Proficiency Effects on Relative Roles of Vocabulary and Grammar Knowledge in Second Language Reading*

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The present study examines L2 reading proficiency effects on the relative contribution of vocabulary knowledge and grammar knowledge to L2 reading comprehension for Korean high school EFL learners. To this end, 200 high school students were asked to take a vocabulary knowledge test, a grammar test, and a reading comprehension test. The participants were divided into three sub-groups by L2 reading ability in order to examine L2 proficiency effects. Multiple regression analyses for the sub-groups indicated the relationships among the three variables as distinctive. The results showed that syntactic knowledge had a predictive power for reading performance in the high reading group, but vocabulary had the same quality in the intermediate reading group. For the low reading group, neither vocabulary nor grammar could significantly account for the L2 reading variance. Theoretical implications and directions for further studies are discussed.

**Key Words:** vocabulary knowledge, grammar knowledge, L2 reading comprehension, reading proficiency, commonality analysis

1. INTRODUCTION

As important as it is to achieve fluency and accuracy in reading for language learners, most second language learners struggle to improve their reading ability, and second

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language educators and researchers have sought to find ways to help learners to do so. However, the answer seems quite unattainable or highly complicated, largely due to the multifaceted nature of reading. Since Alderson (1984) raised the question of whether L2 reading is a reading problem or a language problem, numerous L2 reading researchers have launched investigations on the issue and provided substantial evidence for the critical role of language knowledge in L2 reading (Alderson, 2000; Bernhardt, 2005; Bernhardt & Kamil, 1995; Bossers, 1991; Koda, 2004; Lee & Schallert, 1997; Taillefer, 1996; Yamashita, 2002).

As L2 reading studies accumulated, there was a need to examine the construct in a more systematic way, and a component-skills approach was utilized in the field (e.g., Haynes & Carr, 1990). This approach regards reading as consisting of multiple cognitive processes and involving various subskills (Jeon & Yamashita, 2014). Adopting this approach, the components of language knowledge were also examined in relation to L2 reading, and it turned out that vocabulary and grammar were two most essential types of language knowledge required for proper L2 reading (Alderson, 1984; Barnett, 1986; Brisbois, 1995; Nassaji, 2003; Yamashita, 2002). This has been reflected in the L2 reading models of Bernhardt (1991, 2000, 2005, 2011), Birch (2007), and Khalifa and Weir (2009). The importance of grammar and vocabulary was also supported by the results of a meta-analysis conducted by Jeon and Yamashita (2014). They conducted a meta-analysis of 57 correlational studies, based on learners of a different L1, L2, age range, and L2 proficiency, to examine “the overall average correlation (weighted for sample size and corrected for measurement error) between passage-level second language (L2) reading comprehension and 10 key reading component variables investigated in the research domain” (p. 160). They found that vocabulary and syntax are the two strongest correlates of L2 reading.

However, these previous studies that investigated the relative importance of vocabulary and grammar in L2 reading have not provided consistent findings. Brisbois (1995), Chen (2009), Guo (2008), Nassaji (2003), and Zhang (2012) found vocabulary to be more important than grammar in L2 reading, whereas Jeon (2012), Shin and Kim (2012), Shiotsu (2010), Shiotsu and Weir (2007), and van Gelderen et al. (2004) found the opposite. Possible explanations for this discrepancy might be differing sample sizes, ages of the participants, L1-L2 distance, L2 use environment, methods of analyses, operational definitions of the variables, and L2 proficiency.

Among those, the present study sought to extend this field by taking learners’ reading proficiency and age into account. First, the present study attempted to examine whether the respective roles of vocabulary and grammar knowledge in L2 reading differ among three

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1 The term ‘grammar’ is used in the present study to refer to the syntactic knowledge, i.e. the knowledge of how sentences are structured.
levels of learners’ L2 reading proficiency. Previous studies have investigated the roles of vocabulary and grammar in two reading ability levels (e.g., Brisbois, 1995; Guo, 2008; Nassaji, 2003; Shiotsu, 2010; Shiotsu & Weir, 2007). However, when a normal distribution of L2 learners’ proficiency levels is assumed, it is more realistic to divide the participants into three ability groups rather than two, as the number of intermediate level L2 readers should exceed that of advanced- or low-level learners. Furthermore, the findings of this study would have more relevant pedagogical implications in a general school setting with diverse L2 reading abilities. Second, by investigating L2 reading of adolescents, the present study seeks to expand the diversity of the participants in the field where adult participants have been predominant. Furthermore, as they attend a public high school, the participants in the present study are expected to represent a broader spectrum of L2 readers of varying abilities than the college students participating in previous studies. The findings of the present study would thus provide not only theoretical but also pedagogical insights into a general school setting with students of diverse L2 reading abilities.

Based on these rationales, the present study was embarked on in order to gain a better understanding of the relative roles of vocabulary and grammar in English reading of Korean high school students. Particularly, it sought to investigate whether the roles of vocabulary and grammar knowledge in L2 reading differ among three levels of learners’ L2 reading proficiency.

