# English Vocabulary Size as a Predictor of TOEIC Listening and Reading Achievement among EFL Students in Taiwan 

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#### Abstract

This paper investigates the relationship between vocabulary size and performance on the reading and listening portions of the Test of English for International Communication (TOEIC). The participants were 973 English as a foreign language (EFL) learners from a technical college who had studied English for at least six years. The learners' TOEIC listening and reading scores were found to be strongly associated with their receptive vocabulary size with no gender differences. These results indicate that vocabulary size could have a statistically significant effect on TOEIC listening and reading scores, reinforcing the value of vocabulary size for English proficiency. Additionally, English vocabulary size and the prediction of proficiency in the TOEIC listening and reading sections reached statistical significance. These findings demonstrate the importance of receptive vocabulary for EFL learners. Outcomes from the study have implications for EFL learners and teachers as well as future research.


Index Terms-English vocabulary size, TOEIC listening and reading, English proficiency, EFL learners

## I. Introduction

The vocabulary (lexicon) of any language, regardless of whether it is spoken or signed, entails more than just a list of the dictions (phonology) and lexical semantics of the words. Vocabulary also involves morphological as well as syntactic information (Webb \& Chang, 2012). Morphological information is made up of the linguistic category of a word, the declension class of nouns, the gender, and the conjugation category of verbs as well as any indiscretions of form. The syntactic information includes the contexts in which a word characteristically occurs (Sarani \& Kafipour, 2008). This study investigated the correlation between English as a foreign language (EFL) learners' vocabulary size (VS) and their performance on the Test of English for International Communication (TOEIC) listening and reading sections. VS here refers to the receptive words that an EFL learner can recognize (Nation, 2015).

## II. Literature Review

## A. VS Tests

The sampling of a word for the items involves representing the various frequency levels at which it occurs in the English language with a bias at any given frequency level. The frequency levels are basically based on the word families within the British National Corpus (McLean, Hogg, \& Kramer, 2014). Because the major purpose of the test is to measure total VS, the test should measure the frequency levels beyond the most likely VS (Nation, 2005), but only a small number of items can be selected from each vocabulary level. The most famous VS levels were developed by Paul Nation, who conducted a vast amount of research based on the British National Corpus word family lists during sampling and obtained good reliability and validity for different versions of vocabulary level tests (Nation \& Beglar, 2007). However, the test does not actually measure how well each level is understood or known (Nation, 2005) because there are not enough items at each level. In other words, it is expected that the total scores will decrease for the rest of the levels, as the test is what matters (Nation, 2005).

Vocabulary in relation to a language includes single items and phrases of several words that communicate a particular meaning. VS is the number of words that a language learner has in his mental lexicon. According to Webb's (2005) analysis, $78 \%$ of frequently used words (2000) are headwords (base words) of English, and university words, technical words, and the remainder constitutes $8 \%, 3 \%$, and $2 \%$, respectively. He further explains that all learners must know at least 2000 to 3000 words to be effective in speaking and understanding English (Webb, 2005). VS testing is the sum of all interrelated standby knowledge of collation and word meanings in written form (Nation \& Beglar, 2007). A VS test measures the VS of both first-language and second-language learners mostly in written vocabulary (Webb \& Chang, 2012). That is, the test measures their knowledge of written word forms, their meaning connection, and their concept meaning (Shrum \& Glisan, 2015). A VS test is primarily a test of decontextualized knowledge of the written vocabulary.

[^0]Vocabulary is a key to communication. The main purpose of studying a foreign language is to be able to communicate with others in the target language (Şener, 2003). Schmitt (2012) and Powers, Yu, and Yan (2013) assert that those who have little or no interest in mastering the vocabulary are likely to fail to master the communication fundamentals of a foreign language. Vocabulary represents most of the skills necessary to teach and learn a foreign language at the level needed to read, watch a movie, or write a note to a friend (Liao, $\mathrm{Qu}, \&$ Morgan, 2010). Meaning is the basis for developing all other writing and reading skills (Webb, 2008). A good example relates to spelling, listening, speaking, reading, writing and even punctuation (Mukoroli, 2011). Vocabulary is about more than just learning a foreign language and grammar; it also aids the development of knowledge (Sarani \& Kafipour, 2008).

