



## Good Text in, Good Text out: The Impact of Extensive Reading on Lexical Complexity in Second Language Writing\*

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### ABSTRACT

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Extensive reading (ER) is widely agreed to improve L2 learners' vocabulary and writing, but the precise effects that ER has on particular characteristics of L2 vocabulary used in L2 writing remain unclear. To address this issue, university level Korean EFL learners in an L2 essay writing class engaged in extensive reading over a semester and wrote argumentative essays about a topic of their choosing. These essays were analyzed for two key indicators of lexical complexity (i.e., lexical density and number of different words) using a computerized text analysis tool. Analysis results generally affirmed previous studies' conclusions that ER has a positive influence on L2 writing adding that the more words learners read, the greater variety of words they used in their essays. Likewise, in accord with other research showing gains in English word recognition and recall, learners' perceptions about the difficulty of their ER materials had an effect on the lexical density of their written essays thus providing additional evidence that ER impacts L2 vocabulary use in essay writing. Somewhat unexpectedly, learners' perceived enjoyment had no effect on either lexical complexity variable which indicates that, contrary to some claims, selecting reading material based on its entertainment value may not actually lead to vocabulary development in L2 writing.

### I. INTRODUCTION

The more we read, the better we write (Arshavskaya, 2018; Krashen, 1993). But what specific aspects of L2 writing can reading a lot in a second language improve? Writing is arguably the most complex and difficult skill for second language learners to learn (Tillema, 2012). And it is particularly challenging to develop academic writing skills in a second language (Mohan & Lo, 1985). Thus, L2 writing teachers and their students search for ways to help their students learn the myriad of intricate procedures that ensure effective English writing. One method for support-

ing L2 learners' writing development that has been steadily gaining in popularity is the use of extensive reading (ER). While researchers are beginning to gain some understanding of ER's potential effectiveness for aiding L2 writing development, we still lack a sufficiently clear idea of the specific aspects of L2 writing that ER can influence. Additionally, we do not know whether particular factors deemed to be important considerations in ER such as text difficulty or learner enjoyment have a substantial influence upon particular aspects of L2 writing.

Therefore, the current investigation aims to examine the impact that several variables associated with ER have on particular linguistic features of L2 writing. This re-

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search will explore the relationship between the ER-related variables of number of words read, learner-perceived difficulty and enjoyment and essay scores as analyzed by lexical analysis software. The purpose of this analysis is to determine whether ER in the L2 can cultivate particular lexical complexity features in learners' L2 written vocabulary. As language teachers, we hope to cultivate the ability to write in lexically complex text in our learners because it is an indicator of a well written text. This analysis will provide a more nuanced understanding of how ER-related variables such as perceived difficulty of reading materials and readers' levels of enjoyment while reading can contribute to the development of specific aspects of the L2 lexical complexity of their L2 writing. This research can also shed light on how ER influences unique features of the lexical complexity of L2 writing by teasing out how individual aspects of lexical complexity like the number of different words and lexical density are affected by ER.

## II. LITERATURE REVIEW

### 1. Computational Linguistics and Computerized Text Analysis Tools

The web-based L2 Lexical Complexity Analyzer (Ai & Lu, 2010) was used to count and examine participants' writing samples for indicators of lexical complexity. These online tools can provide us with information about second language text complexity (Murphy Odo, 2018). This tool is based on a computational linguistics approach to text analysis that addresses logistical constraints on data analysis related to the resource intensiveness and limited reliability associated with human ratings. Two of the more well-known computational software tools available are Text Analyzer (Ai & Lu, 2010) and Coh-Metrix (Graesser, McNamara, & Kulikowich, 2011). The Text Analyzer online web software contains analysis tools for both vocabulary and syntactic structure. Computational tools like Coh-Metrix and the Lexical Complexity Analyzer are well-validated platforms for assessing lexical sophistication of written texts (Crossley & McNamara, 2011) that lend themselves to quantitative analysis by focusing on various particular lexical features of the L2 (Lu, 2012).

