Second Language Reading and Writing in Relation to First Language Ability, Vocabulary Knowledge, and Learning Backgrounds: A Literacy Development Study

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Abstract

Being able to read and write in English as a second language (L2) in the globalized world has been increasingly considered important to gain greater personal, academic, and business achievement. This study investigates English (L2) reading and writing abilities in relation to first language (L1) reading and writing abilities, L2 vocabulary knowledge, and L2 educational backgrounds. The L1-L2 reading and writing relationships were examined in terms of the linguistic threshold and linguistic interdependence hypotheses. Data from 108 undergraduate students who learned English in South Korea were analyzed using a path analysis. Results indicated that L2 vocabulary knowledge was the most important predictor of both L2 reading and writing. L1 reading scores predicted L2 reading scores, which supports the linguistic interdependence hypothesis. A positive relationship between L1 and L2 writing was found for L2 learners with greater L2 vocabulary knowledge, supporting the linguistic threshold hypothesis. L2 educational backgrounds were also found important, such that time living in an L2-speaking country was related to better understanding L2 reading passages, while test familiarity was associated with better L2 writing performance. The findings provide a more comprehensive understanding of L2 reading and writing abilities in relation to their relevant skills and educational backgrounds.

Keywords: second language reading, second language writing, vocabulary knowledge, educational backgrounds; threshold hypothesis; interdependence hypothesis

Introduction

Bilingualism (or multilingualism) has become increasingly common around the globe with estimates indicating that approximately 70% of the world's population are bilinguals who can understand and use more than one language to some degree (e.g. May, 2013). During the process of learning second languages (L2s), text literate bilinguals can develop biliteracy where their first language (L1) and L2 intersect reciprocally.[1] According to Hornberger (1990), biliteracy refers to "any and all instances in which communication occurs in two (or more) languages" (p. 213) including vernacular, formal, and academic settings (Hornberger & Link, 2012).

As English has become a language of global communication and business, the importance of being able to read and write in English as a foreign-language (EFL) contexts has continuously increased (e.g., Dewey, 2007). To facilitate students' reading and writing abilities in English, many universities offer English-medium courses to prepare students to succeed in global business and academic environments (e.g., Park, 2009). However, becoming biliterate for L2 learners is not an easy task because learners need to have solid linguistic knowledge in their L2 (e.g., van Gelderen et al., 2004) and reading and writing skills well developed in their L1 that can enhance L2 reading and writing processes (Alderson, 1984; Cummins, 1979), which can be developed through various learning experiences (e.g., Hulstijn, 2015). Previous studies have investigated the relationships among L2 reading and writing, and L2 linguistic knowledge, L1 reading and writing, and educational backgrounds. However, these relationships have been examined in a piecemeal manner. Consequently, we do not have a comprehensive understanding of how L2 reading and writing abilities interact with the related skills and knowledge. To fill this gap, the present study examines reading-writing relationships in an L2 while considering L1 reading and writing abilities, L2 vocabulary knowledge, and L2 learning backgrounds.

The goal of this study is to develop a hypothesized model that can help better explain L2 reading-writing relationships in reference to relevant skills and educational backgrounds (as represented in Figure 1). The model was developed with the assumption that biliteracy development occurs holistically and is context-sensitive (Hornberger & Link, 2012), highlighting the importance of examining cognitive, linguistic, and social factors which influence the

[1] In this study, an L2 is referred to as a language that is not a native language, including foreign languages. Reading was used to refer to reading comprehension.

development of biliterate repertoires, including L1 development and prior learning contexts. While the model we suggest takes into account a small percentage of language skills and backgrounds, it is based on previous studies and provides a principled foundation for the analyses found in this study. The model in Figure 1 indicates that L2 reading and writing abilities influence each other as shown by the bidirectional arrow (e.g., Fitzgerald & Shanahan, 2000; Hulstijn, 2015). The model also shows that both L2 reading and writing abilities are influenced by a range of factors. Influential relationships are shown by one-direction arrows. Among these factors, some are likely shared between reading and writing, such as language resources (e.g., vocabulary knowledge), foundational cognitive resources (e.g., working memory), and higher-level cognitive processes (e.g., awareness of text structure; e.g., Grabe & Stoller, 2011; Fitzgerald & Shanahan, 2000; Schoonen, 2019; Wong, 2018). L2 reading and writing abilities are also influenced by educational backgrounds including L2 exposure, length of L2 learning, and familiarity with reading and writing tasks (e.g., Barkaoui, 2019; Muñoz, 2008; Saito, Dewaele, Abe, & In'nami, 2018). Conversely, some factors may primarily influence reading ability, while others may mainly influence writing ability. For example, L1 reading ability mostly impacts L2 reading ability, while L1 writing ability primarily affects L2 writing ability (Alderson, 1984; Cummins, 1979).