The more words a learner knows, the better his or her chance of learning. Vocabulary is learned through concise study as well as incidental learning through listening and reading. In terms of concise learning, learning is possible only if the amount of unknown words remains low (Nation, 2014). The implication is that the learner must have enough vocabulary to be in a fundamental position to learn further new words in the format in which they appear. Therefore, learners with less vocabulary are at a clear disadvantage, whereas learners with more words will be able to use the ones they know and learn even more (Sener, 2003). Although it is possible to convey meaning through body language without words, and EFL learners recognize that nonverbal communication is part of language learning, they must acknowledge the irreplaceable importance of acquiring vocabulary. For most students, the main reason for an inability to communicate is a lack of vocabulary (McCardle, Kapinus, \& Chhabra, 2008). The more words learners obtain or learn, the more easily they can recall and use them ( $\mathrm{Wu}, 2005$ ).

Language learners often recognize the importance of vocabulary to their language learning (Bozorgian, 2012). Vocabulary is a core aspect of English-language learning. There is no doubt that without sufficient vocabulary, language learners cannot understand other learning materials, express themselves or describe their own ideas despite the possibility of nonverbal communication. In other words, without vocabulary, nothing can be conveyed. As language learners gain and develop greater fluency and improve their ability in English, it becomes easier for them to acquire personal vocabulary strategies (Shrum \& Glisan, 2009). A learning vocabulary greatly helps language learners master and perfect their English skills (Çelik \& Toptaş, 2010).

Second-language acquisition depends greatly on the development of a strong vocabulary (Alqahtani, 2015). Most researchers have focused on the need for language learners to optimize their vocabulary knowledge (Nation \& Beglar, 2007). Vocabulary knowledge is important in learning a foreign language. However, although learners know the usefulness of words, they may not know that VS can help them successfully learn vocabulary (Sarani \& Kafipour, 2008).

## C. TOEIC Listening and Reading Sections

The TOEIC tests the ability to understand work-related conversations, writing and instructions in written and spoken English. No speaking is involved in the TOEIC listening and reading portions. In the listening section, test takers are required to answer questions in response to a variety of statements. The listening section consists of 100 questions to be answered in 45 minutes. The reading section, which tests how well the test taker understands written English, consists of 100 multiple-choice questions and lasts 75 minutes. Each test taker receives a score on a scale ranging from 5 to 495 with an augmentation of 5 points (Powers, Yu, \& Yan, 2013). The TOEIC is specifically intended to examine the ability to apply and use English in practical life situations. The test design ensures that the scores can be accurately compared among individuals worldwide (Liao, Qu, \& Morgan, 2010). The TOEIC has become one of the most popular comprehensive assessments in the world (Bozorgian, 2012); more specifically, it is designed to measure English skills in an international working environment (Chujo \& Oghigian, 2009).

## D. Related Studies

A vast majority of the research on the correlation between VS, both in breadth and depth, and English proficiency among EFL learners unanimously indicates that the former is positively correlated with the latter. Most of the variance in the results reported in the existing literature concerns the significance of the correlation, the degree to which VS promotes English proficiency, the elements of English proficiency (speaking, reading, listening, and writing) on which VS has the greatest and/or most significant effect, and the specific context in which the researchers conducted their studies (test scores, learning strategies, lexical coverage, etc.). Generally, the studies indicate, to varying degrees, that VS is positively correlated with TOEIC scores, which measure proficiency in listening and reading comprehension and in speaking and writing (Kanzaki, 2010, 2015; Taguchi, 2015). These results reveal that as EFL learners' vocabularies increase, they score higher on proficiency tests. As one might assume, reading comprehension is the skill most affected by VS, since it is the context in which vocabulary is most often taught and learned (Kanzaki, 2010, 2015). While researchers agree that VS is positively correlated with speaking and listening proficiency, the correlation tends to vary in significance and is consistently less significant than the correlation between VS and reading comprehension (Kanzaki, 2010, 2015; Koizumi \& In'nami, 2013; Taguchi, 2015).