2. THEORETICAL BACKGROUND

After Barnett (1986), many researchers followed suit by examining L2 reading in relation to vocabulary and grammar as separate variables. While the significance of both vocabulary and grammar knowledge in L2 reading was predominantly acknowledged, the findings regarding the relative weights of the two variables remain inconclusive. For instance, the correlational studies by Brisbois (1995), Nassaji (2003), Guo (2008), and Chen (2009) found the degree of correlation between vocabulary and reading to be greater than between grammar and reading. Based on multiple regression and structural equation modeling (SEM) analyses, Chen (2009), Shin and Kim (2012), van Gelderen et al. (2004), and Zhang (2012) found that one’s vocabulary knowledge accounted for more L2 reading performance than syntactic knowledge. However, opposite results were reported in the studies of van Gelderen et al. (2003), Shiotsu and Weir (2007), and Shiotsu (2010).

Among those previous studies, some attempted to investigate the effect of L2 proficiency on the roles of vocabulary and grammar in relation to L2 reading (e.g. Brisbois, 1995; Guo, 2008; Shiotsu, 2010; Shiotsu & Weir, 2007). For example, Brisbois (1995) examined the contributions of L2 vocabulary and grammar to L2 reading at the beginning
and advanced levels of reading proficiency. The participants were 131 English-speaking French learners, 84 beginners and 38 at the upper levels, at the US Air Force Academy. The L2 grammar test consisted of multiple-choice and cloze items, and the L2 vocabulary test was made up of fifty lexical items selected from the passages in the L2 reading test, for which the participants were required to write the definition in English or the English equivalent. The reading comprehension test was conducted in a free written recall task. The hierarchical multiple regression analyses showed that while both predictors proved to be significant for beginners, only L2 vocabulary achieved significance for upper level learners. Overall, “the variance of the L2 vocabulary scores contributed more to that of the L2 reading comprehension scores than did the variance in the L2 grammar scores, which in most cases contributed the least” (pp. 576-577).

Another study favoring vocabulary knowledge for advanced learners was Zhang (2012), who conducted an SEM analysis with data obtained from 172 Chinese EFL learners attending a graduate school in China. Breadth and depth of vocabulary knowledge were measured by the Vocabulary Levels Test and Word Associates Test, respectively. Two measurement instruments were used to tap into two types of grammar knowledge: (1) a 98-item test of a timed grammatical judgment task designed to tap into learners’ implicit knowledge of grammar, and (2) a 20-item test of a grammatical error correction task devised to measure learners’ explicit knowledge of grammar. The grammar test items were taken from the grammatical structure sections of retired TOEFL tests. The reading comprehension was composed of six passages, each with three multiple-choice questions. The SEM analysis showed that vocabulary knowledge was the stronger predictor of the learners’ reading comprehension abilities than grammatical knowledge.

Other studies, however, reported that learners’ grammar knowledge accounted for more L2 reading performance. For example, Shiotsu and Weir (2007) took language proficiency into account when examining the relative role of grammar knowledge and vocabulary breadth in L2 reading. The researchers analyzed data from 591 Japanese EFL learners attending five universities in Japan. They employed an abridged version of the Vocabulary Levels Test with 60 items in order to assess the breadth of participants’ vocabulary knowledge. The participants’ knowledge of grammar was measured by a sentence completion task with 32 items, each followed by four options. The reading comprehension test consisted of four passages, each followed by five multiple-choice questions, which were designed to measure one’s global understanding of a passage. The criteria used for classifying the participants by language proficiency were the status of the university they were attending and their majors, namely English or non-English majors, at the time of the study. The results of SEM analyses of the subgroups suggested that while both vocabulary breadth and syntactic knowledge are significant predictors of L2 reading, relative significance lies in syntactic knowledge in both subgroups.
In a following study, Shiotsu (2010) carried out a research study exploring the effects of L2 linguistic as well as non-linguistic factors on both comprehensibility and reading speed of L2 reading among 219 L1-Japanese EFL college students. The factors included L2 vocabulary breadth, L2 word recognition efficiency, L2 phonological awareness, L2 working memory, L2 syntactic knowledge, and language-independent metacognitive knowledge of text and reading. The criteria used in dividing the participants into two reading ability groups and the testing instruments were the same as in Shiotsu and Weir (2007). Since the interest of the present study is in L2 reading comprehension, the findings relevant to the issue will be reviewed here. The results of the SEM analyses were similar to those of Shiotsu and Weir (2007). Both L2 vocabulary breadth and L2 syntactic knowledge were found to be statistically significant predictors of L2 reading regardless of the participants’ L2 reading abilities. In this study, the significance of syntax in relation to reading was even more pronounced, without ignoring the role of vocabulary. Shiotsu (2010, p. 153) concludes that “passage reading comprehension test performance is best accounted for by the breadth of knowledge in the target language syntax and additionally by the breadth of target language vocabulary” (p. 153).