<FIGURE 1 NEAR HERE>

The current study addresses some of the important factors found in Figure 1 including a) L2 vocabulary knowledge as a shared resource that can influence both L2 reading and writing; b) L1 reading ability as L2-reading-specific resources; c) L1 writing ability as L2-writing-specific resources; and d) three variables related to L2 educational backgrounds (i.e., length of L2 learning, studying abroad in L2-speaking countries, and familiarity with L2 reading and writing tasks)

Relations between L1 and L2 Reading and Writing

When examining relationships between L1-L2 reading and writing, researchers generally assume either a linguistic interdependence hypothesis (i.e., that L2 learners likely use reading and writing skills acquired in their L1 during L2 reading and writing performance; Cummins, 1979) or a linguistic threshold hypothesis (i.e., the transfer of L1 reading and writing abilities to an L2 occurs only after L2 learners attain a certain threshold level of L2 knowledge, Alderson, 1984). These two hypotheses remain central tenets in research on bilingualism. L2 writing research has

reported mixed findings related to the linguistic interdependence hypothesis (Carson et al., 1990; Pae, 2019; Sasaki & Hirose, 1996; Schoonen et al., 2003). For example, Sasaki and Hirose (1996) found that for Japanese EFL learners in higher education, 18% of the variance in L2 (English) writing ability was predicted by L1 (Japanese) writing ability. On the contrary, Carson et al. (1990) found no correlation for Chinese writers of English and a weak and negative correlation for Japanese learners of English. In terms of the linguistic threshold hypothesis, Pae (2019) reported that the relationship between L1 and L2 writing abilities for secondary Korean EFL students was significantly stronger in learners with greater L2 knowledge, supporting the hypothesis. In L2 reading research, many studies have supported both the linguistic interdependence and the threshold hypotheses (e.g., Jeon & Yamashita, 2011; Koda, 2007; Lee & Schallert, 1997; Pae, 2019; van Gelderen et al., 2004). For instance, in a meta-analysis, Jeon and Yamashita (2011) reported a moderate correlation between L1 and L2 reading comprehension, supporting the linguistic interdependence hypothesis, while Lee and Schallert (1997) found evidence for the linguistic threshold hypothesis such that L1 and L2 reading abilities showed moderate correlations for L2 learners with greater L2 linguistic knowledge, while no correlations between L1 and L2 reading abilities were found for L2 learners with less L2 linguistic knowledge.

Shared Resources Between Reading and Writing

Recent empirical studies have examined linguistic knowledge and cognitive skills that may be shared between L2 reading and writing ability (e.g., Schoonen, 2019; Wong, 2018). For example, in a longitudinal study, Schoonen (2019) found that declarative knowledge measures (i.e., vocabulary, grammar, orthographic, and metacognitive knowledge) explained a large amount of the shared variance between reading and writing in Dutch (L1) and English (L2) for three consecutive years of secondary education, suggesting that linguistic knowledge is one of the main shared resources between reading and writing ability. In another longitudinal study (Wong, 2018) reported that for 5th-grade learners of Chinese (L2), initial reading ability was indirectly related to the subsequent sentence writing ability via L2 linguistic skills (i.e., Chinese character writing fluency and written syntactic skills), indicating that L2 linguistic skills likely served as building blocks that helped connect cognitive processes of reading and writing at the sentence level. In the current study, we chose vocabulary knowledge to measure language resources shared between reading and writing because vocabulary knowledge is considered key for

successful reading and writing in models of reading (e.g., Perfetti, Landi, & Oakhill, 2005) and writing (e.g., Hayes & Berninger, 2014). Empirical studies have also reported that L2 vocabulary knowledge is a significant predictor of L2 reading scores (e.g., van Gelderen et al., 2007) and L2 writing scores (e.g., Stæhr, 2008; Schoonen et al., 2003).