English proficiency tests, such as the TOEIC and the Test of English as a Foreign Language (TOEFL), provide the most effective way to examine the relationship between VS and English proficiency for three reasons: (1) these tests have proven reliability and validity, (2) their results are categorized by each element of language proficiency, and (3) they are the most commonly used measures of English proficiency. In administering the Vocabulary Levels Test (VLT)
and a TOEIC practice test among Japanese students, Kanzaki (2010) found that performance on the reading section of the TOEIC was correlated with performance on the vocabulary test at 0.76 and with performance on the listening section at 0.39 , with the averages demonstrating a "moderate correlation" (p. 748). It is important to note that the correlation between reading comprehension and VS was dramatically more significant than that between listening and vocabulary, which Kanzaki attributes to the absence of a speech-based element in the vocabulary test. In a more comprehensive follow-up study, Kanzaki (2015) compared performance on the reading, listening and speaking sections of the TOEIC with the VLT and the Vocabulary Size Test (VST). Kanzaki again found that among the three sections, reading comprehension was most significantly correlated with performance on the VLT at 0.69 and with performance on the VST at 0.61 . Kanzaki also found that the scores across all three sections were much more significantly correlated with the VLT than with the VST. Listening scores were more significantly correlated with the VLT than in the previous study at 0.49 and correlated poorly with the VST at 0.39 . Performance on the speaking section correlated moderately and poorly with the VLT and VST at 0.58 and 0.33 , respectively. In addition, Taguchi investigated a small sample of Japanese EFL learners and found that VS correlated with reading and listening scores at 0.535 and 0.497 , respectively. These results indicate the least significant correlation between reading scores and VS. Overall, these trends suggest that VS tends to correlate strongly with reading comprehension scores, but correlations between VS and speaking and listening tend to have little significance, approaching moderate significance among Japanese EFL learners.

As the most statistically significant, the correlation between VS and reading comprehension has been more thoroughly and independently studied, using a variety of other measures. In addition to reading scores from the TOEIC, Sieh (2016) measured the relationship between VS and the phonological awareness of 41 EFL university students in Taiwan, assessing the participants' propensity for elision, blending words, and phoneme reversal. Sieh confirmed a strong correlation between VS and TOEIC reading scores of Chinese EFL learners and-though not the study's core focus-also found a moderate correlation between VS and the phonological awareness measures. Since the study also indicated a correlation between phonological awareness and reading comprehension among the whole sample, these results indicate a correlation between VS and phonological awareness that represents more advanced reading comprehension skills. Using an adaptation of the Exercise and Elderly-Circuit Training, Güngör and Yaylı (2016) confirmed a strong correlation between VS and reading comprehension that also indicated a basic linear correlation between vocabulary coverage and reading comprehension among 178 Turkish university EFL students. Using the reading comprehension section of English Proficiency Test of the International Islamic University, Malaysia, Ibrahim, Sarudin, and Muhamad (2016) found a positive, upper-moderate correlation between VLT scores and reading comprehension among Malaysian EFL learners. All these results demonstrate that across several different measures of reading comprehension and several different first languages, VS-breadth and depth-consistently correlates at least upper moderately with reading comprehension in a way that is statistically significant.

Despite the need to clarify variances in the results reported in the existing literature for the correlation between VS and listening skills, very few studies have examined the relationship in isolation. As previously mentioned, Kanzaki $(2010,2015)$ compared the relationship between the two to the relationship between VS and reading comprehension and the relationship between VS, reading comprehension, and speaking skills to find that listening skills had the weakest correlation with VLT scores and an even weaker correlation with VST scores. However, using a different methodology and focusing exclusively on listening skills, Wang (2015) obtained much different results. Comparing the performance of 120 non-English-major students in a medical university on the VLT and VST to their performance on the College English Test 4 (CET4), a Chinese national assessment of English proficiency, Wang found that vocabulary breadth and especially depth had a significant influence on listening comprehension. Wang also found a positive correlation between the influence of vocabulary breadth on listening scores and the proficiency of the participants. These results suggest a more strongly significant relationship between VS and listening skills than any other study discussed thus far. Moreover, following the same trend, Sieh's (2016) study demonstrated more significant results among more advanced university students in Taiwan.

As with listening skills, little research has focused exclusively on the relationship between VS and speaking skills. Kanzaki (2015) found that speaking skills were moderately correlated with VLT scores and poorly correlated with VST scores. Once again, using different methodologies and different assessments, at least one study revealed a stronger relationship. Koizumi and In'nami (2013) conducted two studies, the first of which examined the relationship between vocabulary breadth and depth and speaking proficiency and the second of which introduced vocabulary speed. In the first study, using original depth tests that assessed the participants' propensity for derivation, antonyms, and collocation, a breadth test adapted from the JACET8000 to measure VS, and an original test requiring participants to produce "realtime monologues" to measure speaking proficiency, they found that VS substantially predicted high speaking proficiency scores at $32-44 \%$. The second study, using the same JACET8000 test, a Lexical Organization Test (LOT), and a Lexical Access Time Test (LEXATT) to measure VS and the Versant English Test to measure speaking proficiency, indicated an even stronger predictor at $84 \%$. While there is no method to convert and compare these results to those of the other studies discussed here, with respect to their own methodology, these results demonstrated a much stronger relationship between vocabulary and speaking skills. Koizumi and In'nami also indicated that speaking skills can be most substantially predicted by vocabulary breadth, while other studies found that reading and listening skills
were more strongly correlated with vocabulary depth (Kanzaki, 2015). However, given the experimental nature of the study, Koizumi and In'nami (2013) noted that their results may potentially be restricted to the design of the study.