A strong relationship has been demonstrated to exist between human raters' evaluations of L2 text quality and measures of their linguistic characteristics produced by computational linguistics web tools like Text Analyzer and Coh-Metrix. For example, indicators of lexical sophistication (e.g., frequency and diversity of different vocabulary used) have been shown to predict native speaker ratings of written texts (Crossley & McNamara, 2012; McNamara, Graesser, Cai, & Kulikowich, 2011). These lexical variables also account for considerable variability in human raters' judgement ESL college students' written texts and they can be used to differentiate between test takers (Crossley & McNamara, 2010). With regard to lexical fea-

tures, computational linguistics studies likewise indicate that vocabulary sophistication can better predict the quality of texts written by ESL students than use of cohesive devices (Crossley & McNamara, 2010; S. Min, 2019). As well, lexical diversity and word frequency have been shown to associate with L2 writing performance (Crossley & McNamara, 2012; J. Kim, 2014).

### 2. Extensive Reading Supports L2 Writing

Research in different contexts has contributed to a growing understanding of the impact that ER in the L2 has on L2 learners' writing ability. Studies with younger learners have shown that "book flood" programs whereby they read extensively for pleasure contribute to the English writing development of both the students (Elley, 1998; Elley & Mangubhai, 1981; Hafiz & Tudor, 1990) and their teachers (Elley, 1998). A comparison of an L2 reading and writing program for secondary-level learners in Hong Kong reported that those in the reading condition improved their writing holistically but their organization, vocabulary, and mechanics remained relatively unaffected (Tsang, 1996). Comparable observations were made in an investigation of Egyptian secondary-level learners who made gains in their L2 writing after reading teacher-selected texts on a variety of topics (Ibrahim, 2006). J. Lee and Schallert (2016) investigated Korean middle school learners exposed to ER and extensive writing treatments. They saw that only the more proficient learners' writing developed after either the ER or writing treatment. Thus, there appears to be a proficiency level that learners must be beyond for ER or extensive writing to improve their L2 writing.

Postsecondary L2 writers have received some attention as well. ER was found to have a positive effect on Iranian (Salehi, Asgari, & Amini, 2015) and Saudi (Al-Mansour & Al-Shorman, 2014) EFL postsecondary students' essay writing performance. The same was also true of learners' ability to write L2 summaries (Mason & Krashen, 1997). Others researchers examined specific characteristics of L2 learners' writing and observed that when struggling Taiwanese vocational college English students experienced ER they showed significant gains on various aspects of their writing including written content, organization, vocabulary, mechanics (S. Y. Lee & Hsu, 2009; Mermelstein, 2015) as well as L2 written grammar (Yaghoubi-Notash, 2015) and course grades (S.-Y. Lee & Krashen, 2002). Nevertheless, at least one study with Thai EFL learners concluded that ER did not improve L2 writing ability (Kirin, 2010).

These various investigations of the effect of ER on writing ability generally point toward it being helpful for young learners (Elley, 1998; Elley & Mangubhai, 1981; Hafiz & Tudor, 1990), secondary-level learners (Ibrahim, 2006; J. Lee & Schallert, 2016; Tsang, 1996) and post-secondary learners in fostering growth in L2 written grammar (Yaghoubi-Notash, 2015), essay (Salehi et al., 2015) and summary writing (Mason & Krashen, 1997) as well as

other features of L2 writing (S. Y. Lee & Hsu, 2009; Mermelstein, 2015). However, at least one study reported that ER does not lead to better L2 writing (Kirin, 2010).

### 3. Effect of ER on L2 Vocabulary Development

ER can benefit learners from various backgrounds with regard to their L2 development. A distinction is commonly made between intentional and incidental learning in research that looks at the impact of ER on vocabulary learning. Typically, ER is claimed to be responsible for incidental learning whereby learners unconsciously acquire the meaning of previously unknown words over time as they encounter these words in a variety of contexts while reading for meaning and inferring the unknown words' meaning from context (Krashen, 2004). This type of learning is incidental because it is a side effect of reading rather than its primary aim (Waring & Takaki, 2003).