Educational Backgrounds

Various L2 educational backgrounds can impact L2 reading and writing abilities. While background variables may be considered construct-irrelevant because they theoretically function independently of L2 reading and writing abilities, they tend to affect learner performance, resulting in learner variability. This is particularly common in foreign language learning contexts where L2 experience is primarily limited to classroom settings (Muñoz, 2014).

Two important L2 learning backgrounds are age of initial L2 learning and length of L2 leaning (Larson-Hall, 2008; Muñoz, 2008, 2014; Saito et al., 2018). Age of initial L2 learning is crucial in naturalistic immersion contexts where massive input is available, such that the earlier, the better. It is generally agreed that prior to puberty, children's exposure to massive amounts of L2 input can naturally trigger language acquisition (DeKeyser, 2000). However, in foreign language contexts, there is no clear evidence which supports that an early start necessarily results in higher L2 proficiency because foreign language learning settings tend to provide limited exposure to L2s (Muñoz, 2008, 2014). For example, Muñoz (2014) examined English (L2) oral performance (i.e., film-retelling narrative) of university students in Spain and reported that English oral performance was related to input measures (e.g., length of instruction in years and contact with native speakers), but not to starting age. This finding indicates that the amount and quality of L2 learning may be more important than the age in which a foreign language learning setting starts.

L2 learning experience in an L2-speaking country, such as study abroad, is also beneficial for enhancing L2 learning because living abroad in an L2 country potentially provides an abundant amount of L2 input and greater opportunities to produce L2 output (Authors, 2018; Sasaki, 2007; Serrano, Llanes, & Tragant, 2016). For example, Sasaki (2007) examined changes in English (L2) writing abilities of Japanese university students who studied abroad in English-speaking counties and found that the students improved their L2 writing fluency after studying abroad. While some L2 areas, such as oral and written fluency, tend to improve after studying abroad, studying abroad is not necessarily beneficial in other areas, such as grammar and

accuracy (Knoch, Roushad, & Storch, 2014; Serrano et al., 2016). For example, Knoch et al. (2014) found that after a year of study at English-medium university, L2 (English) learners tended to improve their writing in terms of fluency, but not accuracy.

Test familiarity (i.e., the degree which learners are familiar with the test) may also affect test performance because greater familiarity with the test may indicate learners' prior practice on the test (Barkaoui, 2019; Reeve, Heggestad, & Lievens, 2009; Yoo, Manna, Monfils, & Oh, 2018). For example, Barkaoui (2019) examined L2 (English) learners who repeated an English writing test and reported a familiarization effect, such that first-time test-takers tended to receive higher scores on the second test occasion, though this might be a one-time gain. This gain may relate to test-takers familiarizing themselves with the format and tasks of the test. However, to our knowledge, there is no research on comparing the effects of test familiarity on L2 reading and writing scores.

Current Study

Few if any studies have investigated the relationships among reading and writing across L1s and L2s, L2 vocabulary knowledge, and L2 learning backgrounds concurrently within the same population. To fill this gap, the current study examines L2 reading-writing relationships for Korean university EFL learners along with L1 abilities, L2 vocabulary, and L2 learning backgrounds, and attempts to provide evidence for either the linguistic interdependence hypothesis or the linguistic threshold hypothesis (or both) and the relative contributions of related skills and educational backgrounds to L2 reading and writing. The current study is guided by the following research question:

1. To what extent can L2 reading and writing scores be predicted by L1 reading and writing scores, L2 vocabulary knowledge, and L2 learning backgrounds?

Materials and Methods

Participants

Participants were 108 EFL undergraduate students from a university located in South Korea. All participants were native speakers of Korean. The students ranged in age from 18 to 22 with a mean of 19.21 (SD = 1.14). The participants were either freshmen (n = 61) or sophomores (n = 47). The participants' majors included Korean language education (n = 54), English language education (n = 34), History (n = 10), Archeology (n = 9), and Chemistry (n = 1). Seventy-four participants were female.

Measures

Background survey. The background survey asked participants for demographic information such as age, year in college, gender, and major. It also asked about English learning experience including years of learning English and months living in English-speaking countries.