The incongruent findings of the aforementioned studies can be explained by numerous causes, including the differences in the participants’ L1 and L2, operational definitions of the variables, and methods of analyses. In addition, the methodological flaws in each of the previous studies could have attributed to such inconclusive findings on the issue in question. In Brisbois’s study (1995), for instance, the selection of the lexical items greatly favored the upper level learners since those had been included in the upper-level curriculum. Moreover, she altered the vocabulary test to a reading test by asking the participants to write L1 counterparts of the L2 words within the L2 passage, and thus allowing them to infer the meanings from the passage provided. The grammar test items employed in Zhang’s (2012) study were taken from the grammar section of the TOEFL tests. They would thus require a high level of vocabulary knowledge in order to work out the grammar test items, possibly obscuring the distinction between a grammar test and a vocabulary test. These careless overlaps between the constructs hampered the credibility of the results. Incorporating appropriate assessment tools in measuring each construct is thus critical in the present study. Furthermore, most of the previous studies (e.g., Brisbois, 1995; Guo, 2008; Nassaji, 2003; Shiotsu, 2010; Shiotsu & Weir, 2007) divided the participants into two reading ability levels in order to examine proficiency effects on the roles of vocabulary and grammar in L2 reading. It is more realistic, however, to divide the participants into three ability groups, since the number of intermediate level L2 readers should exceed those of advanced or poor level if the levels were defined in relative terms. Overcoming these limitations of the previous studies, the present study investigates the roles of vocabulary knowledge and grammar knowledge in three levels of L2 reading.
3. RESEARCH METHODS

3.1. Research Questions

The present study aims to explore the respective roles of vocabulary and grammar knowledge in the second language reading comprehension by Korean EFL learners. Particular interest lies in whether the respective roles of vocabulary knowledge and grammar knowledge in L2 reading differ depending on the readers’ comprehensibility of an L2 text. The specific research questions are as follows:

1. How do vocabulary knowledge and grammar knowledge relate to L2 reading comprehension in three levels of reading proficiency?
2. What are the unique contributions of vocabulary knowledge and grammar knowledge in L2 reading comprehension in three levels of reading proficiency?

3.2. Participants

Two hundred Korean high school students learning English as a foreign language in seven intact classes participated in the study. They were all native speakers of Korean, and all were eleventh graders attending a public high school in Busan, South Korea. They had been taking English as a compulsory subject for seven years at the time of the study. The criterion used in dividing the students into three reading proficiency groups was the average score of the reading comprehension test (refer to the next subsection for the details of the test). The students with reading scores higher than the average score plus one standard deviation were assigned to the high reading level group (HR), and those with reading scores lower than the average minus one standard deviation were assigned to the low reading level group (LR). The students with reading scores lower than the average plus one standard deviation and higher than the average minus one standard deviation were placed in the intermediate reading level group (IR).

The resulting number of learners of high, intermediate, and low reading groups was 43, 108, and 49, respectively. To examine discrepancies in the reading test scores among the three groups, a one-way ANOVA was conducted. The results showed that the reading test...
scores differed significantly across the three groups, $F(2, 197) = 440.165$, $p < .001$, and a post-hoc Scheffé test revealed that they significantly differed by groups, $p < .001$.

3.3. Instruments

Three measurement instruments were employed in the study. All the tests were prepared in a multiple choice format, as the participants were very much used to multiple-choice tests like most students in Korean schools, and the directions and response options were provided in Korean wherever possible (see the Appendix for sample test items of the three tests). Table 1 summarizes the descriptions of three tests employed in the present study.

| TABLE 1 |
| Test Battery Description |
| Task | Number of Items | Reliability Estimates | Approximate Time Taken |
| Vocabulary test | 150 | .96 | 30 min |
| Grammar test | 50 | .85 | 30 min |
| Reading comprehension test | 20 | .73 | 30 min |

First, the Korean version of the Vocabulary Levels Test (VLT) was employed to measure the breadth of participants’ English vocabulary. The rationale for using the VLT as a measure of the students’ vocabulary knowledge is as follows. First, as Nation (2001) stated, the VLT measures receptive knowledge of vocabulary and taps into partial knowledge of a word. Schmitt, Schmitt and Clapham (2001) claimed that it should “be seen as providing an indication of whether examinees have an initial knowledge of the most frequent meaning sense of each word in the test” (p. 62). Since reading is also a receptive activity in a sense, and often the degree of lexical knowledge could be heightened through reading, the characteristic of the VLT was deemed suitable for the present study. Second, the discrete nature of the VLT ensures that the test is solely focused on measuring vocabulary knowledge. The possibility of its overlapping with the other constructs, grammar and reading, is actually non-existent. Therefore, construct validity is guaranteed. Finally, the VLT is the most widely used vocabulary test when assessing the size of one’s English vocabulary (Schmitt, 2010). Thus, use of this testing tool makes it possible to compare the results of the present study with many other existing studies. Decisions regarding the applicability of findings from this study in other contexts can also be

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3 The Korean version of the Vocabulary Levels Test (VLT) is a replica of the English version. The only difference between them is that the definitions are provided in Korean for the Korean version, but in English for the English version.
facilitated by using a common tool. The internal consistency reliability of the vocabulary test was excellent, with a Cronbach’s alpha of .96 in this sample.

The grammar test consisted of two multiple choice tasks, each with 25 items. One (GT1) was the task of finding the missing element of a stem sentence from four options provided, and the other (GT2) was the task of locating the ungrammatical element among four underlined sections of a sentence. Since there exists no comprehensive list of types of grammatical knowledge (Urquhart & Weir, 1998), the researchers opted for the inclusion of as many essential types as possible in the test from those included in commercial tests and in basic grammar books. The sentences of the grammar test were adopted from the Preliminary English Test (PET), First Certificate in English (FCE), and Grammar for IELTS (Hopkins & Cullen, 2008).