A number of investigations with K-12 grade learners in different contexts support the claim that ER builds L2 vocabulary. An early "book flood" experiment in Fiji where learners read self-selected books for 20 to 30 minutes per day showed considerable gains in their L2 vocabulary knowledge (Elley & Mangubhai, 1983). Later replications of this research in South Africa and Sri Lanka revealed that elementary learners scored three times higher on vocabulary measures after five months of ER (Elley, 2000). The same was true for low level Korean English elementary level learners who read authentic materials for 16 weeks (K.-S. Cho & H.-J. Kim, 2004) and reluctant elementary-level Turkish EFL learners who did ER for three hours per week over three months (Tiryaki & Tütüniş, 2013). Results from another study indicated that lower-level school-aged ESL learners in Quebec needed to see new vocabulary repeatedly to recall it effectively (Zahar, Cobb, & Spada, 2001).

Research on secondary-level students is somewhat more mixed. A study of secondary students in Hong Kong that compared extensive reading and frequent writing programs found that ER was effective for promoting content, language use, and overall writing quality. However, the reading group exhibited no significant gains in vocabulary (Tsang, 1996). Similarly, research on a summer program in Hong Kong found that learners incorrectly guessed vocabulary meaning while reading for gist which sometimes caused them to misinterpret the text (Lai, 1993). In contrast, beginner through advanced Taiwanese secondary school EFL learners who read beginner level graded readers over 37 weeks showed substantial vocabulary gains for both groups. However, the higher-level learners had significantly greater growth suggesting that existing vocabulary knowledge has a powerful effect on vocabulary learning through ER (Webb & Chang, 2015). Another study looked at Taiwanese senior high-school students who read five beginner graded readers over 13-weeks. Findings were that those who read easier materials had a significantly higher learning rate than those who read more difficult texts but both groups displayed very high

learning rates (Chang, 2015).

Research in post-secondary contexts was similar to elementary schools. Post-secondary advanced Spanish L2 university students' English word recognition and meaning recall was assessed after their reading of an authentic novel. Approximately 10 exposures enabled the meaning and spelling to be recognized for over three-quarters of the words (Pellicer-Sánchez & Schmitt, 2010). University level EFL students in Hong Kong attending a popular literature class that included self-selected reading showed clear vocabulary gains of approximately 3000 new words over the semester (Lao & Krashen, 2000). Three studies of Taiwanese university students showed ER to be as effective as traditional instruction in acquiring English vocabulary especially if it is done over a long period of time (S. Lee, 2007).

Other studies in the Northeast Asian context agreed that new vocabulary is incidentally acquired Japanese university students but only after a considerable amount of reading of graded materials (Waring & Takaki, 2003). These materials should also have sufficient repetition of unknown vocabulary and teachers must realize that learners will probably be better at recognizing rather than actively recalling these words as time passes (Brown, Waring, & Donkaewbua, 2008). Likewise, intermediate-level science and engineering majors in Korea who read three adolescent chapter books over five weeks showed significant vocabulary gains. Unique findings from this study were that nouns and more frequent words were easiest to learn and retain and low frequency words were better learned when their meanings were central to understanding the text (S.-O. Kweon & H.-R. Kim, 2008).

Comparable results were reported for adult learners who read light novels (K.-S. Cho & Krashen, 1994). Horst (2005) examined ESL adult immigrant learners who read self-selected graded readers for six weeks. They increased their knowledge of over half of the unfamiliar words from the materials. Pigada and Schmitt (2006) conducted a month-long extensive reading case study of a highly-motivated adult learner to investigate the extent of partial learning of words. Findings suggested that knowledge of over half of the target words was enriched especially for spelling and meaning.