English receptive vocabulary test. As a proxy measure of L2 knowledge, L2 vocabulary knowledge was chosen because of its strong links to general L2 proficiency (Hulstijn, 2015), L2 reading abilities (Jeon & Yamashita, 2014; Koda, 2007), and L2 writing abilities (Stæhr, 2008; Schoonen et al., 2003). English vocabulary knowledge was measured through the new vocabulary levels test (NVLT; McLean & Kramer, 2015). The NVLT included five tests to assess receptive knowledge of the first five 1,000-word frequency levels (the fifth one including words from the highest frequency level) based on Nation's (2012) British National Corpus (BNC)/Corpus of Contemporary American English (COCA) word lists. Each test comprised 24 multiple-choice questions. The five tests were piloted with two students from the university where the data were collected. Based on the results from the piloting, the tests covering the third and fourth 1,000-word frequency levels were selected as appropriate levels for the participants. The vocabulary level tests had a total of 48 multiple-choice questions (i.e., 24 questions from each of the two tests). Each vocabulary test item was presented both in isolation and in a sentence with the word in bold (e.g., **see**: They **saw** it), and participants were asked to select one of the four options which had the closest meaning to the given word. The participants were given 10 minutes to complete the vocabulary test. The scores were summed. Cronbach's alpha for the vocabulary test was .86, indicating acceptable reliability.

Korean reading comprehension test. To assess overall L1 reading comprehension ability, a standardized Korean reading test was used from the Korean Broadcasting System (KBS). The KBS Korean Proficiency Test was designed to measure native Korean speakers' general Korean language abilities including grammar, listening, and reading. The reading sections comprised 30 multiple-choice questions, and reading passages included various domains (e.g., novels, poems, expository texts, academic texts, newspapers, and reports). The questions assessed test-takers' literal, analytic, and inferential understanding of the given passages. The participants were given 35 minutes to complete the test. Cronbach's alpha for the Korean reading test was .71.

English reading comprehension test. Participants' overall L2 reading comprehension ability was measured with the Level 10/12 Gates-MacGinitie Reading Test Form S (GMRT;

MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2000). The test included 48 multiple-choice questions with passages from various domains, including narratives, autobiographies, and academic texts. The comprehension questions were both literal and inferential. The participants were given 35 minutes to complete the test. Cronbach's alpha for the English reading test was .81.

Korean and English writing tests. To assess participants' general writing ability, both Korean and English essays were written in response to independent essay prompts taken from a retired version of the Test of English as a Foreign Language (TOEFL). An argumentative essay genre was chosen because it is one of the most frequently used course assignments in higher education (Nesi & Gardner, 2012). Two different prompts from TOEFL independent writing tasks (i.e., argumentative writing) were used: One prompt asked an opinion about the use of technology, and the other asked an opinion about the use of automobiles. Writing tasks were counterbalanced across the two languages, such that half of the participants (n = 55) wrote a Korean essay about technology and an English essay about automobiles, while the other half (n = 55) wrote a Korean essay about automobiles and an English essay about technology. The participants were given 25 minutes to complete each writing test.

Both Korean and English essays were evaluated using a 5-point holistic rating scale developed for the TOEFL independent writing tasks[2]. The scoring rubric concerned effective completion of the writing task, organization, the appropriate use of explanations and exemplifications, coherence, and the demonstration of syntactic variety and appropriate word choice and phrase. The same rubric was used because the rating criteria covered general aspects of writing quality, and thus were considered applicable across languages. Both English and Korean essays were rated by two trained raters who were PhD students majoring in either applied linguistics or Korean language education and bilinguals in both English and Korean. After training sessions, the raters independently scored the essays collected in this study. If two ratings differed by more than one point, the raters adjudicated the ratings so that the disagreement between the raters was one point or less. The Cohen's kappa coefficients for English essays and Korean essays were .73 and .81, respectively, indicating satisfactory inter-

[2] The independent scoring rubric is available on the ETS website at https://www.ets.org/s/toefl/pdf/toefl_writing_rubrics.pdf

rater reliability (Landis & Koch, 1977). Average scores between the raters were calculated for each essay.

Test familiarity. L2 reading and writing test familiarity was measured by two items, respectively. These items were adapted from Lu (2010) and had a 5-point Likert scale from 1 ("*strongly disagree"*) to 5 ("*strongly agree"*). L2 reading test familiarity items included "*I'm familiar with the types of English passages I just read*." and "*I have practiced reading these types of English passages*." L2 writing test familiarity items included "*I'm familiar with the type of English essays I just wrote (i.e., argumentative essay*)." and "*I have practiced writing this type of English essays*." The values from the two items were averaged.