Numerous studies have also been conducted on the relationship of lexical or vocabulary coverage to performance on English proficiency tests. Coverage, which refers to the percentage of words in a given text that the reader and listener can understand, is a specific application of reading comprehension, in this case to the language used on an English proficiency test (Webb \& Paribakht, 2015). Chujo and Oghigian (2009) found that learners would need to know 4,000 words to understand and therefore perform well on a TOEIC test and 4,500 to understand and perform well on a TOEFL test. Furthermore, Webb and Paribakht (2015) found that the required lexical coverage of some English proficiency tests is based on texts that actually have vastly different lexical profiles, including the use of proper nouns, and different tests that measure proficiency in the same ways can have different lexical profiles. While previous findings concerning the relationship between VS and English proficiency extend their implications practically, these studies afford insight into the specific ways in which VS affects proficiency and present concerns that require consideration for further research.

## E. Statement of the Problem

Vocabulary has received much attention in foreign language teaching as well as learning. Morris and Cobb (2004) found that vocabulary profiles have important potential as predictors of academic performance among learners of English as a second language. Zareva, Schwanenflugel, and Nikolova (2005) also maintains a positive relationship between second-language learners' VS and their proficiency. Moreover, VS was found to be strongly associated with English abilities, especially in reading and writing (Hilton, 2008).

Recently, a large number of academic institutions have adopted the TOEIC as one of the measures of students' English proficiency, and many universities use the TOEIC as the English graduation threshold as a result of pressure from the Taiwan Ministry of Education (Nichols, 2016). Moreover, many business enterprises refer to TOEIC scores as an important reference on the résumés of job candidates. In response to government, academic and industrial demands for the TOEIC, the test was administered to nearly 40 thousand Chinese test takers in 2016 (ETS TOEIC Taiwan Branch, 2017). However, some have criticized (Nichols, 2016; Templer, 2004) the cost and time-consuming nature of official TOEIC administration for both academic institutions and English learners who wish to estimate English proficiency.

Despite the large number of articles devoted to VS in EFL, few studies have discussed the relationship between VS and the TOEIC, especially whether VS could act as a predictor for TOEIC scores. Although VS has received much recent attention, Meara and Jones (1988), Gu and Johnson (1996), Gu (2002), Morris and Cobb (2004), and de Souza and Soares-Silva (2015) argued against using VS as an indicator and urged further research. Most studies conducted in Taiwan technical colleges have focused separately on VS and TOEIC performance, but it is important to know whether there is any relationship between English VS and TOEIC. Little research has focused specifically on the correlation between VS and proficiency among EFL learners in Taiwan. Therefore, this study intends to answer the following questions.

How does English VS correlate with TOEIC listening and reading performance? Does English VS predict TOEIC listening and reading performance for technical college students in Taiwan?

## III. The Study

## A. Research Questions

The purpose of the study was to investigate the relationship between English VS and performance on the TOEIC listening and reading sections. Specifically, the following questions were addressed:
(a) How does English VS correlate with TOEIC listening and reading performance?
(b) How does VS affect performance on the TOEIC listening and reading sections?

## B. Participants

The sample consisted of 973 first-year technical college students from ten non-English-related majors in a private college in central Taiwan. The students were all enrolled in the freshman English course in the 2016 academic year. The participants' ages ranged from 17 to $19 ; 38 \%(37.5 \%)$ were males, and $62 \%$ ( $61.5 \%$ ) were females. All the participants had undergone at least six years of formal English education in junior and senior schools before entering the university. Therefore, all the participants had experienced a similar English curriculum prior to the university.

## C. Instruments

Two instruments were used in this study: one measured English VS levels, and the other measured proficiency in terms of listening and reading.