Recently, a number of meta-analyses have been conducted to aggregate the findings from numerous studies to identify patterns among their results. All of these meta-analyses concur that ER encourages L2 vocabulary growth. Where they differ is in their conclusions about the magnitude of the effect. Some have reported that ER has a small to moderate impact on L2 vocabulary development (E.-Y. Jeon & Day, 2016; Wang, 2010) while others have concluded that ER brings about moderate to large gains in L2 vocabulary (Liu & Zhang, 2018; Nakanishi, 2015). Possible reasons for this discrepancy in findings are due to different studies being included in the samples for each of the analyses. It is worth noting that some studies did not focus on finding effect sizes for vocabulary specifically and included it with other variables like comprehension

(E.-Y. Jeon & Day, 2016). However, the studies that did single out vocabulary in their analyses tended to find more robust effect sizes (Liu & Zhang, 2018; Nakanishi, 2015) although this was not always the case (Wang, 2010).

In summary, while there does appear to be some disagreement in the literature, the majority of sources across various age groups and national backgrounds points to ER being an effective tool for promoting the acquisition of L2 vocabulary in terms of the rate of acquisition and ultimate vocabulary gains although some have pointed out that repeated exposure to targets is necessary in order for them to be retained long term.

Despite the advances in our understanding of the impact of ER on writing several important questions remain unexplored. Previous studies have tended to concentrate on writing quality in general rather than specific features of writing such as lexical complexity. Accordingly, the current study can offer some unique insight into how ER impacts L2 writing at the lexical level. The present research will also address a limitation of several previous studies which was their operationalization of ER as students reading a lot in the L2. The issue is that this ignores other key characteristics of ER such as self-selection and access to engaging materials. Therefore, the current study ensured that learners chose their own books from a wide selection of engaging titles. N. Suk (2017) identified a number of other limitations related to this research that the present study attempted to address as well. These included others' vague reporting of how much ER was done, relatively brief ER treatment periods and small sample sizes. Lastly, there has also been no research conducted that actually connects the precise number of words read with specific characteristics of vocabulary found in actual samples of learners' authentic written L2 output.

Given these oversights in the existing research within this domain, the following research questions have been posed to guide the present investigation:

- 1) Do the ER- related variables of number of words read, perceived text difficulty and text enjoyment influence the lexical density of written L2 texts?
- 2) Do the ER- related variables of number of words read, perceived text difficulty and text enjoyment influence the number of different words included in written L2 texts?

### III. METHODS

#### 1. Participants

This study recruited of 98 undergraduate pre-service English teachers studying for a bachelor of education at a research-intensive university located in a major metropolitan center in South Korea. Participants were all non-native speakers of English who ranged from 21-28 years of age. Their English proficiency ranged from intermediate to upper intermediate (B1 to B2 on the Common European

Framework of Reference (CEFR) (Council of Europe, 2001) and they had all been studying English as a foreign language for 10 or more years. Participants had previously taken one English writing class prior to this course but otherwise had limited experience writing in English. This sample was selected as a convenience sample that represents a group of learners who typically are expected write in English more than other EFL learners. Namely, they are postsecondary students majoring in an English-related subject area. Given the pressing importance of English writing in their lives, it is worthwhile to investigate how ER might improve particular features of their writing.

#### 2. Research Context

Four groups from four consecutive fall semester classes of an essay writing course taught by the same instructor in the academic years of 2016 through 2019 participated in the study. All participants took part in the study voluntarily. The course was a 16 week class whose aims were to develop students' use of English essay writing in an academic context and to develop their critical and analytical thinking skills for academic study. There were three hours of in-class teaching per week. The writing instruction focused mostly on text structure and text genre features. The instructor taught paragraph and essay structure for various genres of essays including descriptive, argumentative and comparison. Participants were instructed in thesis statement and topic sentence development, as well as organizing supporting details. Participants were also required to write essays from each of the genres over the term on self-selected topics. The course also included an extensive reading (ER) component described below because, ER has been found to support the development of various aspects of L2 writing in post-secondary learners (Mason & Krashen, 1997; Mermelstein, 2015; Salehi et al., 2015; Yaghoubi-Notash, 2015).