Procedure

Participants were recruited using flyers distributed across the university and in the English/Korean education department buildings specifically. Students majoring in English/Korean education were particularly targeted because they were considered to have higher proficiency in English/Korean and to be more motivated to complete reading and writing tasks than those majoring other areas, such as mathematics and engineering. The participants attended one session in a computer lab which accommodated around 50 participations. After the participants provided informed consent forms, the session proceeded. They first completed a background survey. All of the participants then took an English vocabulary test. Korean and English reading/writing tests were counterbalanced. For approximately half of the participants (n = 54), Korean reading and writing tests preceded English reading and writing tests. For the other half of the participants (n = 56), English reading and writing tests preceded Korean reading and writing tests. Reading tests preceded writing tests for each condition. Between Korean tests and English tests, a break time was provided for 10 minutes. Participants were remunerated for their participation.

Statistical analysis

To investigate whether L2 reading and writing scores were simultaneously explained by a set of various variables, a path analysis (a type of multivariate analysis) was conducted. Path analysis uses correlation matrix input and predicts regression weight (Alwin & Hauser, 1975). Path coefficients show the directions and magnitudes of the predicted effects. Path analysis can also have multiple dependent variables. In path analysis, it is important to include the directionality specifications of a path model based on clear rationales for each path (Kline, 2015).

Our hypothesized path model is shown in Figure 2. First, L2 vocabulary knowledge would predict both L2 reading and writing (e.g., Stæhr, 2008; Schoonen et al., 2003; van Gelderen et al., 2007). Second, based on the interdependence hypothesis, L1 reading would predict L2 reading, while L1 writing would predict L2 writing (Cummins, 1979; Sasaki & Hirose, 1996). Third, to examine the threshold hypothesis (Alderson, 1984), the model included interaction effects via moderation analysis (i.e., examining whether the relationship between two variables depends on a third, moderating variable; Hayes, 2013). Two interaction effects were calculated: an interaction effect of L2 vocabulary and L1 reading on L2 reading and an interaction effect of L2 vocabulary and L1 writing on L2 writing. Forth, L2 reading and writing would be predicted by L2 learning backgrounds, including the length of L2 learning (Muñoz, 2008, 2014), years of English-as-a-second-language (ESL) experience (Sasaki, 2007; Serrano et al., 2016), and test familiarity (Barkaoui, 2019; Yoo et al., 2018). Lastly, after L2 reading and writing were explained by L2 vocabulary (i.e., a shared resource), the correlation between the residuals of L2 reading and writing would decrease (Schoonen, 2019).

<FIGURE 2 NEAR HERE>

For sample size requirements for path analysis, various rules-of-thumb have been suggested, including a minimum sample size of 100 (Boomsma, 1982) and 10 observations per variable (Nunnally, 1967). These requirements were met in this study with 108 participants and nine variables (12 observations per variable). Given the possibility that at least one predictive path coefficient may be non-significant, after the model shown in Figure 2 was tested, a final model was created by removing non-significant predictive paths. By doing so, a parsimonious final model was created. To evaluate overall model fit, three goodness-of-fit measures were used: the χ^2 (Chi-square), comparative fit index (CFI), and standardized root mean square residual (SRMR). Given that Chi-square is sensitive to sample size, a normed chi-square (χ^2/df) was used with a threshold for acceptable value set at below five (Tabachnick & Fidell, 2007). Indicators of acceptable model fit included CFI statistics greater than .90 and SRMR less than .06 (Hu & Bentler, 1999). In assessing the fit indices, MLM (i.e., using standard maximum likelihood to estimate the model parameters with robust standard errors and a Satorra-Bentler scaled test statistic; Satorra & Bentler, 1994) was used. For path analysis, the *lavaan* package (Rosseel, 2012) in *R* (R core Team, 2018) was used.

