. The descriptive statistics analysis was initially conducted to assess level of performance in measures. The focus of the analyses was at relationships between the measures. Pearson correlation coefficients (Bachman, 2004) was used to demonstrate the relationships all measures. Furthermore, a series of hierarchical regression analyses were conducted to investigate differences in the level of prediction of reading comprehension between the different measures of lower and higher comprehension skills. Entry of measure into regression, vocabulary was first entered the group-categorization.

5. RESULTS

The results are presented in two sections. First, the descriptive statistics and correlations between variables are presented. Regression analyses are then presented to determine the level of prediction of variability in reading comprehension produced by the different variables in the study. All analyses were conducted using the raw data of 126 participants consisting of 65 low vocabulary and 61 high vocabulary students. Means

and standard deviations for each of the measures are shown in Table 1. All measures demonstrated a range in scores with none showing major floor or ceiling effects. Overall, the mean scores for the high vocabulary group were higher than those of the low vocabulary group.

Table 1

Descriptives Statistics of the Five Measures for the Low Vocabulary and High Vocabulary Participants

		Vocabulary (29 items)	Word processing (34 items)	Grammar (17 items)	Inference (21 items)	Reading comprehension (18 items)
Low Vocabulary (N=65)	Mean	12.43	18.85	6.25	11.63	5.38
	SD	3.54	6.13	2.92	4.45	2.88
High Vocabulary (N=61)	Mean	20.74	25.89	10.64	17.62	11.33
	SD	2.47	4.29	2.80	2.26	2.86
Total (N=126)	Mean	16.45	22.25	8.37	14.53	8.26
	SD	5.17	6.37	3.60	4.65	4.13

The correlation analyses between five variables for 126 participants are presented in Table 2. All measures were significantly correlated with each other, with the correlation between vocabulary and inference making being the greatest.

Table 2

Correlations Between Vocabulary, Word Processing, Grammar, Inference and Reading Comprehension for 126 Participants

Measures	1	2	3	4	5
1. Vocabulary	1				
2. Word processing	.662**	1			
3. Grammar	.715**	.559**	1		
4. Inference	.790**	.570**	.617**	1	
5. Reading comprehension	.739**	.551**	.696**	.697**	1

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

Additional correlation analyses were performed for the low vocabulary and high vocabulary groups. These are presented in Table 3. The low vocabulary group showed positive relationships between reading comprehension and all measures, with the grammar measure showing the largest correlation with comprehension. In contrast, the results for the high vocabulary group demonstrated that reading comprehension was significantly related to all measures, with the Inference measure showing the greatest correlation.

Table 3

Correlations Between Measures for the High Vocabulary Group (Upper, Right-Hand Corner) and Low Vocabulary Group (Lower Left-Hand Corner)

	Vocabulary	Word processing	Grammar	Inference	Reading comprehension
Vocabulary		.173	.321	.346	.242
Word processing	.558		.124	.169	.115
Grammar	.580	.474		.225	.344
Inference	.687	.392	.457		.425
Reading comprehension	.484	.364	.572	.475	

*Correlations in bold are significant at the .01 level

*Correlations in bold and italics are significant at the .05 level

Regression analyses investigating predictors of reading comprehensions are reported in Table 4. A series of hierarchical regression analyses were conducted on the data from the low vocabulary group and separately for the high vocabulary group. These entered the vocabulary measure first (this was the group-categorisation measure, but was controlled in the analyses in case it still predicted variance), followed by the individual word processing measure (assessing word-level prediction), then the grammar measure (assessing links between words/phases) and finally the inference measure (to assess the influence of higher level comprehension skills over that of lower level skills). Beta scores for the final model (with all variables entered) were also calculated. For the low vocabulary group, only grammar predicted unique variance in reading comprehension outcomes. In contrast, for the high

vocabulary group, inference task explained the largest variability in reading comprehension.