1) TOEIC

The TOEIC is a paper-and-pencil test designed to estimate the reading, listening, speaking, and writing skills needed in a workplace. When the TOEIC speaking and writing portions are taken together with the TOEIC listening and reading portions, the test can achieve an accurate measure of proficiency in all four English-language skills. Since
speaking and writing skills are advanced English skills that are not required by school administrations，this study focused on the listening and reading parts of the TOEIC．Therefore，the TOEIC score is defined as the TOEIC listening and reading scores in this study．For the listening section，test takers are required to answer 100 questions in response to a variety of statements．The time given to answer the questions is 45 minutes．The reading section，which assesses the test taker＇s understanding of written English（Webb \＆Chang，2012），consists of 100 multiple－choice questions and lasts 75 minutes．For the reading section，each test taker is awarded a score on a scale ranging from 5 to 495 with an augmentation of 5 points（Choi，2008）．All the participants were required to take the formal TOEIC listening and reading sections once during their freshman year．

2）VST
The VLT，first established by Paul Nation in 1983，has been revised several times through continued studies（Nation， 1983，1990，2001；Schmitt，Schmitt，\＆Clapham，2001）．After the original VLT had been used for 20 years，Nation and Beglar（2007）presented the VST for divergent purposes in which the VLS was designed to evaluate overall VS，while the VLT focused on estimating learners＇vocabulary levels．Despite the minute differences in their design purposes， both tests were based on frequency levels and the receptive knowledge of the vocabulary．

To measure participants＇VS，or how many words the subjects perceived in the width of English vocabulary，a vocabulary test was utilized．A VST was designed by Nation and Beglar（2007）that contains 100 items to estimate the total receptive VS for both native and non－native speakers by dividing learners＇test results into 100 to obtain their total VS．The VST acquired a Cronbach alpha of 0.963 on all levels in Akbarian＇s（2010）study．The VST is available in multiple languages to reduce the challenge and time demands of the monolingual version（Le Thi Cam Nguyen \＆ Nation，2011）．To eliminate participants＇language barriers in recognizing the words and to reduce testing time，the VST Chinese version of 1000 to 5000 words was used for the study．Ten words accompany each example sentence with four choices of definitions in the Chinese edition．A VST usually takes 40－60 minutes to complete．To ensure the validity of the test，levels 1000 to 5000 （ 50 points）were chosen from the VST to avoid meaningless guessing since the majority of the students enrolled in the selected college were in the beginning to intermediate levels of English proficiency based on their college entrance grade level，which was based on a norm－referenced procedure．Examples of questions from the first 1000 are as follows．

First 1000
1．see：They see it．
a．切
b．等待
c．看
d．開始
2．time：They have a lot of time．
a．錢
b．食物
c．時間
d．朋友

## D．Procedure

The participants took the VST in September 2015，the beginning of their first semester in college，to provide an estimation of their English VS．For the VST，they were instructed to read the target words and the example sentences and then the four Chinese definitions．The participants had to choose the correct definition from the four possible choices for 50 questions in 40 minutes（ 5 levels）．The cutoff point for mastering each level in the VST was $24 / 30$ ．The participants were requested to take one formal listening and reading TOEIC before the end of their second semester． The participants could not take the VST and TOEIC simultaneously because the formal TOEIC is administered only once in a month in central Taiwan，usually on weekends．

Data collection from the VST was completed at the end of September 2015，and scores for the TOEIC listening and reading sections were gathered from October 2015 to May 2016．Linear regression analysis was applied to investigate the predictive power of VS（independent variable）at different TOEIC levels（dependent variable）．All the data were analyzed using SPSS 18．0，and the alpha significance level was preset at p $<0.05$ for statistical analyses．

## IV．Results

## A．How Does English VS Correlate with TOEIC Listening and Reading Performance？

To answer research question one，two dimensions were considered：the participants＇overall performance on the VST and the participants＇TOEIC listening and reading scores．The participants＇performance on the VST and TOEIC is reported in Table I．

TABLE I.
DESCRIPTIVE STATISTICS OF THE VST AND TOEIC

|  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Variable | N | Lowest | Highest | Ave | Sd |
| Vocabulary size | 973 | 600 | 4,400 | $2,016.86$ | 581.37 |
| TOEIC total scores | 973 | 150 | 815 | 296.36 | 94.06 |

## 1) Descriptive Statistics of the VST and TOEIC

A total of 973 students participated in this study. Thirty-eight percent were male, and approximately $62 \%$ were female. The participants' performance on the VST and TOEIC was provided with a general profile of their achievements, as presented in Table II. The VST ranges from a minimum of 600 to approximately 4400 words. The TOEIC listening and reading scores range from the lowest, 150 , to the highest, 815 .

An independent sample t-test and one-way ANOVA were used to explore the gender differences in the VST and TOEIC. If the one-way ANOVA of the $F$ test was statistically significant, the Scheff method should be applied for further comparison. As shown in Table II, gender differences in the t-test of the VST and TOEIC were not statistically significant ( $\mathrm{p}>0.05$ ), indicating that there are no differences between the male and female participants in VS or in the scores obtained in the TOEIC listening and reading sections.