Results

Table 1 displays descriptive statistics of and correlations among the measured variables. Participants' mean length of L2 learning was 11.44 years. Survey results showed that ten students had studied English in English-speaking environments. Their time abroad ranged from two months to two years with an average of .66 years.[3]

<TABLE 1 NEAR HERE>

The path model is shown in Figure 2 fit the data: SB$\chi^2(6) = 13.60$, $p = .03$, $\chi^2/df = 2.27$, CFI = .93, and SRMR = .03. The assumptions for path analysis (i.e., linear relationships among variables, interval level data, and uncorrelatedness between residuals of a dependent variable and the variables that predicted the dependent variable) were met. After removing the non-significant variables to generate a more parsimonious model, the final model fit the data (see Figure 4): SB$\chi^2(6) = 3.45$, $p = .75$, $\chi^2/df = .58$, CFI = 1.00, and SRMR = .02.

<FIGURE 3 NEAR HERE>

<FIGURE 4 NEAR HERE>

In the final model, 37.3% of the variance in L2 reading scores was accounted for by L2 vocabulary scores ($\beta = .51$, $p < .01$), ESL experience ($\beta = .28$, $p < .01$), and L1 reading scores ($\beta = .13$, $p < .05$). No interaction between L1 reading and L2 vocabulary was found. These results indicate that proficient L2 readers tended to have greater L2 vocabulary knowledge, have ESL experience, and be more proficient L1 readers.

In addition, 37.2% of the variance in L2 writing scores was accounted for by L2 vocabulary ($\beta = .51$, $p < .01$), L2 writing test familiarity ($\beta = .19$, $p < .01$), and the interaction between L1 writing and L2 vocabulary ($\beta = .17$, $p < .01$). These results indicate that proficient L2 writers tended to have greater L2 vocabulary knowledge and be more familiar with the writing test. Furthermore, the significant L1-writing-and-L2-vocabulary interaction effect suggests that the impact of L1 writing on L2 writing changed as a function of the level of L2 vocabulary. To further investigate the interaction, L1-L2 writing relationships were explored using quantiles of vocabulary test scores. We created two sub-groups: a group with the lowest 25% of students on the vocabular test ($n = 30$) and another group with the highest 25% of students on the vocabular test ($n = 31$). For the higher-score group, a significant moderate

[3] Among the 10 students, two lived in the Australia, one in Canada, two in New Zealand, three in Philippines, and two in the USA. Nine students studied abroad in between 3rd and 7th grades, while one student studied aboard in her first year in college.

correlation between L1 and L2 writing scores was found (*rho* = .39, $p < .05$), while for the lower-score group, no relation was found (*rho* = .01, $p > .05$)[4]. This indicates that L2 learners with greater vocabulary knowledge tended to be more proficient L2 writers when they were also proficient L1 writers.

Finally, the residual correlation between L2 reading and L2 writing was not significant ($r_{residual} = .14$, $p > .05$; see Figure 4), suggesting that the remaining variances in L2 reading and L2 writing were unrelated. Specifically, the original, bivariate correlation between L2 reading and writing was significant ($r = .43$, $p < .01$; see Table 1). However, after L2 reading and writing scores were explained in the model, the residual, partial correlation between the two was no longer significant. Given that L2 vocabulary was the only variable that predicted both L2 reading and writing, it appears that L2 vocabulary knowledge accounted for the communality between L2 reading and writing, leading the remaining common variance (i.e., residual correlation) between L2 reading and writing to be non-significant.

Discussion

In this study, we examined L2 reading and writing abilities in relation to L1 reading and writing abilities, L2 vocabulary knowledge, and L2 learning backgrounds for Korean EFL learners. First, L2 vocabulary knowledge was the most important predictor for both L2 reading and L2 writing, such that L2 learners with greater vocabulary knowledge were more likely to be proficient L2 readers and writers. This finding supports the importance of vocabulary knowledge in L2 reading and writing development, such that word meanings are the bases for forming propositions written in the text and constructing a mental model of the situation during reading, and using a range of words is essential for meaning making during writing (Hulstijn, 2015; Stæhr, 2008; van Gelderen et al., 2004).

Beyond vocabulary knowledge, in terms of the L1-L2 reading relationship, results indicated that L1 reading ability predicted L2 reading ability, thus supporting the linguistic interdependence hypothesis for the L1-L2 reading transfer (Alderson, 1984; Cummins, 1979).[5] This suggests that some reading comprehension skills (e.g., reading a text for gist) acquired in

[4] Both groups' data did not follow normal distributions due to small sample sizes, and thus Spearman's rank order correlations were reported.