#### 3. Research Instruments

The two types of reading materials made available to participants during the study were graded readers designed for second-language learners and young adult literature. The graded readers allow L2 learners to read more comfortably because they are not required to excessively access the dictionary for unknown words (British Council, 2016). The graded readers provided were designed for beginners up through upper-intermediate. A number of young adult literature books were also included in the class library because of their ability to motivate L2 learners, promote L2 learning (K.-S. Cho & Krashen, 1995) and can serve as a model of quality writing (Bucher & Manning, 2014). During the class, participants also kept a daily reading log that required them to record the number of words they read as well as five-point Likert scale items to indicate their self-perceived difficulty and enjoyment of what they were reading.

An argumentative essay that participants wrote toward the end of their writing course was used for the present writing analysis. Participants engaged in free writing of an argumentative written essay assignment about a topic of their choice without feedback or revision. Students electronically composed and submitted the essay at the end of the course (week 16). This was a type of ‘performance assessment’ is based on the kinds of writing observed in authentic situations (Bachman & Palmer, 1996; Weigle, 2002).

#### 4. Procedures

The ER began during the first week of the course, students were shown how to use the portable classroom library to choose reading materials at their level. They were told to select enjoyable texts and read as much as they could without dictionaries. They borrowed books from a library of 350 titles and read for 15 minutes per class which came to approximately 30 minutes out of the allotted 2 and a half class hours per week. Participants were also told that they were doing ER to support their writing development, something which has been empirically supported (e.g., see the work of S. Y. Lee & Hsu, 2009; J. Park, 2015).

The writing instruction emphasized overall text structure and genre features. The course covered paragraph and essay structure for descriptive, argumentative and comparison essays. Participants learned how to craft thesis statements and topic sentences in addition to how to integrate supporting details into their writing. They learned how to structure introduction and conclusion paragraphs for each essay type. In the concluding weeks of the course, they had to write the argumentative essay that was analyzed for the present study.

#### 5. Data Analysis

The lexical complexity variables used in this analysis were taken from the Web-based Lexical Complexity Analyzer (<https://aihaiyang.com/software/lca/>). This is an online web tool that leverages the computational ability of technology to analyze the lexical complexity for samples of written English language texts “using 25 different measures of lexical density, variation and sophistication proposed in the first and second language development literature” (Ai, 2017, para. 1) to produce metrics for lexical (Ai & Lu, 2010) text features (Lu, 2010). Existing research has demonstrated the utility of Web-based Lexical Complexity Analyzer results for analyzing and evaluating the oral (Lu, 2012) and written production of L2 learners (Lu & Ai, 2015).

Lexical complexity features that were measured in the analysis included lexical density (LD) and number of different words (NDW) were analyzed using the Lexical Complexity Analyzer software. Lexical density is defined as the number of lexical words (or content words) divided by the total number of words which is taken to be a

measure of “... information packaging; a text with a high proportion of content words contains more information than a text with a high proportion of function words” (Johansson, 2009, p. 65). NDW is a measure of the total number of different words in a language sample and is considered useful for assessing changes in language over time (Klee, 1992). These variables correspond to features commonly associated with lexical sophistication in written language output (Goldman & Lee, 2014; Gregori-Signes & Clavel-Arroitia, 2015).

Results for the lexical complexity measurements from the analysis of each of the written essays were then entered into SPSS 23 and analyzed. The statistical test used for the analysis was a multivariate multiple regression analysis because there were three explanatory (i.e., number of words, perceived difficulty and enjoyment) and two response variables (i.e., LD and NDW). After writing evaluation scores were obtained from the Lexical Complexity Analyzer for the two measures of lexical complexity, a multivariate multiple regression analysis was then used to examine how well each of the ER-related variables predicted the two response variables for lexical complexity in L2 writing.

### IV. RESULTS

Regression diagnostics were conducted for all models, including examination of linearity, multicollinearity, homoscedasticity, normality and residuals. The means, standard deviations, and inter-correlations of the variables under investigation are presented in Table 1. Pearson correlations demonstrated significant interrelationships among several variables. However, the correlation between lexical density and number of different words (i.e., -.03) was not significant.