Table II.
Gender Differences in the VST and TOEIC

| Variable | Gender | N | Ave | Sd | $t$ | $p$ value |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Vocabulary size | Male | 365 | 1970.69 | 532.20 | -1.68 | 0.094 |
|  | Female | 598 | 2034.78 | 600.44 |  |  |
| TOEIC | Male | 365 | 289.05 | 80.35 | -1.73 | 0.085 |
|  | Female | 598 | 299.11 | 98.64 |  |  |

The Pearson correlations between variables of this study are presented in Tables III to VI. Statistical descriptions of the correlation between VS and TOEIC total scores are shown in Table III, which indicates that the participants' VS was moderately correlated with their TOEIC scores in listening and reading ( $\mathrm{r}=0.67, \mathrm{p}<0.001$ ). Thus, the higher the scores the participants obtained on the VST, the better total scores they could achieve on the TOEIC (listening and reading).

When the TOEIC scores are viewed separately, as shown in Table IV, there is a positive significant correlation between VS and the TOEIC listening score ( $\mathrm{r}=0.62, \mathrm{p}<0.001$ ), indicating that the higher the scores the participants obtained on the VST, the better listening scores they could achieve on the TOEIC.

TABLE III.
Correlation between VS and TOEIC Total Scores

| Variable | N | Lowest | Highest | Ave | Sd | r | p |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Vocabulary size | 973 | 600 | 4,400 | 2,016.86 | 581.37 | 0.67*** | < 0.001 |
| TOEIC total score | 973 | 150 | 815 | 296.36 | 94.06 |  |  |

Table IV
Correlation between VS and TOEIC Listening Scores

| Variable | N | Lowest | Highest | Ave | Sd | r | p |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Vocabulary size | 973 | 600 | 4,400 | $2,016.86$ | 581.37 | $0.62^{* * *}$ | $<0.001$ |
| TOEIC listening | 973 | 75 | 425 | 175.81 | 59.41 |  |  |
| $* p<0.05$, ** $p<0.01$, *** $p<0.001$ |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Table V.
Correlation between VS and TOEIC Reading Scores

| Variable | N | Lowest | Highest | Ave | Sd | R | p |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Vocabulary size | 973 | 600 | 4,400 | $2,016.86$ | 581.37 | $0.61^{* * *}$ | $<0.001$ |
| TOEIC reading | 973 | 45 | 405 | 120.54 | 43.02 |  |  |

Table VI.
Summary of Correlation Coefficient in vs and TOEIC Scores

| TOEIC test | VS |
| :--- | :--- |
| Listening | $0.62^{* * *}$ |
| Reading | $0.61^{* * *}$ |
| Total score | $0.67^{* * *}$ |
|  | $* p<0.05, * * p<0.01,{ }^{* * *} p<0.001$ |

Similarly, Table V revealed that participants' VS was significantly correlated with their TOEIC reading scores ( $\mathrm{r}=$ $0.61, \mathrm{p}<0.001$ ). In other words, there is a significant positive correlation between VS and TOEIC reading score,
indicating that the higher the scores the participants obtained on the VST, the better reading scores they could achieve on the TOEIC.

A summary of the statistical description of the relationship between VS and TOEIC listening and reading indicated that the participants' English VS was moderately correlated with their total TOEIC listening and reading scores, as shown in Table VI. The correlation coefficients are 0.61 to 0.67 , indicating that the higher the scores the participants obtained in the VST, the better listening and reading scores they could achieve on the TOEIC.

## B. How Does VS Affect Performance in TOEIC Listening and Reading?

Since the TOEIC can be divided into A1, A2, B1,... as a grade-order variable, with the higher grades reflecting better performance, ordinal logistic regression analysis was used. In addition, for the TOEIC test scores, linear regression (enter method) was conducted to consider the predictive power of English VS for the TOEIC.

1) Listening Levels

Ordinal logistic regression modeling was used to assess the association between the outcome variables and the predictor variables. A total of 973 participants were analyzed using ordered logistic regression analysis for predictable effect analysis. VS and gender were the independent variables used to explore these factors on the TOEIC listening levels (in the order A1, A2, B1+).

As shown in Table VII, the only statistically significant variable was VS $(\mathrm{OR}=1.002, \mathrm{p}<0.001)$; the OR value was greater than 1 , indicating that when the students' VS increased, the TOEIC listening level tended to be higher. Gender had no statistically significant influence on TOEIC listening level.