Table 4

Results of Regression Analysis

	Low Vocabulary			High Vocabulary		
	R ² change	Anova	Final Beta	R ² change	Anova	Final Beta
Vocabulary	.234	$F_{(1,63)}=19.25$ $p<.001$	.068 ($p=.677$)	.058	$F_{(1,59)}=3.66$ $p=.061$	.036 ($p=.781$)
Word processing	.013	$F_{(1,62)}=1.07$ $p=.306$	.045 ($p=.718$)	.005	$F_{(1,58)}<1$ $p=.563$	.018 ($p=.882$)
Grammar	.116	$F_{(1,61)}=11.11$ $p=.001$	.409 ($p=.002$)	.076	$F_{(1,57)}=5.07$ $p=.028$	.250 ($p=.048$)
Inference	.026	$F_{(1,60)}=2.57$ $p=.114$	.224 ($p=.114$)	.107	$F_{(1,56)}=7.92$ $p=.007$	.353 ($p=.007$)
Total variability explained	39%			25%		

6. DISCUSSION

This study aimed to investigate the associations between lower and higher level comprehension skills and reading comprehension, thereby assessing the predictive ability of lower and higher level comprehension skills in EFL adult learners. Two primary contributions from the study are discussed below.

6.1 The relationships between lower and higher level comprehension skills in the EFL context

There were positive relationships between all lower and higher comprehension skills, with the largest correlation appearing between vocabulary and inference making ($r=.790$). The positive relationships among all measures within a group of EFL undergraduate students support the positive reciprocal development of all skills in the reading comprehension process. Several previous studies in the EFL contexts

have been focused on a few skills rather than multiple comprehension skills, such as vocabulary and reading comprehension (e.g., Astan, 2014; Chen, 2011; Ibrahim et al., 2016), grammar knowledge and strategies and reading comprehension (Akbari, 2014; Alsied et al., 2018; Kumduang, 2019). Therefore, the current findings extend our understanding as to relationships between multiple comprehension skills in the Thai EFL contexts. In addition, the largest correlation between vocabulary and inference making confirms the view that vocabulary knowledge supports higher comprehension processes, such as making inferences (Calvo, 2004). The study of Hatami and Tavakoli (2012) also indicated that both vocabulary breadth and depth play a critical role in lexical inference generation. Moreover, it is consistent with the importance of vocabulary that has been identified in studies conducted with young English (L1) participants into the early stage of reading comprehension (e.g., Currie & Cain, 2015; Kendeou et al., 2009). However, there have not been any similar previous EFL studies to be further referred to.

In terms of word processing analysis, the current study suggests that while individual word processing does show a positive correlation with comprehension in the low vocabulary group, it did not show such a sizeable correlation with the high vocabulary group data. It is likely the case that the high vocabulary readers had better developed word recognition skills and therefore, in comparison to the low vocabulary students, were not relying to the same extent on such skills. This additional English language data may be consistent with findings for other first language data, in that written word recognition processes will become less predictive of reading comprehension levels as reading proficiency and experience improves. Language comprehension skills then become more significantly correlated with reading comprehension in comparison to decoding skills (Kershaw & Schatschneider, 2012). Indeed, several studies indicate that the influence of word decoding reduces to relatively small levels by the end of grade 6 (Ouellette & Beers, 2010; Verhoeven & Van Leeuwe, 2008).

6.2 The role of lower and higher level comprehension skills in the prediction of reading comprehension in the EFL context

Regression analysis was conducted to investigate the predictive power of lower and higher level comprehension skills on reading comprehension

within the low and high vocabulary groups. The low vocabulary group data demonstrated that while all predictors showed some predictive ability with regard to reading comprehension, the knowledge of grammar made the greatest contribution to predicting reading comprehension. The finding is consistent with the significance of grammar knowledge which appear in several research works in the EFL contexts (Akbari, 2014; Gürata, 2008; Shiotsu & Weir, 2007). Generally speaking, both lower and higher comprehension skills are necessary for discourse comprehension (Hogan et al., 2011). Text comprehension involves two processes: (1) at the lower level, readers need to decode the written texts into their basic linguistic meaning; (2) while at the higher level, readers combine these individual idea units into larger units to form meaningful and rational comprehension (Kendeou et al., 2014). As low vocabulary level students had acquired only a limited number of vocabulary words, they might struggle to comprehend even explicit texts in lower level comprehension processes. This finding might be attributed to the greater significance of the role of lower comprehension skills, such as grammar, in constructing the literal meaning of reading texts. Therefore, it is reasonable to expect that grammar explained most of the variance in the low vocabulary group.