Alderson (1993) cautioned that a grammar test should be separated from a reading test. Too much dependency on the other construct in a grammar test would obscure its construct validity, and vice versa, although the construct of either grammar or reading is difficult to define. In any case, we opted to focus the grammar test on decontextualized sentences to minimize reading. To further increase the construct validity of the grammar test, several processes were administered. First, the level of vocabulary in the task was checked through VocabProfile (Cobb, 2002) in order to reduce vocabulary difficulty. Second, the readability of the test was examined to ensure that the sentences used were not complicated or hard to understand. Third, two experienced English professionals reviewed the test for the appropriateness. After several revisions, the final version of the test contained 91.9% of 1000 (K1) words and 5.4% of 2000 (K2) words. The words beyond the K2 level (2.7%) were considered fairly easy for the participants, according to the two professionals. The readability indices of the GT2 were almost identical with those of the GT1: the Gunning fog and SMOG index scores were 5.3 and 3.9, respectively. The two professionals also confirmed the plain language used and suitability of the test. The internal consistency reliability (Cronbach’s alpha) of the grammar test was .85 in this sample.

The reading comprehension test consisted of 20 items, involving four passages. The reading passages were adapted from two high school English textbooks which the participating school did not use (Kim et al., 2009; Kim et al., 2008), in an attempt to match their difficulty with the participants’ English proficiency level or at least with that of their English textbook. The four reading passages varied in difficulty to avoid ceiling and floor effects (Nagy, Anderson & Herman, 1987). The level of vocabulary and the readability of the texts were checked through the VocabProfile (Cobb, 2002) and the Readability Test Tool website, respectively. The mean length of the texts was 222 words long, and the average proportion of the K2 words is .895. As for the readability of the four passages, Flesh-Kincaid indices ranged from 5.1 to 7.2, and those of the Gunning fog ranged from 7.7 to 9.8. The reading comprehension questions were designed to necessitate six subskills
of reading: gist, detailed information, conjunction, co-reference, sequence, and inference. The estimated internal consistency reliability was acceptable, with a Cronbach’s alpha of .73 in this sample.

3.4. Data Collection and Analysis

The students were asked to take the three tests over three consecutive days in the order of vocabulary test, grammar test, and reading comprehension test. The tests were taken in their regular English classes, and were proctored by two English teachers of the school. They had a full understanding of the tests and the purpose of the study. Before each test, the teachers gave the students a brief overview of the test, and encouraged them to answer all the questions sincerely but to leave them blank rather than guessing blindly when they had no idea. The average time taken for each test, not counting test distribution time and time for an explanation, was about 30 minutes, and no student found the allocated time insufficient.

Each correctly answered item received one point, and incorrectly answered and unanswered ones received no points for all the test items. Prior to conducting correlation and multiple regression analyses, the students were divided into three groups with different reading abilities (high, intermediate and low) based on their reading comprehension test scores. To verify the group differences in their reading abilities, one-way ANOVA was performed and Scheffé tests were conducted as a post hoc analysis.

The respective roles of vocabulary and grammar knowledge in second language reading for the each group were investigated by conducting zero-order correlation and multiple regression analyses. First, zero-order correlation analyses were carried out to investigate the bivariate relationships among vocabulary knowledge, grammar knowledge and reading comprehension. Multiple regression analyses were then conducted to examine the predictive power of vocabulary and grammar knowledge for reading comprehension of the three reading ability groups. Specifically, structure coefficients, product measures, and commonality coefficients were calculated using the values obtained by multiple regression analyses (Nathans, Oswald, & Nimon, 2012). Structure coefficients\(^4\) were calculated to check the bivariate correlation between the learners’ vocabulary/grammar knowledge and reading comprehension predicted by the multiple regression model. Product measure\(^5\) was also

\(^4\) Structure coefficients were calculated by dividing the bivariate correlation between an independent and a dependent variable by the multiple correlation coefficient for the regression containing all independent variables.

\(^5\) The product measure was calculated by multiplying the variable’s zero order correlation by its beta weight (Pratt, 1987).
computed to examine the relative importance of each predictor variable based on the partitioning of the regression effect (Pratt, 1987). Finally, a commonality analysis was conducted to partition the regression effect into non-overlapping components of variance, and to identify exactly how much unique and common variance each predictor variable would contribute to the regression equation (Pedhazur, 1997).

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics of Respective Reading Proficiency Group

The roles of vocabulary and grammar in L2 reading comprehension were explored considering the students’ L2 reading proficiency. As the students’ reading comprehension ability levels varied to a large extent, they were grouped in three ability levels in order to examine the roles of vocabulary and grammar at different levels of L2 reading ability.