[5] For the participants in this study who started to learn English as a foreign language after they had acquired their L1, it is likely that their L1 had effects on their L2. Thus, we used such terms as "transfer" and "influence" from the L1 to the L2.

the L1 may have been used during L2 reading processes (Carson et al., 1990). On the other hand, the L1-L2 reading relationship did not change as a function of L2 vocabulary knowledge, which does not support the linguistic threshold hypothesis in L1-L2 reading. This finding may be attributed to L2 knowledge levels and task difficulty. A majority of the participants may have already attained the threshold of L2 knowledge necessary for L1-L2 reading transfer to occur in the context of the L2 reading test used in this study.

With respect to of the L1-L2 writing relationship, L1 writing ability did not predict L2 writing ability, seemingly providing no support for the linguistic interdependence hypothesis. However, the L1-L2 writing relationship changed as a function of the level of L2 vocabulary knowledge such that moderate correlation between L1 and L2 writing scores was found for L2 learners with greater vocabulary knowledge. This suggests that greater L2 vocabulary knowledge may enable L2 learners to use their writing skills that had been acquired in their L1 during L2 writing processes, supporting the linguistic interdependence hypothesis. Taken together, it seems that when L2 learners have not reached the threshold level of L2 knowledge at which the L1-L2 writing transfer occurs, writing skills acquired in the L1 may not be successfully applied to L2 writing processes, which is in line with the linguistic threshold hypothesis (Carson et al., 1990). In contrast, when L2 learners have attained the threshold level of L2 knowledge necessary for the L1-L2 writing transfer, it is likely that writing skills acquired in the L1 can be applied to L2 writing processes, which is in line with the linguistic interdependence hypothesis (Pae, 2019; Sasaki & Hirose, 1996).

When L1-L2 reading and writing relationships are considered together, our findings indicate that the threshold level of L2 knowledge at which the L1-L2 reading transfer occurs may be lower than that at which the L1-L2 writing transfer occurs at least for producing argumentative essays. This can be explained in two ways. First, reading comprehension and writing require different types of L2 knowledge (Fitzgerald & Shanahan, 2000; Grabe & Stoller, 2011). Specifically, reading comprehension mainly involves receptive processing of retrieving meaning based on the given input, whereas writing composition requires more demanding, productive processing including the use of precise orthography, morphology, and syntax (i.e., retrieving appropriate both form and meaning from memory and writing them accurately in context). Second, for EFL students, composition can be more difficult because less instruction is

generally given to writing as compared to reading in EFL contexts (Ruecker, Shapiro, Johnson, & Tardy, 2014).

In addition, after L2 reading and writing were explained by related knowledge and skills, particularly by L2 vocabulary knowledge (which predicted both L2 reading and writing), the remaining correlation between L2 reading and writing was not significant. That is, L2 vocabulary explained a substantial amount of the common variance between L2 reading and writing, which supports the potential role of L2 vocabulary to explain the correlation between L2 reading and writing. These findings, to some degree, indicate that L2 reading and writing may be built on the same resources—L2 vocabulary knowledge (Schoonen, 2019).

We also examined how L2 educational backgrounds predicted L2 reading and writing scores. Years of English learning were not predictive of L2 reading or writing scores, while ESL experience was predictive of L2 reading scores and test familiarity was predicted of L2 writing scores. The lack of the relationship between L2 reading and writing with the length of L2 learning may indicate that in foreign language learning contexts, where exposure to the L2 tends to be limited, the length of L2 learning itself is not important. Instead, some types of turning points in students' learning histories, such as ESL experience and prior writing practice experience, may lead learners to enter a more meaningful learning phase (Muñoz, 2008, 2014). Additionally, the finding that length of L2 learning did not predict L2 reading or writing may also be partially due to the homogeneous nature of the participant population in this study in terms of the length of L2 learning (Hulstijn, 2015). On the other hand, that ESL experience was predictive of L2 reading scores, but not L2 writing scores, may suggest that ESL experience, which often involves extensive exposure to L2 input, is particularly helpful in becoming more proficient L2 readers, while for L2 writing skills, other factors, such as opportunities to practice and to receive feedback from experts, may be more important than exposure to the L2 (Storch & Hill, 2008). Finally, L2 reading test familiarity did not predict L2 reading scores, but L2 writing test familiarity predicted L2 writing scores. This finding may be relevant to English learning contexts in South Korea where there are fewer L2 writing practice opportunities than L2 reading opportunities (Authors, 2018). In addition, L2 reading test familiarity that reflects general reading experience for comprehension was not closely related to L2 reading test scores, whereas L2 writing test familiarity likely resulting from writing practices for the particular writing task used in this study was an important factor to perform better in L2 writing tests.