This was not the case for the high vocabulary group. Their data indicated that inference was the largest predictor of reading comprehension. This finding is in line with several previous longitude studies providing evidence for the importance of inference making for the development of reading comprehension with children who learned English as their first language (Cain & Oakhill, 2007; Kendeou et al., 2008; Purvis, 2014). For example, the study of Silva and Cain (2015) revealed that grammar made a unique contribution to reading comprehension with a group of 4- to 6-year-old learners in the U.K. In addition, it is also consistent with some studies in the EFL context; (e.g., Dhanapala & Yamada, 2015; Prior et al., 2014; Riazi & Babaei, 2008); however, the studies in the EFL have focused on only lexical inferencing. The high vocabulary students achieved higher mean scores in the study measures compared to those in the low vocabulary group. It may be reasonable to argue that they had likely already acquired lower comprehension skills. As a result, inference, a higher level comprehension skill, showed a greater predictive role, above word processing and grammar knowledge. Inference making is the ability to construct coherent meaning of a text,

which readers need to generate the inferences that combine both information from the text and their background knowledge (Graesser et al., 1995). After understanding a text explicitly, inference generation is significant for a reader in the development of a mental representation of a text (Graesser et al., 1995; Van Dijk & Kintsch, 1983).

7. LIMITATIONS, IMPLICATIONS, AND CONCLUSIONS

This study investigated the relationships between lower level comprehension skills and higher level comprehension skills, and their predictive roles in reading comprehension. The results support the view that both lower and higher comprehension skills are significant predictors of variance in text comprehension (Oakhill & Cain, 2012; Silva & Cain, 2015) in adults learning English as a foreign language contexts as well as first language learning contexts. However, one limitation in this study was that inference was the only measure used to represent the higher level comprehension skills, which resulted in only a limited range of knowledge of the higher level comprehension skills being examined in the study.

There are two practical implications that can be drawn from the analysis of the current study. Based on the evidence of the positive relationships among lower and higher comprehension skills, we suggest that training in and the practice of lower and higher level comprehension skills would be recommended. Teachers should consistently teach and encourage learners to develop these skills. The second is drawn from the findings that reading comprehension is determined by both lower and higher comprehension skills in EFL adult learners.; however, the emphasis on lower or higher level comprehension may vary at different stages in the acquisition of foreign language skills. Learners need to have sufficient lower comprehension skills—vocabulary and grammatical knowledge—prior to achieving the deeper meanings of a text (Hogan et al., 2011; Kendeou et al., 2014). Therefore, in assessing the learners' reading abilities, it would help teachers to plan suitable reading instruction to assist learners develop their lower or higher level comprehension skills to their fullest reading potentials

In conclusion, it is important to understand what underpins the processes of comprehension for EFL learners. The findings from this study suggest that both lower and higher level comprehension skills are

crucial. Grammar plays a more significant role for the low vocabulary learners, while inference making is crucial for the high vocabulary students. This study shed light on the implementation of the significance of lower and higher level comprehension skills in the Thai EFL higher education setting, which would be likely to be applicable in other EFL situations. Furthermore, additional measures of the lower and higher lever comprehension skills should be further investigated with the EFL college students as these may increase the level of variability in reading comprehension explained. For example, the addition of measure of comprehension monitoring in the study would provide wider understanding of the relationships between these comprehension skills. Better understanding about the relationships between various higher level comprehension skills would be beneficial for EFL instruction.

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