Table 2 summarizes the descriptive statistics for the vocabulary, grammar and reading test results of each group. In the HR group, the mean scores for the vocabulary, grammar, and reading tests were 91.00, 30.98, and 15.35, respectively. In the IR group, the average scores for the vocabulary, grammar, and reading tests were 73.56, 24.46, and 10.56, respectively. The mean scores for the vocabulary, grammar, and reading tests in the LR group were 57.20, 19.24, and 5.67, respectively. The mean scores of all three tests were highest for the HR group, and lowest for the LR group.

| Reading Level | Test     | Mean  | SD   | Min | Max  | Skew | Kurtosis |
|---------------|----------|-------|------|-----|------|------|----------|
| High (N = 43) | Vocabulary | 91.00 | 16.04 | 40  | 114  | -2.94| 2.39     |
|               | Grammar  | 30.98 | 7.43 | 16  | 45   | -0.23| -1.50    |
|               | Reading  | 15.35 | 1.40 | 14  | 19   | 2.58 | 0.04     |
| Intermediate (N = 108) | Vocabulary | 73.56 | 19.67 | 6   | 109  | -2.84| 1.16     |
|               | Grammar  | 24.46 | 7.31 | 12  | 44   | 2.38 | -0.28    |
|               | Reading  | 10.56 | 1.76 | 8   | 13   | -0.09| -2.77    |
| Low (N = 49)  | Vocabulary | 57.20 | 19.24 | 14  | 101  | 0.26 | -0.17    |
|               | Grammar  | 19.24 | 5.67 | 8   | 32   | -0.01| -1.19    |
|               | Reading  | 5.67  | 1.20 | 3   | 7    | -1.38| -1.18    |

To examine the differences among the test scores among the groups, a one-way ANOVA...
was conducted. Test scores differed significantly across the three groups. $F$ values for the reading, vocabulary, and grammar scores are as follows: $F(2, 197) = 440.165, p < .001$; $F(2, 197) = 36.850, p < .001$; and $F(2, 197) = 32.429, p < .001$, respectively. A post-hoc Scheffé test revealed that all test scores significantly differed by groups, $p < .001$. For all three tests, there were gaps among the intervals, confirming that the groups are distinct in all measures (Cumming, 2012).\(^7\) Apparently, as the students’ reading score increases, so do their vocabulary and reading scores.

### 4.2. Relationships Between Vocabulary, Grammar, and Reading Comprehension

Bivariate relationships among the variables were examined by computing Pearson product-moment correlation coefficients; the results are shown in Table 3. All correlations among the variables were statistically significant for the HR and IR groups. For the LR group, while the vocabulary and grammar scores were significantly correlated, $r(47) = .578$, $p < .001$, neither showed significant correlation with the reading score. As in the LR group, the effect of the correlation between the vocabulary and grammar scores was large, according to Cohen’s (1988) criteria, in both the HR and IR groups, $r(41) = .569, p < .001$ and $r(106) = .632, p < .001$, respectively. However, the correlations between the vocabulary and reading scores and between the grammar and reading scores were medium in both the HR and IR groups. The correlation coefficient for grammar and reading, $r(41) = .458, p < .01$, was greater than for vocabulary and reading, $r(41) = .314, p < .05$, in the HR group. On the other hand, the correlation coefficient for vocabulary and reading, $r(106) = .350, p < .001$ was greater than for grammar and reading, $r(106) = .319, p < .001$, in the IR group.

The coefficient of determination, $r^2$, suggested that the vocabulary scores explained 9.8% ($r^2 = .098$) and 12.3% ($r^2 = .123$) of the reading score variance for the HR and IR groups, respectively, while the grammar scores accounted for 20.9% ($r^2 = .209$) and 10.2% ($r^2 = .102$) of it for the HR and IR groups, respectively. Although not statistically

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\(^7\) The comparison of the confidence interval (CI) of each test scores corroborated these findings. As for the reading test, the mean score of the HR group was 15.35, 95% CI [14.92, 15.78]; that of IR was 10.56, 95% CI [10.22, 10.89]; and that of LR was 5.67, 95% CI [5.33, 6.02]. For the vocabulary test, the mean score of the HR group was 91.00, 95% CI [86.06, 95.94]; that of IR was 73.56, 95% CI [69.81, 77.32]; and that of LR was 57.20, 95% CI [51.68, 62.73]. The mean scores of the grammar test for the HR, IR, and LR groups were 30.98, 95% CI [28.69, 33.26]; 24.46, 95% CI [23.07, 25.86]; and 19.24, 95% CI [17.62, 20.87], respectively.
TABLE 3

Zero-order Correlations Among All Variables by Groups

| Variable   | Vocabulary | Grammar | Reading |
|------------|------------|---------|---------|
| HR Group   |            |         |         |
| Vocabulary | --         | .569*** | .314*   |
| Grammar    | --         |         | .458**  |
| Reading    | --         |         |         |
| IR Group   |            |         |         |
| Vocabulary | --         | .632*** | .350*** |
| Grammar    | --         |         | .319*** |
| Reading    | --         |         |         |
| LR Group   |            |         |         |
| Vocabulary | --         | .578*** | .083    |
| Grammar    | --         |         | .150    |
| Reading    | --         |         |         |

* p < .05; ** p < .01; *** p < .001

significant, the coefficient of determination for the vocabulary and reading scores was $r^2 = .007$, and that for the grammar and reading scores was $r^2 = .023$ for the LR group. According to the cutoff values of $r^2$ determining their effects as small ($r^2 = .02$), medium ($r^2 = .13$), and large ($r^2 = .26$) suggested by Cohen, Cohen, West and Aiken (2003), only the $r^2$ for the grammar and reading scores of the HR group showed medium to large effects, and the $r^2$ for the vocabulary and reading scores of the HR group and the $r^2$ for the grammar and reading scores of the HR and IR groups seemed to have small to medium effects. For the LR group, the $r^2$ for the vocabulary and reading scores had a negligible effect of .007, and for the grammar and reading scores it had a small effect of .023, and none of these values reached statistical significance.