TABLE VII.
TOEIC LISTENING LEvEL IN LOGISTIC REGRESSION ANALYSIS

| Independent variable | B | OR | $95 \%$ CI of OR | $p$ |
| :--- | :--- | :--- | :--- | :--- |
| Vocabulary size | 0.002 | 1.002 | 1.002 to 1.003 | $<0.001$ |
| Gender (male vs. female) | 0.21 | 1.24 | 0.80 to 1.91 | 0.337 |

Note: The group in brackets is the category ref.

$$
* p<0.05, * * p<0.01, * * * p<0.001
$$

## 2) Reading Levels

Similarly, logistic regression was used to analyze VS and gender as the independent variables, showing how these variables affect the dependent variable in terms of prediction.

The regression analysis results, as shown in Table VIII, indicated that VS has statistical significance for TOEIC reading level ( $\mathrm{OR}=1.002, \mathrm{p}<0.001$ ); the OR value was greater than 1 , showing that when the students' VS increased, the TOEIC reading level tend to be higher. Gender had no statistically significant influence on TOEIC reading level.

Table VIII.
TOEIC READING LEVEL IN LOGISTIC REGRESSION ANALYSIS

| Independent Variable | B | OR | $95 \%$ CI of OR | $p$ |
| :--- | :--- | :--- | :--- | :--- |
| Vocabulary size | 0.002 | $1.002^{* * *}$ | 1.002 to 1.002 | $<0.001$ |
| Gender (male vs. female) | -0.02 | 0.98 | 0.7 to 1.37 | 0.909 |
| Note: The group in brackets is the category ref. |  |  |  |  |
|  | ${ }^{*} p<0.05,{ }^{* *} p<0.01,{ }^{* * * p}<0.001$ |  |  |  |

## 3) Results for the Participants' Total TOEIC Scores

Multiple logistic regression analyses were conducted to determine the effect of the participants' English VS on the prediction of total TOEIC listening and reading scores. Table IX shows that the regression model in the whole F test was significant ( $\mathrm{F}=56.13, \mathrm{p}<0.001$ ), indicating the explanatory power of the regression model ( $\mathrm{R} 2=0.45$ ) with statistical significance, which indicates that the participants with a higher VS tended to have higher total TOEIC scores.

Table IX.
LINEAR REGRESSION FOR THE TOEIC SCORES

| Independent Variable | Nonstandardized <br> Regression Coefficient $(B)$ | Standardized <br> Regression coefficient $(\beta)$ | $t$ value | $p$ value |
| :--- | :--- | :--- | :--- | :--- |
| Constant term | 73.79 | - | $6.07^{* * *}$ | $<0.001$ |
| Vocabulary size | 0.10 | 0.65 | $25.56^{* * *}$ | $<0.001$ |
| Gender (male vs. female) | -3.66 | -0.02 | -0.69 | 0.490 |

Note: The group in brackets is the category ref., $R^{2}=0.45$, Adj. $R^{2}=0.45, F=56.13, p<0.001$
${ }^{*} p<0.05, * * p<0.01, * * * p<0.001$
T-test results show that the VS of the regression coefficient was significant ( $\mathrm{p}=0.65, \mathrm{p}<0.05$ ), and the regression coefficient is positive.

## V. Discussion and Suggestions

## A. Discussion

The relationship between VS and TOEIC scores was investigated for 973 technical college non-English-major students in Taiwan and divided into two groups by gender. Gender differences had no statistical significance for the VS of the participants and their performance on the TOEIC listening and reading sections. This finding seems to be consistent with the previous findings regarding gender and English proficiency studies (Lee \& Pulido, 2017; Nisbet, Tindall, \& Arroyo, 2005; Salem, 2006).

Overall, the results of the present study demonstrate a correlation between VS and TOEIC test scores for reading and listening at 0.67 ( $\mathrm{p}<0.001$ ). The results correspond to the findings of previous studies (Kanzaki, 2010, 2015; Taguchi, 2015), indicating an upper-moderate positive relationship with very high statistical significance. VS correlated specifically with reading scores at 0.61 and listening scores at 0.62 , and both are statistically significant. In other others, these results demonstrate that participants with a larger VS tend to score better than participants with a smaller VS. Furthermore, that trend seems to persist linearly as vocabulary increases. However, whether VS has a linear relationship with TOEIC scores should be verified through further studies. The study also indicates that VS correlates more strongly with listening scores than with reading scores. Vocabulary may be more strongly correlated with listening scores because hearing is not performed in a word-oriented context; although EFL learners can still guess the content, missing hearing the key words often misleads them regarding the key content points.