Conclusion

In conclusion, to provide a more comprehensive understanding of English (L2) reading and writing abilities, we examined English reading and writing in relation to learners' first language reading and writing abilities, L2 vocabulary knowledge, and L2 educational backgrounds. The findings in this study have implications for teaching L2 reading and writing. To be proficient L2 readers and writers, adult EFL learners likely need to build English knowledge (e.g., vocabulary) to reach threshold levels of English knowledge at which they can use reading and writing skills acquired in their L1 during English reading and writing processes. When EFL learners have reached the threshold level of English knowledge at which L1-L2 reading transfer occurs, but successful English reading comprehension may not occur, then these learners might benefit from interventions in general reading comprehension strategies that can operate across languages (e.g., building a coherent interpretation of text and organizing the information provided in the text) or/and benefit from easier texts. When EFL learners have reached the threshold level of English knowledge at which L1-L2 writing transfer occurs, but they may not be successful in composing EFL texts, they might benefit from interventions that teach general writing strategies (e.g., paying attention to generating, organizing, and revising ideas) and building background and content knowledge or/and need to practice easier writing genres and tasks. In addition, in foreign language learning contexts, given that intensive exposure experiences (such as ESL experiences) rather than the mere length of L2 study seem to be more closely related to better performance on L2 reading, implementing educational programs that include periods of intensive exposure to the L2 would merit consideration (Muñoz, 2014). Likewise, providing various writing practice opportunities to L2 learners may be crucial for L2 learners to improve their L2 writing abilities given that prior writing practice experiences rather than the mere length of L2 study appear to be more closely linked to better performance on L2 writing.

While informative, the findings of this study have limitations. First, the sample size was relatively small when compared to other studies (e.g., van Gelderen et al., 2003). Future studies could explore the reading-writing relationship in L1s and L2s with a larger sample size. Second, this study used L2 vocabulary knowledge as a proxy for general linguistic knowledge. Future studies should consider using more general linguistic knowledge features (i.e., standardized language tests) when exploring the links between reading and writing across L1s and L2s. Third, due to limited resources and time, we used a single writing task to tap into L1 and L2 writing

ability. While some previous research included a single writing task in a similar manner to this study (e.g., Lee & Schallert, 2018; Pae, 2018; Stæhr, 2008), future research should include at least two different writing tasks to generalize about an individual's writing ability and minimize measurement errors (e.g., Schoonen, 2019; Wong, 2018; van Weijin, 2009). Fourth, this study did not consider the directionality between the L1 and the L2 for reading and writing tasks. Examining whether reading and writing abilities across two languages have bidirectional relations would merit consideration. Lastly, this study examined the relationship across L1s and L2s in written language. Future studies should investigate the relationship across L1s and L2s in listening and speaking as well.

Word counts: 7,057

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Table 1 *Descriptive statistics and correlations* (N = 108)

Variable	1	2	3	4	5	6	7	8	Mean	*SD*	Range	Maximum possible
1. L2 reading	1								18.40	7.00	4–41	48
2. L2 writing	.43								2.20	.93	.5–4.5	5
3. L2 vocabulary	.53	.56							36.69	6.92	12–47	48
4. L1 reading	.10	–.03	–.04						17.23	4.23	2–25	30
5. L1 writing	.04	.06	.04	.27					3.62	.92	1.5–5	5
6. Years of L2 learning	.20	.20	.17	–.05	.01				11.44	2.15	6–17	—
7. Years of ESL experience	.32	.16	.08	–.04	–.10	.17			.06	.26	0–2	—
8. L2 reading test familiarity	.07	–.09	.14	–.06	–.04	–.03	.13		2.61	.94	1–5	5
9. L2 writing test familiarity	.30	.38	.37	–.10	–.18	.10	.20	.34	2.49	1.12	1–5	5

Note. $|r| \geq .19$, $p < .05$; $|r| \geq .26$, $p < .01$