In sum, the correlation analyses showed that the relationship between grammar and reading was higher than that between vocabulary and reading in the HR group, whereas the reverse was true in the IR group. However, in the LR group, neither vocabulary nor grammar was significantly correlated with reading.

4.3. Predictive Power of Vocabulary and Grammar Knowledge for Reading Comprehension

Since correlations do not reveal causal relationships among the variables, hierarchical multiple regression analyses were conducted to predict L2 reading outcomes using scores of vocabulary and grammar tests as predictors for each reading proficiency group. Assumptions of regression were checked before running the analyses, and no abnormality was observed. Skewness and kurtosis indices of the variables are summarized in Table 4. According to their VIF values and Tolerance, the data also met the assumption of collinearity, indicating that multicollinearity was not a concern. No VIF values were greater than 10, and no Tolerance was less than 0.1.

The prediction model was statistically significant only for the HR and IR groups, but not
for the LR group, as shown in Table 4. In HR group, the linear combination of language measures was significantly related to the reading comprehension index, $F(2, 40) = 5.43, p < .01$. The model accounted for approximately 21% of the variance of reading comprehension, $R^2 = .214$. Of the two predictor variables, only grammar reached statistical significance to be predictive of reading comprehension when the vocabulary variable was statistically controlled: $t(40) = 2.42, p < .05$ (cf. for vocabulary, $t(40) = .463, p = .646$).

### TABLE 4

| Group | Predictor Variable | $b$ | $\beta$ | $r_s$ | $r^2_s$ | Pratt $r$ | Pearson $r$ | Commonality Coefficients |
|-------|--------------------|-----|---------|-------|---------|-----------|---------------|--------------------------|
|       |                    |     |         |       |         |           |               | Unique                   |
|       |                    |     |         |       |         |           |               | Common                   |
| HR    | Vocabulary         | .007| .079    | .679  | .461    | .025      | .314          | .004                     |
|       | Grammar*           | .077| .413    | .990  | .981    | .189      | .458          | .115                     |
| IR    | Vocabulary*        | .022| .274    | .942  | .887    | .087      | .350          | .037                     |
|       | Grammar            | .039| .163    | .858  | .737    | .052      | .319          | .016                     |
| LR    | Vocabulary         | .000| -.005   | .556  | .309    | .000      | .083          | .000                     |
|       | Grammar            | .032| .153    | 1.001 | 1.002   | .023      | .150          | .016                     |

Note: "Unique" indicates the amount of the variance that the independent variable contributes to the regression model that is not shared with the other variable; "Common" indicates the amount of the variance that the independent variable contributes to the regression model that is shared with the other variable.

* $p < .05$

Table 4 also presents various measures that examine the individual contribution of each predictor variable to the regression effect. The beta weight, product measure, structure coefficient, and the squared semipartial correlation (unique effect of the commonality coefficient) all indicated the relatively greater contribution of grammar over vocabulary to regression effects. When the vocabulary variable was held constant, a one standard deviation increase in grammar would result in an increase of 0.413 in reading. The squared structure coefficient indicated that grammar alone accounted for about 98% of the predicted reading score. The product measure also revealed greater weight for grammar on the regression effect. The component of grammar that is not shared with vocabulary uniquely explained about 12% of reading variance, while the intersection of vocabulary and grammar accounted for about 9% of it. Therefore, the multiple regression results suggest that, in the HR group, one with a higher grammar score is likely to obtain a better reading score, and that an increase in the vocabulary score does not necessarily lead to a higher reading score.

For the IR group, the linear regression model was statistically significant, $F(2, 105) = 5.43, p < .001$. Vocabulary and grammar accounted for about 14% of the reading variance, $R^2 = .139$. However, when the role of the individual predictor variables in the regression model was examined, only vocabulary was statistically significant, $t(105) = 2.116, p < .05$. 
As shown in Table 4, the relative importance of vocabulary as a predictor variable over grammar was also supported from the larger beta weight, product measure, structure coefficient, and the squared semipartial correlation of vocabulary than for grammar. According to the regression model, if there is a one standard deviation gain in the vocabulary score, the predicted reading score would increase by 0.274, when the grammar variable is held constant. About 89% of predicted reading variance could be accounted for by vocabulary. The unique variance explained by vocabulary alone was about 4%, and by the intersection of vocabulary and grammar was about 9%. These results suggest that, in the IR group, it is feasible to read better when one’s vocabulary size becomes larger, while grammar knowledge does not play a unique role.