Initial MMR results were that the number of words and perceived difficulty [predictors] had a significant effect on the lexical complexity variables while the enjoyment variable did not. However, an additional follow-up MMR comparing the models with two response (i.e., number of words and perceived difficulty) and three predictors showed that there was no significant difference in the models so, following the advice of Chen, Xu, Tu, Wang, and Niu (2018), all three predictors were included in the multivariate multiple regression analysis.

**TABLE 1**  
Means, Standard Deviations and Intercorrelations Among the Variables Measured (*n* = 98)

Variables	<i>M</i>	<i>SD</i>	2	3	4	5
1. No. of words	32643	18739	0.164	0.027	0.069	0.318**
2. Difficulty	0.00337	0.991	—	-0.245*	0.244*	0.117
3. Enjoyment	3.90	0.611		—	0.041	0.073
4. Lexical density	0.554	0.0258			—	-0.035
5. Number of different words	298	60.0				—

Note. \* *p* < .05, \*\* *p* < .01

To examine the research hypotheses of the study, a multivariate multiple regression analysis was conducted to test a model that predicts the lexical density (LD) and number of different words (NDW) as indicators of lexical complexity in participants' L2 writing. More precisely, the model includes (1) factors affecting extensive reading in the L2 (number of words read, perceived difficulty, enjoyment) as independent variables and (2) L2 written lexical complexity outcomes (lexical density and number of different words) as dependent variables.

Relationships among the ER variables number of words read, perceived difficulty, and enjoyment and the two dependent variables, lexical density and number of different words, were tested using the multivariate general linear model command in SPSS (see Table 2). Analysis results show that number of words read (*Pillai's Trace* = .092,  $F(2, 93) = 4.71, p < .05$ ) and perceived difficulty (*Pillai's Trace* = .075,  $F(2, 93) = 3.82, p < .05$ ) were statistically significant at the multivariate level. However, enjoyment was not significant in the multivariate analysis (*Pillai's Trace* = .02,  $F(2, 93) = 0.96, p < .383$ ). Therefore, one or more independent variables significantly predict one or more dependent variables.

To further explore the relationships between the independent and each dependent variable, each dependent variable was regressed on all three independent variables in a univariate analysis. These follow up univariate regression analyses revealed that the number of words read variable was significantly associated with number of different words found in L2 writing ( $F(1,94) = 9.28, p < .01$ ), but did not associate with lexical density ( $F(1,94) = .049, p = .826$ ). At the univariate level, perceived difficulty was a significant predictor of lexical density ( $F(1,94) = 6.514, p < .05$ ) but not of number of different words ( $F(1,94) = .755, p = .387$ ). As well, the follow up univariate analysis showed that enjoyment did not significantly predict lexical density ( $F(1,94) = 1.048, p = .309$ ) or number of different words ( $F(1,94) = .74, p = .392$ ).

These results suggest that perceived difficulty had an effect on lexical density indicating that those who read materials that they perceived as being more difficult wrote L2 essays that contained a higher proportion of content words and information. The lexical density of academic writing is particularly high as well and greater lexical density demonstrates a writer's authority. Focusing on increasing lexical density can enhance learners' academic writing (Thonney, 2011). Thus, an activity like ER using moderately challenging texts can have a positive effect on the lexical density of learners' L2 writing and make them more authoritative writers.

Number of words read also had an effect on number of different words (NDW) in learners L2 written essays. This suggests that the more words participants read during ER, the more different words they used in their written essays. In this way ER has a positive influence upon the diversity of words that learners choose in their L2 writing.

The amount of total variance explained by the predictors for each L2 lexical complexity characteristic differed.

The variables predicting lexical density accounted for 7% of the variance whereas the predictor variables accounted for 11% of the variance in number of different words. These results reveal that the three independent variables are better predictors (i.e., explain more variance) of number of different words than of lexical density. As well, although a substantial amount of the variance in the criterion variables was not explained, a significant and positive main effect was found for ER-related variables as predictors of lexical density and number of different words.