The study also indicated that performance on the TOEIC reading and listening sections can be predicted by the participants' VS but not by their gender. Logistic regression of VS and test results illustrated that a larger VS predicted better test scores on both sections. The $t$ value of the analysis further confirmed the statistical significance of these results. Therefore, performance on TOEIC tests can be predicted with a consistent degree of certainty. In other words, performance on TOEIC tests, one measure of English proficiency, can be explained to a great extent by VS, indicating a causal relationship between the two.

On a broader scale, the results of this study confirm the findings in the existing literature that VS, specifically as measured by the VST, is positively correlated with English proficiency, specifically as measured by TOEIC scores in reading and listening. Surprisingly, VS correlated with reading scores in the present study of 973 Chinese university freshman students at the exact same rate that it did in Kanzaki’s (2015) study of 82 Japanese university students. Although no other findings were obtained, the large sample size of this study establishes a strong positive relationship between VST and TOEIC compared to the small size of Kanzaki's study. Similarly, these results demonstrate an uppermoderate relationship that is consistent with some of the other studies that have been discussed (Ibrahim, Sarudin, \& Muhamad, 2016; Taguchi, 2015) and slightly lower than others (Güngör \& Yaylı, 2016; Kanzaki, 2010).

However, VS correlated with listening scores at a much higher rate than in most of the studies discussed above. Most of the existing literature indicates a weak correlation between them (Kanzaki, 2010, 2015; Taguchi, 2015), in contrast to the upper-moderate correlation found in this study $(\mathrm{r}=0.62)$, except Wang (2015), who found a strong correlation between VS and listening. Similarly, the present study revealed a stronger relationship between VS and listening than between VS and reading, contradicting the results reported in the previous literature. Interestingly, participants in both Wang's study and the present study were Chinese students whose first language is Chinese, indicating that VS seems to have a stronger correlation in the receptive language of English listening than in other languages.

## B. Implications

The general implications of this study correspond to the existing literature, but its specific results denote a departure, particularly regarding the differences in how VS correlates with different aspects of English proficiency in terms of listening and reading. Further research is needed. Furthermore, little research has been devoted to the ability to predict English proficiency based on VS. The only study discussed here, conducted by Koizumi and In'nami (2013), focused specifically on speaking skills.

It is generally accepted among researchers that there is a statistically significant correlation between VS and English proficiency. This study contributes two valuable theoretical implications. First, it confirms the large number of previous studies that indicate the correlation and moves the discussion towards exploring a potential causal relationship between VS and English proficiency. Second, although the results of this study are consonant with Wang's (2015) study, the present study challenges the relationship between VS and listening skills that has been generally accepted and, in addition, questions how it compares to the relationship between VS and reading skills. A variety of different methodologies should be used to explore the relationship between VS and listening skills more extensively.

The practical implications of this study support the existing literature. The first regards to the degree to which building VS should be included in EFL instruction. While a great deal of time is already devoted to vocabulary, instructors might consider making it a more fundamental element of their curricula. Instructors should also teach vocabulary from a variety of different angles that emphasize both size and depth. For instance, they might consider assigning a certain number of essential words each week to cover VS gradually while incorporating a variety of authentic assignments that develop students' depth of understanding and exercises that assist students in developing their ability to use the vocabulary in real-world contexts. In addition, the ability to predict performance based on VS can be used to regulate the necessary lexical coverage to perform well on the TOEIC as well as on other English proficiency tests. As Chujo and Oghigian (2009) suggested, it is crucial to incorporate a certain level of lexical knowledge into EFL curricula to ensure better performance. This application calls out for the larger assumption that demands the inclusion of evidence-based practices in EFL language teaching systems.

## C. Limitations

This study confronted many limitations. It was limited primarily by the narrowness of its scope. Its purpose was to confirm the correlation between VS and performance on the TOEIC reading and listening sections and to direct the discourse towards exploring a causal relationship. While the results fulfill this function using fundamental methodologies and limited variables, more complicated research should be conducted with the same or a similar purpose to explore more extensively how the depth of vocabulary affects performance and the ways in which other variables affect the relationship between VS as well as vocabulary depth and English proficiency. Finally, the study emphasized the reading and listening sections of the TOEIC test, whose relationship to VS has been thoroughly explored. Future research should explore more thoroughly the relationship between VS and performance on the speaking and writing sections of the TOEIC.

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[^0]:    B. Importance of Vocabulary in EFL Learning