The regression equation predicting reading scores with vocabulary and grammar scores was not statistically significant in the LR group, $F(2, 46) = .531, p = .592, R^2 = .023$. Although not significant, the relatively greater contribution of grammar over vocabulary to the regression effects could be assumed from the beta weight, product measure, structure coefficient, and the squared semipartial correlation of grammar, as shown in Table 4. While the unshared component of vocabulary with grammar explained almost no amount of reading variance, grammar uniquely accounted for about 2% and the intersection of vocabulary and grammar about 1% of it. Based on these results, it could be assumed that there are variables other than vocabulary and grammar that are more important in predicting one’s reading in the LR group.

The regression model predicting the students’ L2 reading comprehension from their vocabulary and grammar scores accounted for more reading variance in the HR group than in the IR group. The LR group came last, but the prediction model was not statistically significant for the group. When the raw regression weights were compared, the relative significance of vocabulary in the regression model was, in the order of relative significance, IR, HR and LR, and that of grammar was HR, IR, and LR. Therefore, even when statistical significance is not considered, the orders show that both vocabulary and grammar seem to be least effective in explaining reading variance in the LR group, while grammar in the HR group and vocabulary in the IR group appear to be more powerful predictor variables.

4.4. Discussion

The ANOVA results demonstrated that vocabulary and grammar scores differed significantly across the three reading ability groups. As the learners’ L2 reading scores increased, so did their vocabulary and grammar scores. This highlighted the importance of vocabulary and grammar knowledge in comprehending L2 texts.

Nevertheless, the roles of vocabulary knowledge and grammar knowledge in L2 reading for the three reading ability groups were not unitary. The correlation between grammar and
reading was higher than that between vocabulary and reading in the HR group, and the correlation between vocabulary and reading was higher than that between grammar and reading in the IR group. However, neither vocabulary nor grammar was significantly correlated with reading in the LR group. The regression analyses also revealed that in the HR group only grammar could explain reading, while vocabulary was the sole statistically significant predictor of reading in the IR group. However, none of these language competences were legitimate predictors of reading in the LR group. Therefore, it can be concluded that grammar knowledge had a greater effect on advanced readers, while it was the breadth of vocabulary that had a similar effect for intermediate readers. For poor readers, vocabulary and grammar knowledge were not related to their reading.

Since no previous studies have examined the relative roles of vocabulary and grammar in L2 reading of three reading ability groups, it is not possible to make a direct comparison between the findings of this study and those of previous studies. Of the studies that probed the relationships among vocabulary, grammar, and reading, only a few took L2 proficiency into consideration, and they did it in a dichotomous manner. Having explored the relationships associated with differing L2 proficiency level, previous studies resulted in mixed findings. For example, with advanced EFL learners in a Chinese graduate school, Zhang (2012) found lexical knowledge a more substantial contributor, not grammatical knowledge, to L2 reading comprehension. Nassaji (2003) also found that lexical knowledge played the most distinctive role between skilled and less-skilled readers among adult ESL students at a Canadian graduate school. However, the opposite was true for L1 Japanese EFL college students in the studies by Shiotsu (2010) and Shiotsu and Weir (2007). They claimed that it was syntactic knowledge that contributed the most to reading comprehension even when classified into two groups of better and poorer readers. There could be numerous reasons for these inconsistent results: L1- L2 distance, participants’ age, L2 proficiency, measures for the competence of each construct, and others.

Nevertheless, the findings of the present study suggest that differentiating L2 learners into three levels helps to clarify the relative roles of vocabulary and grammar in L2 reading comprehension since there tends to be L2 learners at these three levels, i.e., advanced, intermediate, and low, in most educational settings. The prominent role of grammar among advanced L2 readers, and that of vocabulary among intermediate L2 readers can be explained by “The Matthew Effects”, a term used by Stanovich (1986) to illustrate the importance of individual differences in reading. According to him, advanced readers improve because they read more and thus acquire more reading skills by reading, including inferring the meaning of an unknown word. For the HR group of the present study, the students’ vocabulary level was high, so they could have inferred the meaning of most unknown words, which renders vocabulary a non-influential factor in their reading difficulty. With vocabulary not interfering with reading comprehension, grammar played
one of the key roles of reading success for them. However, the IR group must have encountered difficulties because of unknown words, so vocabulary was the only significant predictor of their reading. These findings corroborate those of Alavi and Akbarian (2012). They studied the effect of vocabulary size in five types of L2 reading questions among Iranian college students at three levels of vocabulary, and found that vocabulary size only accounted for the guessing vocabulary scores for those with high level vocabulary.

The lack of relatedness among the constructs of vocabulary, grammar, and L2 reading among poor readers in the present study can be explained in many ways. First, it could have been caused by the limitations in the range of the subject pool. A wider range with more study participants could have revealed a different picture. Second, the floor effect could have prevented vocabulary and grammar knowledge from playing a role in comprehending the text. That is, the relatively high difficulty of the reading materials for the poor readers could have made it difficult to capture their reading processes and facilitating effects of vocabulary and grammar knowledge. Finally, for poor readers, having other skills and knowledge might be more critical. As in this study, Taillefer (1996) reported that knowledge of vocabulary and grammar along with L1 reading comprehension ability did not predict reading scores of French L1 EFL college students with low L2 proficiency. Likewise, Alavi and Akbarian (2012) found that the breadth of vocabulary of their low level EFL learners at Iranian universities was not a significant contributor to reading. Two of the basic elements of L2 reading that were omitted in the present study were phonological and orthographic knowledge, the basis of decoding a text. Birch (2007) considered acquiring phonological and orthographic knowledge as a prerequisite for reading for meaning. Hoover and Gough (1990) also contended that decoding is a foundation of reading along with linguistic competence. Therefore, poor readers of the present study could have lacked decoding skills.