**TABLE 2**  
Multivariate and Univariate Analysis of No. of Words, Difficulty, and Enjoyment as Predictors of Lexical Density and Number of Different Words ( $n= 98$ )

Multivariate	df	F	Pillai's trace	p
No. of words read	2	4.71	0.092	.011*
Perceived difficulty	2	3.82	0.075	.025*
Enjoyment	2	0.96	0.020	.383
Univariate tests				
No. of words read	Sum of squares	df	F	p
Lexical density	3.10	1	.049	.826
Number of different words	30675.72	1	9.288	.003**
Perceived difficulty	Sum of squares	df	F	p
Lexical density	.004	1	6.514	.012**
Number of different words	2495.19	1	.755	.387
Enjoyment	Sum of squares	df	F	p
Lexical density	.001	1	1.048	.309
Number of different words	2444.13	1	.74	.392

\* Significant at the multivariate level

\*\* Significant at the univariate level

## V. DISCUSSION

This research begins with the observation that L2 learners at the post-secondary level need efficient methods to learn how to write well in their L2. A key component of effective writing at this level is sophisticated vocabulary use. Extensive reading has been put forth as an effective tool for improving L2 learners' vocabulary and writing. However, existing research has not provided a fine-grained answer as to the specific effects that ER can have on developing particular characteristics of L2 vocabulary in L2 writing. Therefore, the purpose of the current investigation was to examine the influence of extensive reading on the development of specific features of lexical complexity (i.e., diversity and density) in L2 writing.

Results from the analysis of ER-related variables with word diversity in their L2 writing were that the more words participants read, the greater variety of words they used in their essays indicating that ER has an effect on the diversity of words used in L2 writing. These results are generally affirmed by accumulating evidence for the positive influence that ER has on the L2 writing growth of elementary (Elley, 1998; Elley & Mangubhai, 1981;

Hafiz & Tudor, 1990), secondary (Ibrahim, 2006; J. Lee & Schallert, 2016) and post-secondary learners (Al-Mansour & Al-Shorman, 2014; Mason & Krashen, 1997; Mermelstein, 2015).

Indeed, ER was found to have a positive effect on EFL postsecondary learners' essay (Al-Mansour & Al-Shorman, 2014; Lee & Hsu, 2009; Mermelstein, 2015) and summary writing (Mason & Krashen, 1997) performance. Likewise, other researchers have observed gains on specific features of L2 writing such as written content, organization, vocabulary, mechanics (Lee & Hsu, 2009; Mermelstein, 2015) and course grades (S.-Y. Lee & Krashen, 2002). Nevertheless, these conclusions are not unanimous in support of ER for L2 writing (Kirin, 2010) or L2 written vocabulary development (Tsang, 1996).

In answer to the second research question, learners' perceived difficulty of their ER materials had an effect on the lexical density of their written essays demonstrating that ER materials they thought to be more difficult promote production of L2 essays that have more content words and information. This finding provides evidence that ER impacts L2 vocabulary development. The result is generally in accord with those for elementary (K.-S. Cho & H.-J. Kim, 2004; Elley, 2000; Tiryaki & Tütüniş, 2013), and some findings at the secondary level (Chang, 2015; Webb & Chang, 2015). Adult learners (K.-S. Cho & Krashen, 1994; Horst, 2005; Pigada & Schmitt, 2006) and post-secondary L2 university EFL students similarly show gains in English word recognition and meaning recall (Pellicer-Sánchez & Schmitt, 2010) in as quickly as a semester (Lao & Krashen, 2000). However, it has been argued to be more effective over the long term (S. Lee, 2007) with considerable reading (Waring & Takaki, 2003) and repetition of unknown vocabulary (Brown et al., 2008; S.-O. Kweon & H.-R. Kim, 2008). Findings from meta-analyses concur that ER encourages L2 vocabulary growth although they differ with regard to the magnitude of the effect with some concluding it is small to moderate (E.-Y. Jeon & Day, 2016; Wang, 2010) and others that it is moderate to large (Liu & Zhang, 2018; Nakanishi, 2015).