5. CONCLUSION AND IMPLICATIONS

The overall aim of this study was to advance an understanding of the relative roles of vocabulary and grammar in L2 reading, particularly by taking L2 reading ability into account in the context of Korean secondary education. The findings showed that the particular roles of vocabulary and grammar knowledge in L2 reading were not consistent across the groups of differing L2 reading abilities. The role of grammar was more prominent for advanced L2 readers, while vocabulary played a major role in reading performance of intermediate L2 readers. For poor readers, although the importance of vocabulary and grammar knowledge in their L2 reading comprehension cannot be denied, it seemed that they lacked more basic knowledge, i.e. decoding skills (Birch, 2007; Hoover
The findings of the present study have implications for theories of L2 reading and L2 reading pedagogy. First, it is necessary to distinguish between vocabulary and grammar in L2 reading theories (Bernhardt, 1991, 2000, 2005, 2011; Birch, 2007; Khalifa & Weir (2009). Treating the two types of language knowledge as one may obscure the exact nature of L2 reading. Second, from a pedagogical viewpoint, both vocabulary and grammar should be emphasized in L2 reading instruction. However, the relative weight of each kind of knowledge should differ depending on the L2 reading level of L2 learners. More attention may need to be paid on grammar for advanced L2 readers, whereas expanding vocabulary size is likely to be a more urgent need for intermediate L2 readers. Grammar instruction can be more effective when delivered in a meaning-focused way and through systematic and focused grammar practice procedures and activities (Ur, 2009). Scriverner (2010) recommends that a teacher ask concept questions, not yes-no questions, so that he or she can better diagnose the true understanding of students in the grammar class. The exercise of extended reading can help L2 learners expand their vocabulary size (Day & Bamford, 1998). Pulio (2009) suggests that reading texts on a familiar topic and providing background knowledge as a pre-reading activity can help students infer the meanings of unknown words. Poor readers may need to learn more elementary skills first, such as L2 decoding skills (Birch, 2007; Hoover & Gough, 1990). Finally, in order to understand the exact nature of L2 reading of those with varying L2 proficiency levels, appropriate reading materials should be utilized in the reading assessment tool. By such means, possible ceiling and floor effects would be prevented, thereby revealing the actual roles of vocabulary and grammar knowledge in L2 reading.

The present study is limited in two respects. First, the size of the participants is not very large, especially for the analyses of sub-groups. A further study with a large sample of learners with diverse L2 reading abilities may provide important insights into the relative roles of vocabulary and grammar knowledge in L2 reading at different levels of reading proficiency. Second, only one type of measurement instruments is used in the present study. Thus, there might have been a test effect involved in the results of the study, especially regarding the reading comprehension measure. Multiple choice questions of the reading comprehension test can interfere with the natural process of reading and can be answered without necessarily reading the text. Further research incorporating various types of assessment tools would add more insight into the roles of vocabulary and grammar in L2 reading. Moreover, the adoption of standardized testing instruments would enhance research comparability.
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APPENDIX
Sample Items for Tests

(1) Sample Items for the Vocabulary Language Test
This is a vocabulary test. You must choose the right word to go with each meaning. Write the number of that word next to its meaning.

1. business
2. clock ______ part of a house
3. horse ______ animal with four legs
4. pencil ______ something used for writing
5. shoe
6. wall

(2) Sample Items for the Grammar Test

1. My sister and her boyfriend ______ next year.
   a. is getting married   b. are getting married
   c. is getting marry    d. are getting marry

10. My closely friend always gives me candy whenever she visits me.
   ①   ②   ③   ④
When I was younger, I used to silently pray that I would be nothing like my father when I grew up. Other kids at my age were proud to say that their dads were their heroes, which really bothered me. I secretly envied them because I did not have a father like that. My father was so serious in everything he did. His brow was always wrinkled, a sign of his constant watch over his family. It was his own way of saying that his expectations were not being met. My grandmother could not remember a time when my father had done anything wrong. He was too perfect to be a role model for me. I felt timid and self-conscious around him. It is true that my father wanted me to make the right decision at every crossroad in my life, but always from his perspective. My father was always offering words of advice. Although they may have been ancient proverbs or old sayings, they were always "Daddy originals" to me. "When you're prepared, you'll never be scared," he would tell me when I was up late studying for a test. He always stressed the importance of preparation. "Haste makes waste," was his response when I would bring home a math exam full of careless mistakes. In short, I ______ B ______ to relax or be just average on any exam.

1. Which of the following is best appropriate for the blank [A]?
   ① However  ② Unless  ③ Nevertheless  ④ Although

Applicable levels: Secondary

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