However, it is also important to note that in most of the existing research L2 vocabulary use is evaluated separately rather than as part of the writing that occurred in the study. That is, when vocabulary was evaluated in many of these studies, it tended to be assessed impressionistically as part of an overall writing rubric (Mermelstein, 2015; Tsang, 1996). Consequently, it is difficult to compare their results directly with those of the present investigation. With that said, findings of previous studies do support the conclusion of the present analysis that opportunities for learners to engage in ER do foster L2 written vocabulary development.

In addition to the encouraging findings regarding the positive impact that ER-related variables have on the lexical complexity of L2 writing, several unexpected findings also emerged throughout the course of this research. For instance, no significant influence was observed for the number of words read during ER on the lexical density

of L2 writing. One possible explanation for this finding is that the ER treatment only consisted of approximately 360 minutes of reading over one semester. It may have required more time to detect ER's effect on lexical density in L2 writing if one exists. An alternative explanation could be that without a clear justification we should not necessarily expect that the amount of reading learners do will cause them to produce written texts that contain a larger proportion of content words or information. Additional research seems necessary to resolve this issue.

A second unanticipated finding related to the minimal influence of learners' perceived difficulty of their ER texts on the number of different words in their writing. That is, reading more challenging texts did not appear to lead them to write essays that included a greater variety of vocabulary even though they did write texts that were more lexically dense. This could be because reading more difficult text gave them the insight that they needed to write denser texts. However, these more demanding texts may have contained a lot of new and relatively rare vocabulary that only enabled them to develop a receptive knowledge of it over the span of a single semester. Here as well, it may be that more time or exposures to the vocabulary – possibly through narrow reading – would allow them to be able to use new terms productively.

A final somewhat unforeseen result was that enjoyment had no effect on the lexical complexity (i.e., lexical density or number of different words) in participants' writing. A possible explanation for this is that those who choose more enjoyable texts choose texts that are less difficult. A significant negative correlation of  $r = -.246$ ,  $n = 98$ ,  $p = .015$  between the enjoyment and perceived difficulty variables suggests that at least to some degree those who choose more enjoyable materials are also reading materials that they feel are less difficult. Since difficulty relates to at least one aspect of lexical complexity (i.e., lexical density), it may be that in choosing more enjoyable reading materials, learners are unintentionally selecting materials that will not spur growth in their L2 lexical complexity. Therefore, the possibility should be considered that despite what numerous researchers claim about the importance of enjoyment in ER (Day & Bamford, 1998; Krashen, 2011), a danger may exist that choosing more enjoyable texts may not lead to development of lexical complexity in one's L2 writing. Of course, these observations are speculative and additional research is necessary to establish their veracity.

## VI. CONCLUSIONS

This research addressed the question of the impact that ER can have upon the development of specific characteristics of L2 lexical complexity. In support of previous research into the effect of ER on L2 vocabulary development, findings were that ER influences the diversity of words used in L2 writing. Also somewhat in agreement with the bulk of previous research, reading ER texts that are perceived as being more difficult encourages produc-

tion of L2 essays with higher lexical density. However, reading enjoyment did not correlate with the lexical complexity of participants' L2 writing.

A number of implications also follow from these results. First, since ER was shown to support the growth of at least some aspects of L2 written vocabulary development, students in writing classes should be provided with more opportunities to read extensively in English. In particular, using texts that learners perceive to be moderately challenging can foster the development of their L2 written lexical density. As well, ER positively influences the variety of words that learners use in their L2 writing, so teachers should encourage learners to read as much as they can in the L2 if they want to improve the variety of their word choices in their academic writing. However, if teachers are considering using ER to improve the vocabulary of L2 writers, they might be cautious about placing too much emphasis on pleasure reading given its apparent potential for limiting their L2 written vocabulary growth.

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